

EVIDENCE-BASED STRENGTH INTERVENTION IN MULTIPLE CONTEXTS

EDITED BY: Wenjie Duan, Guannan Bai, Wanzhen Chen, Xiaoqing Tang
and Chen Zheng

PUBLISHED IN: Frontiers in Psychology, Frontiers in Public Health and
Frontiers in Psychiatry





frontiers

Frontiers eBook Copyright Statement

The copyright in the text of individual articles in this eBook is the property of their respective authors or their respective institutions or funders. The copyright in graphics and images within each article may be subject to copyright of other parties. In both cases this is subject to a license granted to Frontiers.

The compilation of articles constituting this eBook is the property of Frontiers.

Each article within this eBook, and the eBook itself, are published under the most recent version of the Creative Commons CC-BY licence.

The version current at the date of publication of this eBook is CC-BY 4.0. If the CC-BY licence is updated, the licence granted by Frontiers is automatically updated to the new version.

When exercising any right under the CC-BY licence, Frontiers must be attributed as the original publisher of the article or eBook, as applicable.

Authors have the responsibility of ensuring that any graphics or other materials which are the property of others may be included in the CC-BY licence, but this should be checked before relying on the CC-BY licence to reproduce those materials. Any copyright notices relating to those materials must be complied with.

Copyright and source acknowledgement notices may not be removed and must be displayed in any copy, derivative work or partial copy which includes the elements in question.

All copyright, and all rights therein, are protected by national and international copyright laws. The above represents a summary only. For further information please read Frontiers' Conditions for Website Use and Copyright Statement, and the applicable CC-BY licence.

ISSN 1664-8714

ISBN 978-2-83250-867-1

DOI 10.3389/978-2-83250-867-1

About Frontiers

Frontiers is more than just an open-access publisher of scholarly articles: it is a pioneering approach to the world of academia, radically improving the way scholarly research is managed. The grand vision of Frontiers is a world where all people have an equal opportunity to seek, share and generate knowledge. Frontiers provides immediate and permanent online open access to all its publications, but this alone is not enough to realize our grand goals.

Frontiers Journal Series

The Frontiers Journal Series is a multi-tier and interdisciplinary set of open-access, online journals, promising a paradigm shift from the current review, selection and dissemination processes in academic publishing. All Frontiers journals are driven by researchers for researchers; therefore, they constitute a service to the scholarly community. At the same time, the Frontiers Journal Series operates on a revolutionary invention, the tiered publishing system, initially addressing specific communities of scholars, and gradually climbing up to broader public understanding, thus serving the interests of the lay society, too.

Dedication to Quality

Each Frontiers article is a landmark of the highest quality, thanks to genuinely collaborative interactions between authors and review editors, who include some of the world's best academicians. Research must be certified by peers before entering a stream of knowledge that may eventually reach the public - and shape society; therefore, Frontiers only applies the most rigorous and unbiased reviews.

Frontiers revolutionizes research publishing by freely delivering the most outstanding research, evaluated with no bias from both the academic and social point of view. By applying the most advanced information technologies, Frontiers is catapulting scholarly publishing into a new generation.

What are Frontiers Research Topics?

Frontiers Research Topics are very popular trademarks of the Frontiers Journals Series: they are collections of at least ten articles, all centered on a particular subject. With their unique mix of varied contributions from Original Research to Review Articles, Frontiers Research Topics unify the most influential researchers, the latest key findings and historical advances in a hot research area! Find out more on how to host your own Frontiers Research Topic or contribute to one as an author by contacting the Frontiers Editorial Office: frontiersin.org/about/contact

EVIDENCE-BASED STRENGTH INTERVENTION IN MULTIPLE CONTEXTS

Topic Editors:

Wenjie Duan, East China University of Science and Technology, China

Guannan Bai, Zhejiang University School of Medicine, China

Wanzhen Chen, East China University of Science and Technology, China

Xiaoqing Tang, Zhongnan University of Economics and Law, China

Chen Zheng, Wuhan University, China

Citation: Duan, W., Bai, G., Chen, W., Tang, X., Zheng, C., eds. (2022).

Evidence-based Strength Intervention in Multiple Contexts.

Lausanne: Frontiers Media SA. doi: 10.3389/978-2-83250-867-1

Table of Contents

- 05 Editorial: Evidence-based Strength Intervention in Multiple Contexts**
Xixi Sun and Wenjie Duan
- 09 An Ecological, Participatory, Integral and Contextualized Model (EPIC Model) of Family-School Connection: A Preliminary Analysis**
Mahia Saracostti, José Antonio Lozano-Lozano, Horacio Miranda, Laura Lara, Diana Martella and Taly Reininger
- 17 Cross-Cultural Adaptation and Validation of the Physical Disability Resiliency Scale in a Sample of Chinese With Physical Disability**
Wenjie Duan, Wenlong Mu and Hongxia Xiong
- 26 A Pilot Study for Forgiveness Intervention in Adolescents With High Trait Anger: Enhancing Empathy and Harmony**
Linjin Tao, Mingxia Ji, Tingting Zhu, Hong Fu and Ruoying Sun
- 36 Cultural Capital as Class Strength and Gendered Educational Choices of Chinese Female Students in the United Kingdom**
Siqi Zhang¹ and Xiaoqing Tang
- 48 Positive Psychology Micro-Coaching Intervention: Effects on Psychological Capital and Goal-Related Self-Efficacy**
Alina Corbu, María Josefina Peláez Zuberbühler and Marisa Salanova
- 62 Corrigendum: Positive Psychology Micro-Coaching Intervention: Effects on Psychological Capital and Goal-Related Self-Efficacy**
Alina Corbu, María Josefina Peláez Zuberbühler and Marisa Salanova
- 63 Improving Care for Deinstitutionalized People With Mental Disorders: Experiences of the Use of Knowledge Translation Tools**
Izabela Fulone, Jorge Otavio Maia Barreto, Silvio Barberato-Filho, Cristiane de Cássia Bergamaschi, Marcus Tolentino Silva and Luciane Cruz Lopes
- 73 Fidelity Assessment Checklist Development for Community Nursing Research in Early Childhood**
Lubna Anis, Karen M. Benzies, Carol Ewashen, Martha J. Hart and Nicole Letourneau
- 87 Positive Psychological Coaching Tools and Techniques: A Systematic Review and Classification**
Stefanie Richter, Llewellyn E. van Zyl, Lara C. Roll and Marius W. Stander
- 106 Decreasing Social Isolation to Enhance Mental Health among Older Adults in China: A Mediation Analysis of Aging Attitude**
Xinfeng Cheng, Theodore D. Cosco and Tolulope Ariyo
- 118 A Randomized Controlled Trial of a Positive Family Holistic Health Intervention for Probationers in Hong Kong: A Mixed-Method Study**
Agnes Y.-K. Lai, Shirley M.-M. Sit, Carol Thomas, George O.-C. Cheung, Alice Wan, Sophia S.-C. Chan and Tai-hing Lam
- 134 Widowhood and Life Satisfaction Among Chinese Elderly Adults: The Influences of Lifestyles and Number of Children**
Caiyun Yang, Xixi Sun and Wenjie Duan

- 143 Association of Use of Tourniquets During Total Knee Arthroplasty in the Elderly Patients With Post-operative Pain and Return to Function**
Jian Zhao, Xin Dong, Ziru Zhang, Quanyou Gao, Yunfei Zhang, Junlei Song, Shun Niu, Tian Li, Jiying Chen and Fei-Long Wei
- 155 Sense of Coherence as a Mediator in the Association Between Empathy and Moods in Healthcare Professionals: The Moderating Effect of Age**
Miyo Hori, Eisho Yoshikawa, Daichi Hayama, Shigeko Sakamoto, Tsuneo Okada, Yoshinori Sakai, Hideomi Fujiwara, Kazue Takayanagi, Kazuo Murakami and Junji Ohnishi
- 165 Clinical Efficacy and Safety of Surgical Treatments in Patients With Pure Cervical Radiculopathy**
Quan-You Gao, Fei-Long Wei, Kai-Long Zhu, Cheng-Pei Zhou, Hu Zhang, Wen-Xing Cui, Tian Li, Ji-Xian Qian and Ding-Jun Hao
- 179 Development and Validation of a Quantitative Measure for Parent Empowerment via Transformative Learning**
Siu-ming To, Lei Yang, Lei Dong, Ming-wai Yan, Yuk-yan So and Mee-yee Chung
- 193 The Effect of Horticultural Therapy on Depressive Symptoms Among the Elderly: A Systematic Review and Meta-Analysis**
Ya Wei Zhang, Jun Wang and Tian Hong Fang



OPEN ACCESS

EDITED AND REVIEWED BY
Changiz Mohiyeddini,
Oakland University William Beaumont
School of Medicine, United States

*CORRESPONDENCE
Wenjie Duan
duan.w@outlook.com

SPECIALTY SECTION
This article was submitted to
Health Psychology,
a section of the journal
Frontiers in Psychology

RECEIVED 27 October 2022
ACCEPTED 31 October 2022
PUBLISHED 11 November 2022

CITATION
Sun X and Duan W (2022) Editorial:
Evidence-based strength intervention
in multiple contexts.
Front. Psychol. 13:1081610.
doi: 10.3389/fpsyg.2022.1081610

COPYRIGHT
© 2022 Sun and Duan. This is an
open-access article distributed under
the terms of the [Creative Commons
Attribution License \(CC BY\)](#). The use,
distribution or reproduction in other
forums is permitted, provided the
original author(s) and the copyright
owner(s) are credited and that the
original publication in this journal is
cited, in accordance with accepted
academic practice. No use, distribution
or reproduction is permitted which
does not comply with these terms.

Editorial: Evidence-based strength intervention in multiple contexts

Xixi Sun and Wenjie Duan*

School of Social and Public Administration, East China University of Science and Technology, Shanghai, China

KEYWORDS

evidence-based practice, strength-based perspective, positive psychology, positive interventions, strength interventions

Editorial on the Research Topic

Evidence-based strength intervention in multiple contexts

Introduction

Evidence-based practice (EBP) is a process of making practice decisions and evaluating effectiveness through identifying, selecting, and applying the best scientific evidence (Rubin, 2008; Nevo and Slonim-Nevo, 2011; Kagan, 2022). Randomized control trials (RCTs) are considered one of the strongest evidence and the gold standard methodology with its internal validity in detecting a causal relationship between treatment and outcome and measuring the effectiveness of a treatment (Sibbald and Roland, 1998). A few research including RCTs, has proved that EBP can bring about positive outcomes (Stanhope et al., 2010) and has spread to wider areas, including but not limited to psychology, psychiatry, public health, and social work (APA Presidential Task Force on Evidence-Based Practice, 2006; Brownson et al., 2009; Gambrill, 2011).

Scholars in these health-related fields have accumulated a broad range of research on science-based health promotion programs, which paid more attention to repairing the weakness or problems of individuals and communities. However, it has been recognized that the traditional approach is insufficient or inefficient enough to help individuals and communities achieve sustained outcomes since the emergence of positive psychology in the United States about two decades ago (Gable and Haidt, 2005). Positive psychology focuses on the scientific study of positive experience, positive individual traits, and environmental strength (Duckworth et al., 2005) and views human life from a positive perspective with a central mission to identify, develop, and evaluate interventions that aim to enhance wellbeing (Carr et al., 2020). Compelling evidence illustrated that positive emotion represents a separate psychological process which distinct from negative emotion (Fredrickson, 1998; Duckworth et al., 2005). The understanding of the scope of health is therefore broadened from removing ill-being to being and living well (Neuhaus et al., 2022). In other words, the interventions should not only be designed to help at-risk populations get back to normal life but also to help at-normal populations to a better life.

Although positive psychology is a relatively young branch of psychology, a few strengths-based intervention studies were conducted (Gander et al., 2012; Duan et al., 2018; Bu and Duan, 2019), and the number of publications was increased in recent years. Part of the existing studies demonstrated the effectiveness of strengths-based interventions (Duan et al., 2013, 2022b; Carr et al., 2020), while others constructed and examined the validation of character strengths-based interventions (Niemic, 2018; Duan et al., 2022a). However, research on how and why these strengths-based interventions work remains unclear (Ghielen et al., 2017). To address these questions, we collected a series of articles to represent the latest empirical study on evidence-based strengths interventions in multiple contexts, including psychology, psychiatry, public health, and social work backgrounds. We believe such work will be critical in integrating personal and environmental strengths to foster wellbeing in different settings, including but not limited to clinical, non-clinical, community, and educational settings and across treatment, prevention and promotion models. Furthermore, a deeper understanding of underlying mechanisms of change present in the situations will be attained and can be used to innovate interventions. In this Research Topic, 16 works were collected and published in three journals (i.e., *Frontier in Psychology*, *Frontier in Psychiatry*, and *Frontier in Public Health*), illustrating a snapshot of the latest progress of evidence-based strength interventions.

Evidence-based strength intervention in the psychology context

This section contains nine articles investigating producing positive psychological, social, cultural, and health-based outcomes. Three experimental studies were collected in this section, including one RCT and three quasi-experiment studies. A three-group RCT designed by Lai et al. provided the first evidence of the effectiveness of probation service and the additional use of a positive family holistic health intervention. Results showed that the intervention integrating with positive psychology themes enhanced probationers' holistic health, family communication, and their relationships with probation officers. Saracosti et al. designed a quasi-experiment trial to prove that the Ecological, Participatory, Integral, and Contextualized Family-School Collaboration Model positively influences home-based involvement, memory, attention, and intrapersonal skills in the first cycle of elementary education. Tao et al. used a pretest-posttest method of quasi-experimental design to examine the impact of forgiveness interventions. It is revealed that the forgiveness intervention can effectively improve the positive mental strength (i.e., forgiveness, empathy,

and harmony) of adolescents with high levels of trait anger. Another quasi-experimental trial was conducted by Corbu et al. to test the effect of a Positive Psychological Micro-Coaching program on non-executive workers' psychological capital. Results implicated that short-term positive psychological coaching is a valuable way to develop personal resources in improving goal achievement and then work-related goals in non-executive employees.

Two studies conducted mediation analysis among older adults in the Chinese context, and one study conducted content analysis among Chinese female students in the United Kingdom. Cheng et al. investigated the impact of objective isolation and subjective social isolation on the mental health of older Chinese adults and the mediating effect of aging attitudes. Using the sample from the 2014 Chinese Longitudinal Aging Social Survey, the research showed that aging attitudes play a significant mediating role between social isolation and mental health. Yang et al. used a sample from the 2013 Chinese General Social Survey to examine the relationship between life satisfaction and lifestyle, the number of children, and widowhood status. The established moderated mediation model illustrated that lifestyle partly mediated the relationship between widowhood and life satisfaction while the number of children moderated the relationship between widowhood and lifestyle and between lifestyle and life satisfaction. Zhang and Tang's qualitative study explored factors that impact Chinese students' choice of study destination and choice of subject and program. It is shown that cultural capital, gender, class, and family involvement all influenced Chinese female students' aspiration to study in the United Kingdom, and despite the fact these students have the privilege to study abroad, female students from the middle class are constrained by Chinese gender norms and class background when making educational choices.

Two studies in this section provided evidence-based strength intervention with reliable and valid methods of assessment tools. Duan et al.'s study was the first to examine the factor structure of the Physical Disability Resilience Scale (PDRS) in the Chinese context based on the Multiple Sclerosis Resiliency Scale. The revised PDRS with four subscales (i.e., Emotional and Cognitive Strategies, Physical Activity and Diet, Peer Support, and Support from Family and Friends) showed good reliability and validity in assessing resilience among Chinese people with a physical disability. To et al. developed the Parent Empowerment via Transformative Learning Questionnaire (PETLQ) and confirmed it as a scale with sufficient factorial validity and internal consistency for assessing parents' attitudes and competence in parent empowerment and for evaluating the effectiveness of parenting intervention programs. It is notable that even though these two studies were classified in psychology contexts, social workers were involved in the research process as key members.

Evidence-based strength intervention in the psychiatry context

Three articles were included in this section with a psychiatric focus on evidence-based strength intervention, with two systematic review articles and one correlation study. Two systematic reviews summarized six strategies used to improve community services for deinstitutionalized patients with severe mental disorders (Fulone et al.) and 117 different coaching tools (18 overarching coaching techniques) used in the different phases of the Positive Psychological Coaching model (Richter et al.). To evaluate the mediatory role of sense of coherence, Hori et al. conducted a survey among healthcare professionals in a Japanese general hospital and found that sense of coherence mediated the relations between empathy and both self-vigor mood and self-depression mood. This research indicates that more effective empathy performance interventions need to be developed for healthcare professionals.

Evidence-based strength intervention in the public health context

In the public health context, researchers paid attention to the wellbeing of patients with physical or mental health issues and the fidelity of nurses-delivered healthcare programs, including four articles.

Three articles are systematic reviews studying the wellbeing of patients. Gao et al. conducted a network meta-analysis to examine the safety and effectiveness of surgical interventions for pure cervical radiculopathy. This research illustrates that all surgical interventions can achieve satisfactory results and surgeons can choose appropriate surgical interventions based on their strengths and patient-related factors. Zhao et al.'s systematic review of RCTs on the effects of the tourniquet on pain and return to function showed that the routine use of a tourniquet during total knee arthroplasty was not recommended due to more pain, slower functional recovery, and more complications. Another systematic review and meta-analysis conducted by Zhang et al. found that horticultural therapy had a significant positive effect on depressive symptom reductions in the elderly. To enable the systematic evaluation of parenting program delivery and to better identify the therapeutic components that enable targeted efforts at improvement, Anis et al. developed a fidelity assessment checklist to make the program-delivery evidence-based.

Future research

The collection of this Research Topic presents the features of the broadening scope and high level of evidence (APA Presidential Task Force on Evidence-Based Practice, 2006; Thyer and Pignotti, 2011; Lomas et al., 2020). Regarding broadening scope, 16 articles looked deeply and critically at different groups, including adolescents, families, the elderly, patients, workers, and healthcare professionals. Beyond the primary focus on the individual person, these articles moved toward more contextually-oriented and system-informed approaches, looking into multiple interpersonal and ecological factors that might create nurturing environments and positive institutions (Lomas et al., 2020). The broadening scope was also reflected in the inclusion of cross-cultural research. It is valuable to test tools, constructs, and methodologies across populations that developed in the Western context, illustrating how culture influences people's understanding and experience of the world (Lomas et al., 2020). The high quality of these studies can be seen from the fact that more than half of the research were systematic reviews, RCTs, and quasi-experiment studies, contributing to the high level of evidence.

Despite the progress made through these studies, more work is needed further to develop positive psychology in the evidence-based strength intervention field. It is worth noticing that this Research Topic had not attracted any study from social work, and the number of articles from the psychiatric and public health field was much smaller than psychology. Thus, from the evidence-based perspective, there is still a need for more high-quality empirical evidence to provide a theoretical rationale for the exploration in broadening scope and the establishment of a stronger and broader evidence base, especially from but not limited to social work, public health, and psychiatry professional perspectives. From the strength-based perspective, the current research still mainly focused on individual-level phenomena and did not deeply explore contextual factors. Future research might focus more on contextual and structural factors that impact personal, group, and communal wellbeing in multiple contexts and explore more mediators and moderators that can explain the effectiveness of evidence-based strengths interventions and the underlying mechanisms of positive changes.

Author contributions

XS wrote the draft of this editorial. WD finalized the version and submitted it to the journal. All authors contributed to the article and approved the submitted version.

Funding

The East China University of Science and Technology Supporting Funds for Scientific Research Strengths-Based Interventions in Multiple Contexts.

Acknowledgments

WD would like to acknowledge and give his warmest thanks to the support from the East China University of Science and Technology Supporting Funds for Scientific Research Strengths-Based Interventions in Multiple Contexts. WD would also like to give his special thanks to all the authors who have contributed to this Research Topic.

References

- APA Presidential Task Force on Evidence-Based Practice (2006). Evidence-based practice in psychology. *Am. Psychol.* 61, 271–285. doi: 10.1037/0003-066X.61.4.271
- Brownson, R. C., Fielding, J. E., and Maylahn, C. M. (2009). Evidence-based public health: a fundamental concept for public health practice. *Annu. Rev. Public Health* 30, 175–201. doi: 10.1146/annurev.publhealth.031308.100134
- Bu, H., and Duan, W. (2019). A single-session positive cognitive intervention on first-year students' mental health: short-term effectiveness and the mediating role of strengths knowledge. *J. Am. Coll. Health* 67, 515–522. doi: 10.1080/07448481.2018.1497639
- Carr, A., Cullen, K., Keeney, C., Canning, C., Mooney, O., Chinseallaigh, E., et al. (2020). Effectiveness of positive psychology interventions: a systematic review and meta-analysis. *J. Posit. Psychol.* 16, 749–769. doi: 10.1080/17439760.2020.1818807
- Duan, W., Bu, H., Zhao, J., and Guo, X. (2018). Examining the mediating roles of strengths knowledge and strengths use in a 1-year single-session character strength-based cognitive intervention. *J. Happiness Stud.* 20, 1673–1688. doi: 10.1007/s10902-018-0014-z
- Duan, W., Ho, S. M. Y., Tang, X., Li, T., and Zhang, Y. (2013). Character strength-based intervention to promote satisfaction with life in the Chinese university context. *J. Happiness Stud.* 15, 1347–1361. doi: 10.1007/s10902-013-9479-y
- Duan, W., Kong, Y., Bu, H., Guan, Q., Chen, Z., Luo, Q., et al. (2022a). The online strength-informed acceptance and commitment therapy among COVID-19-affected adolescents. *Res. Soc. Work Pract.* 32, 465–474. doi: 10.1177/10497315211067270
- Duan, W., Wu, T., Bu, H., and He, L. (2022b). Development of a three-stage strength-based meaning intervention to promote mental health among individuals with physical disabilities in disadvantaged communities: a randomized controlled trial. *J. Happiness Stud.* 1–23. doi: 10.1007/s10902-022-00578-3
- Duckworth, A. L., Steen, T. A., and Seligman, M. E. (2005). Positive psychology in clinical practice. *Annu. Rev. Clin. Psychol.* 1, 629–651. doi: 10.1146/annurev.clinpsy.1.102803.144154
- Fredrickson, B. L. (1998). What good are positive emotions? *Rev. Gen. Psychol.* 2, 300–319. doi: 10.1037/1089-2680.2.3.300
- Gable, S. L., and Haidt, J. (2005). What (and why) is positive psychology? *Rev. Gen. Psychol.* 9, 103–110. doi: 10.1037/1089-2680.9.2.103
- Gambrill, E. (2011). Evidence-based practice and the ethics of discretion. *J. Soc. Work* 11, 26–48. doi: 10.1177/1468017310381306
- Gander, F., Proyer, R. T., Ruch, W., and Wyss, T. (2012). Strength-based positive interventions: further evidence for their potential in enhancing well-being and alleviating depression. *J. Happiness Stud.* 14, 1241–1259. doi: 10.1007/s10902-012-9380-0
- Ghielen, S. T. S., van Woerkom, M., and Christina Meyers, M. (2017). Promoting positive outcomes through strengths interventions: a literature review. *J. Posit. Psychol.* 13, 1–13. doi: 10.1080/17439760.2017.1365164
- Kagan, M. (2022). Social workers' attitudes towards evidence-based practice: a multidimensional perspective. *Br. J. Soc. Work*, 2022, bcac067. doi: 10.1093/bjsw/bcac067
- Lomas, T., Waters, L., Williams, P., Oades, L. G., and Kern, M. L. (2020). Third wave positive psychology: broadening towards complexity. *J. Posit. Psychol.* 16, 660–674. doi: 10.1080/17439760.2020.1805501
- Neuhaus, M., Young, T., Ferris, L. J., Grimmel, C. L. M., and Reid, N. (2022). A narrative review of peer-led positive psychology interventions: current evidence, potential, and future directions. *Int. J. Environ. Res. Public Health* 19, 8065. doi: 10.3390/ijerph19138065
- Nevo, I., and Slonim-Nevo, V. (2011). The myth of evidence-based practice: towards evidence-informed practice. *Br. J. Soc. Work* 41, 1176–1197. doi: 10.1093/bjsw/bcq149
- Niemiec, R. M. (2018). *Character Strengths Interventions: A Field Guide for Practitioners*. Boston, MA: Hogrefe Publishing. doi: 10.1027/00492-000
- Rubin, A. (2008). *Practitioner's Guide to Using Research for Evidence-Based Practice*. Hoboken, NJ: John Wiley and Sons.
- Sibbald, B., and Roland, M. (1998). Understanding controlled trials: why are randomised controlled trials important? *BMJ* 316, 201. doi: 10.1136/bmj.316.7126.201
- Stanhope, V., Tuchman, E., and Sinclair, W. (2010). The implementation of mental health evidence based practices from the educator, clinician and researcher perspective. *Clin. Soc. Work J.* 39, 369–378. doi: 10.1007/s10615-010-0309-y
- Thyer, B. A., and Pignotti, M. (2011). Evidence-based practices do not exist. *Clin. Soc. Work J.* 39, 328–333. doi: 10.1007/s10615-011-0358-x

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.



An Ecological, Participatory, Integral and Contextualized Model (EPIC Model) of Family-School Connection: A Preliminary Analysis

Mahia Saracostti^{1*}, José Antonio Lozano-Lozano², Horacio Miranda³, Laura Lara⁴, Diana Martella⁴ and Taly Reininger⁵

¹ Escuela de Trabajo Social, Facultad de Ciencias Sociales, Director of UNESCO Chair Childhood/Youth, Education and Society, Universidad de Valparaíso, Valparaíso, Chile, ² Escuela de Psicología, Instituto de Ciencias Biomédicas, Universidad Autónoma de Chile, Santiago, Chile, ³ Núcleo Científico Tecnológico en Ciencias Sociales y Humanidades, University of La Frontera, Temuco, Chile, ⁴ Escuela de Psicología, Facultad de Ciencias Sociales y Humanidades, Universidad Autónoma de Chile, Santiago, Chile, ⁵ Departamento de Trabajo Social, Facultad de Ciencias Sociales, Universidad de Chile, Santiago, Chile

OPEN ACCESS

Edited by:

Wenjie Duan,
East China University of Science
and Technology, China

Reviewed by:

I. Michael Murphy,
Massachusetts General Hospital
and Harvard Medical School,
United States

Ernesto Treviño,
Pontificia Universidad Católica
de Chile, Chile

*Correspondence:

Mahia Saracostti
mahia.saracostti@uv.cl

Specialty section:

This article was submitted to
Health Psychology,
a section of the journal
Frontiers in Psychology

Received: 25 May 2020

Accepted: 01 October 2020

Published: 22 October 2020

Citation:

Saracostti M, Lozano-Lozano JA,
Miranda H, Lara L, Martella D and
Reininger T (2020) An Ecological,
Participatory, Integral
and Contextualized Model (EPIC
Model) of Family-School Connection:
A Preliminary Analysis.
Front. Psychol. 11:563506.
doi: 10.3389/fpsyg.2020.563506

There are several programs that aim to strengthen the bond between families and schools that have shown a positive impact on this relationship as well as its effectiveness in improving academic and socioemotional child indicators. Most of the studies in this area come from Anglo-Saxon countries while in Latin America research is still scarce. Thus, this study aims to assess the influence of implementing an Ecological, Participatory, Integral and Contextualized Family-School Collaboration Model (EPIC) on family involvement, social-emotional development, and cognitive test outcomes in children in elementary school. Three possible hypotheses have been considered: (1) The EPIC Family-School Collaboration Model will have a positive and significant influence on the level of family involvement; (2) The EPIC Family-School Collaboration Model will have a positive and significant influence on the results of some cognitive tests; and; (3) The EPIC Family-School Collaboration Model will have a positive and significant influence on child social-emotional development. The study included 171 students who attended second and third elementary grades in schools in Chile during 2017 and fourth and fifth grades during 2019. The children were between 7 and 12 years old ($M = 8.17$, $SD = 0.98$), during 2017 and between 9 and 14 years old ($M = 9.88$, $SD = 0.99$), during 2019. The results show that the EPIC Family-School Collaboration Model has a positive and significant influence on the level of home-based involvement, memory and attention and intrapersonal skills in the first cycle of elementary education.

Keywords: family involvement, children's socioemotional development, children's cognitive and learning abilities, child well-being, family and school relation, evidence-based practice

INTRODUCTION

Numerous researchers have endorsed the crucial role of family in the academic performance and in the development of socio-emotional and cognitive abilities of children (Jeynes, 2012; Castro et al., 2015; Ma et al., 2016; Chavkin, 2017; Garbacz et al., 2017).

Most of the studies in this area are predominantly from Anglo-Saxon countries while in Latin America (Baker et al., 2016; Garbacz et al., 2017; Garbacz et al., 2019; Eichin and Volante, 2018)

research is still scarce. Therefore, this study aims to assess the preliminary influence of implementing an Ecological, Participatory, Integral and Contextualized Family-School Collaboration Model (EPIC) in Chile on family involvement, socio-emotional development, and cognitive tests in children in the first cycle of elementary education.

In the Chilean educational system, parental and/or guardian participation in school is considered a key factor in educational policy (MINEDUC, 2017). Due to previous research indicating that the degree of family involvement in school processes is a critical element in children's development and learning during the first school stage (Casper et al., 2006; Galindo and Sheldon, 2012), the EPIC model was designed for implementation in the first cycle of elementary education (Lara and Saracostti, 2020).

The principles of the Family-School EPIC Collaboration Model are: (1) an Ecological Perspective where children are in a situated and contextualized way, thus including their significant environment, family dimensions and educational and social-cultural contexts is considered key (Frey and Dupper, 2005; Saracostti, 2013). (2) a Participatory Approach that understands higher levels of participation of key actors is necessary to implement the solution model. (3) an Integral approach that supposes the efficient use of the social-educational intervention resources present in the school and in the community under the logic of comprehensive continuous improvement. (4) Contextualized co-construction in which training, planning, and implementation of the model is co-constructed with schools and in dialog with the team of professionals and the educational community.

The EPIC Collaboration Model seeks to encompass the family-school relationship from a logic of improvement, including the following phases:

Diagnostic Phase that seeks to identify and understand the family-school relationship from the perspectives of various actors in the educational community. The diagnosis gives rise to the definition of priorities, ranking needs and determining relevant courses of action (Raczynski and Muñoz, 2007; Saracostti and Villalobos, 2015). Schools were accessed through contact with school climate coordinators who then provided access to the school management team. Once the family involvement surveys and cognitive and socioemotional development tests were applied, results were shared with school management and professional teams who provided further complementary school data. This information was then utilized in co-constructing the model based on scientific evidence that demonstrated family involvement had a positive impact on students' learning processes (UNESCO, 2014).

1. Initial Training Phase seeks to install capacities within schools, based on the findings of systematic reviews and meta-analyses on the positive impacts of interventions on student behavior, school climate, academic achievement, and school retention (Wilson et al., 2011; Maynard et al., 2012). This phase is aimed at principals, management teams, teachers and psychosocial school professionals since the literature indicates the need to have the political will of the establishments, recommending actions be channeled

from the governance of the schools as a key condition for developing effective plans that involve the family (Hoover-Dempsey and Sandler, 2005). This stage included (a) 2 days of training aimed at school educational teams: teachers, psychosocial professionals, and managers and, (b) A 1-day training session with the families of students included in the study. Both training activities lasted 8 h and included theoretical information on school family collaborations, the review of national and international experiences, and the design of a collaborative Family-School intervention plan for participating schools.

2. Intervention Phase that aims to accompany and advise the implementation of the Family-School Intervention Plan generated from and for each school, which is inserted within the Family-School Collaboration Model. A workshop was held with school and parent representatives in order to determine the strengths and limitations of family school relations. With this information an action plan was developed for each school considering the principles of the EPIC model. School psychosocial teams (psychologists and social workers) were in charge of implementing the plan in each school and were accompanied by members from the research team in monthly meetings. These workshops created a space for each school to develop new strategies to encourage family involvement and included a reception protocol for students and families, a parenting skills workshop, a citizenship fair and the design of a traveling notebook that arrived at the homes of students in other schools.
3. Systematization, Monitoring and Evaluation Phase which is designed in parallel to the intervention design process and which takes into consideration the specific context of each school as well as each intervention (Saracostti and Villalobos, 2015). Field notes were recorded in regards to the implementation processes of school plans including activities (description of what occurred during each school visit), ideas, reflections, doubts (including interpretations, as well as explanations of what was occurring) and next steps (changes regarding upcoming activities and/or interventions). Furthermore, a second wave of the standardized measures was undertaken during this phase with the family involvement survey applied during the last month of the EPIC model's execution.

The EPIC model, consistent with its principles and application of its four phases, lasted 16 months and contributed to the comprehensiveness and networking between the diverse psychosocial programs being implemented in parallel within the schools. A facilitator from the research team was in charge of overseeing the implementation of the EPIC model by accompanying and guiding the process, working on average 4 h a week with school management teams and/or professionals as well as with families.

In this study, three possible hypotheses have been considered:

1. The EPIC Family-School Collaboration Model will have a positive and significant influence on the level of family

involvement in the first cycle of elementary education, this being higher than that observed in the schools that make up the control group;

2. The EPIC Family-School Collaboration Model will have a positive and significant influence on the results of some cognitive tests of children in the first cycle of elementary education, this being higher than that observed in the schools that make up the control group; and,
3. The EPIC Family-School Collaboration Model will have a positive and significant influence on the social-emotional development of children in the first cycle of elementary education, this being higher than that observed in the schools that make up the control group.

METHODS

Participants

The study included 171 students who attended second and third elementary grades in schools in three regions in Chile (O'Higgins, El Maule and La Araucanía) during 2017 and fourth and fifth grades during 2019. They were randomly assigned to the control group (106) and the experimental group (65) using non-probability purposive sampling (Kerlinger and Lee, 2002). The children had high levels of vulnerability according to the student vulnerability index issued by the Chilean Ministry of Education. The participants were evaluated at two moments, before the intervention (year 2017) and after the intervention (year 2019).

The children were between 7 and 12 years old ($M = 8.17$, $SD = 0.98$), during 2017 and between 9 and 14 years old ($M = 9.88$, $SD = 0.99$), during 2019. 44.6 and 55.6% were girls and boys, respectively.

This study was carried out in accordance with the ethical recommendations of the Chilean National Commission for Scientific and Technological Research. The protocol was approved by the Ethics Committee of the Universidad de La Frontera (Acta 066-2017, Folio 036-17). All the subjects provided written informed consent in accordance with the Declaration of Helsinki.

Instruments

Assessment of Family Involvement

Hoover-Dempsey and Sandler's Parental Involvement model and scales were used to evaluate parental involvement in children's education. These were translated into Spanish and validated by a panel of experts in Chile (Reininger, 2014). The scales included the Parental Involvement forms scale (with two subscales: home based involvement, 5 items, and school based involvement, 5 items); teacher invitations for involvement scale (6 items); and the general school invitations scale (6 items). The first scale has a four-point Likert response scale, from 1 (never) to 4 (always), while the rest was a 5-point scale Likert response, from 1 (strongly disagree) to 5 (strongly agree).

Evaluation of Learning Outcomes

Educational psychology battery EVALÚA (García and González, 2006), was used to assess learning outcomes and basic cognitive

processes. The instrument has been validated and assessed in Chile. Three subtests of the battery were used in this study: Memory and Attention (MA) and two subtests of reasoning, Analogical Thinking (AT) and Perceptual Organization (PO). (1) MA is composed of 4 tasks and a total of 22 items; direct punctuation (DP) is calculated with the formulas: $PDMA = \Sigma A - (E + O)$; (2) AT involves 2 tasks and a total of 20 items; $PD = A - E/3$ is the used to calculate the DP; and (3) PO is composed of 2 tasks and a total of 34 items and the DP of each part is calculated with the formula $\Sigma A - E/31$. In each subtest, the sum of the partial DPs corresponds to total DP. In the formula, A is the number of correct responses; E is the number of errors; O is the number of omissions, and the number 3 correspond to the number of alternatives minus 1.

Assessment of Socioemotional Development

The EQ-I: YV questionnaire (Emotional Intelligence Inventory: Young Version, Bar-On and Parker, 2000) adapted and validated in Spanish (Ferrándiz et al., 2012) evaluate social and emotional competences of children and adolescents. It is composed of 60 items grouped into 5 subscales: interpersonal, intrapersonal, adaptability, stress management, and general mood. The response scale ranged from 1 (rarely) to 4 (nearly always).

Procedure

This study focusses on the effectiveness of interventions to strengthen the link between families and schools. The data referring to the students (evaluation of learning outcomes and assessment of socioemotional development) was collected during school hours and were registered in digital format on the schools' computer rooms during three sessions. The data referring to the families (family involvement) were collected in paper format during parent teacher meetings.

Analysis Plan

To compare the response between the experimental and control groups, the research employed a quasi-experimental pre-post longitudinal design (Hernández et al., 2006) with case study matching based on age, school size, classroom, and gender (Lukas and Santiago, 2004). This determined that no significant differences between the experimental and control group were present at the beginning of the study, as shown in Table 1.

To verify that the comparisons of the main effects of the intervention, time, and interaction were not affected by a difference at the beginning of the study, we proceeded to compare the dependent variables in the initial time between the intervention group vs. the control. The results showed that most of the dependent variables did not present significant differences by the non-parametric Mann-Withey *U*-test. However, the variables analogical thinking and stress management did show significant differences before the intervention, and thus they were removed from the study. Subsequently, the ANOVA model was evaluated on the average ranking non-parametric transformation (Conover and Iman, 2012) with the main effects of the intervention vs. the control, the moments in time, and the interaction between the intervention and time. In this case, the interaction corresponds to a hypothesis test of

the trend over time, with a null hypothesis of parallelism and an alternative hypothesis of non-parallelism that includes divergence, convergence, and trend crossing (Newrnan et al., 1999; Shadish et al., 2002). In some cases, the hypothesis of the interaction was not significant, but the main effects of the intervention or time did show significant differences, which in this study corresponds to divergence or crossing of trends where the distance between the confidence intervals increases significantly toward the end of the study.

The aim is to check whether introducing the set of activities that make up the intervention model (EPIC model) in the Experimental Group (Ge) causes differential effects in its post-treatment performance in relation to the Control Group (Gc). The groups formed are not entirely equivalent nor will the control exercised over the experimental conditions be absolute (Sarría-Santamera, 2020) although constant maintenance was used and subject to self-control. The use of different evaluation instruments is contemplated (cognitive tests and social-emotional development instruments in students, as well as family involvement in parents and/or guardians) in order to provide more extensive and complex information on the processes evaluated.

Because dependent variables did not have normal distribution, the ranking transformation was applied with tie correction to obtain a non-parametric analysis of the hypothesis tests, as proposed by Conover and Iman (2012). The effect assessment was performed through a general linear model applied on dependent variables with ranking transformation with tie correction, with independent variables of type dummy based on intervention (X1: 0-Control/1-Experimental), time (X2: 0-Start time/1-end time) and the interaction between intervention and time (X1*X2). Hypothesis tests were performed using the probability value of student's *t*-distribution of the model parameters, equivalent to the probability value of the Snedecor F distribution with 1 and *n*-1 degrees of freedom from the ANOVA table, used as significance level 0.05.

RESULTS

The characteristics of students and their parents were collected in 2017. In terms of the age, gender, and level of education of the students, no significant differences were found between the intervention and the control group ($p = 0.237$, $p = 0.372$, and $p = 0.656$ respectively). As for the characteristics of the parents, no significant differences were found between the intervention and the control group in regards to the type of relationship with the child, and mother and father's education ($p = 0.322$, $p = 0.386$, $p = 0.09$, respectively).

Regarding the first hypothesis, as shown in Table 2, the EPIC Family-School Collaboration Model had a positive and significant influence only on "Home based involvement" in the first cycle of primary education. The ANOVA showed significant main effects of Group [$F_{(1, 317)} = 3.907$; $p = 0.048$] but not over time [$F_{(1, 317)} = 0.747$; $p = 0.0001$] indicating better performance in the intervention group (mean = 12.00; $SD = 2.46$) in comparison to controls (mean = 11.71; $SD = 2.95$) and in post-intervention

TABLE 1 | Baseline characteristics of students and parents.

Students and parents characteristics	Control (N = 106)	Intervention (N = 65)	P-value
Students' gender			0.237
Girls	44 (41.5)	33 (50.8)	
Boys	62 (58.5)	32 (49.2)	
Student age			0.372
Mean (SD)	8.25	8.09	
Median (IQR)	8(1)	8(2)	
Min-max	7–12	7–11	
Student education level			0.656
Grade 2	64 (60.4)	37 (56.9)	
Grade 3	42 (39.6)	28 (43.1)	
Parent relationship with child			0.322
Mother	94 (88.7)	56 (86.2)	
Father	4 (3.8)	5 (7.7)	
Uncle or aunt	3 (2.8)	0 (0.0)	
Grandfather or grandmother	5 (4.7)	3 (4.6)	
Others	0 (0.0)	1 (1.5)	
Mother's education			0.386
No studies	2 (1.9)	0 (0.0)	
Primary	18 (17.0)	18 (27.7)	
Secondary	71 (67.0)	40 (61.5)	
Vocational School	12 (11.3)	5 (7.7)	
Bachelor's degree or higher	3 (2.8)	2(3.1)	
Father's education			0.099
No studies	0 (0.0)	1(1.5)	
Primary	29 (27.4)	18 (27.7)	
Secondary	65 (61.3)	37 (56.9)	
Vocational School	11 (10.4)	4 (6.2)	
Bachelor's degree or higher	1 (0.9)	5 (7.7)	

Significant at $P < 0.05$. chi-square test. IQR, interquartile range.

(mean = 12.20; $SD = 2.67$) however, after the intervention, the control group proved worse performance (mean = 10.93; $SD = 3.29$).

School based involvement did not show significant main influence of the Group [$F_{(1, 317)} = 1.161$; $p = 0.282$] and Time [$F_{(1, 317)} = 1.131$; $p = 0.288$]. Teacher invitations for involvement scale did not show significant main influence of the Group [$F_{(1, 315)} = 2.322$; $p = 0.129$] and Time [$F_{(1, 315)} = 2.953$; $p = 0.087$]. General school invitations scale did not show significant main influence of the Group [$F_{(1, 316)} = 0.580$; $p = 0.447$] and Time [$F_{(1, 316)} = 9.557$; $p = 0.002$].

Regarding the second hypothesis, as shown in Table 3, the EPIC Family-School Collaboration Model had a positive and significant influence only on the level of "memory and attention." The ANOVA showed significant main effects of Group [$F_{(1, 303)} = 14.56$; $p = 0.0002$] and Time [$F_{(1, 303)} = 34.34$; $p = 0.0001$] indicating better performance in the intervention group (mean = 21.09; $SD = 19.92$) in comparison to controls (mean = 16.05; $SD = 18.35$) and in post-intervention (mean = 35.94; $SD = 15.93$) in comparison to pre-intervention (mean = 25.30; $SD = 16.24$).

Organizational thinking did not show significant main influence of the Group [$F_{(1, 301)} = 0.239$; $p = 0.625$] and Time [$F_{(1, 301)} = 27.49$; $p = 0.0001$].

TABLE 2 | EPIC family-school collaboration model on the level of *family involvement*.

Variable	EC	Ss	F-test	P-value
Home based involvement	Intervention	33.091	3.907	0.048
	Time	6.332	0.747	0.387
	Intervention*Time	7.661	0.904	0.342
School based involvement	Intervention	9.232	1.161	0.282
	Time	8.993	1.131	0.288
	Intervention*Time	0.823	0.104	0.748
Student invitations for involvement scale	Intervention	6.941	0.657	0.418
	Time	0.265	0.025	0.874
	Intervention*Time	6.469	0.612	0.434
Teacher invitations for involvement scale	Intervention	53.265	2.322	0.129
	Time	67.746	2.953	0.087
	Intervention*Time	41.069	1.790	0.182
General school invitations scale	Intervention	10.563	0.580	0.447
	Time	174.057	9.557	0.002
	Intervention*Time	15.493	0.851	0.357

Bold values are significant at $p < 0.05$. EC, Experimental Condition; SS, Sum of Squares.

TABLE 3 | EPIC family-school collaboration model on the level of *learning outcomes*.

Variable	EC	Ss	F-test	P-value
Memory and attention	Intervention	4436.249	14.563	<0.001
	Time	10463.580	34.349	<0.001
	Intervention*Time	565.061	1.8550	0.174
Perceptive organization	Intervention	16.669	0.2891	0.591
	Time	1683.785	29.2452	<0.001
	Intervention*Time	25.120	0.4363	0.509

Bold values are significant at $p < 0.001$. EC, Experimental Condition; SS, Sum of Squares.

TABLE 4 | EPIC family-school collaboration model on the level of *socioemotional development*.

Variable	EC	Ss	F-test	P-value
Interpersonal skill	Intervention	89358.961	2.723	0.099
	Time	23865.985	0.727	0.394
	Intervention*Time	1277.589	0.038	0.843
Intrapersonal skill	Intervention	337811.28	10.555	0.001
	Time	144452.25	4.513	0.034
	Intervention*Time	86739.84	2.710	0.100
Adaptability	Intervention	19.697	0.534	0.465
	Time	22.684	0.615	0.433
	Intervention*Time	77.428	2.100	0.148
General mood	Intervention	27271.22	0.831	0.362
	Time	69235.78	2.11	0.146
	Intervention*Time	47.74	0.0015	0.969

Bold values are significant at $p < 0.001$ or $p < 0.05$. EC, Experimental Condition; SS, Sum of Squares.

Finally, regarding the third hypothesis, as shown in **Table 4**, the EPIC Family-School Collaboration Model had a positive and significant influence only on the level of “*intrapersonal skill*.” The ANOVA showed significant main effects of Group [$F_{(1, 333)} = 10.6$; $p = 0.001$] and Time [$F_{(1, 333)} = 4.5$; $p = 0.03$] indicating better performance in the intervention group (mean = 16.3; $SD = 3.8$) in comparison to controls (mean = 15.3; $SD = 3.9$) and in post-intervention (mean = 16.2; $SD = 3.7$) in comparison to pre-intervention (mean = 15.6; $SD = 4.1$).

“Adaptability” did not show significant main influence of the Group [$F_{(1, 333)} = 0.534$] and Time [$F_{(1, 333)} = 0.615$]. “Interpersonal skill” did not show significant main influence of the Group [$F_{(1, 333)} = 2.72$; $p = 0.099$] and Time [$F_{(1, 333)} = 0.727$; $p = 0.394$]. Stress management did not show significant main influence of the Group [$F_{(1, 333)} = 0.8895$; $p = 0.346$] and Time [$F_{(1, 333)} = 0.2247$; $p = 0.635$]. General mood did not show significant main influence of the Group [$F_{(1, 333)} = 0.8311$; $p = 0.362$] and Time [$F_{(1, 333)} = 2.11$; $p = 0.146$].

DISCUSSION

Family-school collaboration allows for a broader conceptualization of school and family roles, their relationships and the impact on the all-round development of children (Patrikakou et al., 2005; Christenson and Reschly, 2010; Yamauchi et al., 2017). From this perspective, families and schools are protagonists in the construction of their roles and forms of involvement, since they generate new and varied actions to relate, considering the specific context of each educational community. The positive effects of the family-school connection benefit all the actors involved, fostering a positive school climate (Cowan et al., 2002; Wyrick and Rudasill, 2009). The most significant impact is observed in the greater coherence and mutual support between the family and the school, becoming a protective factor for children and their families (Phelan et al., 1998).

Programs that seek to strengthen the relationship between families and schools are theoretically supported by an eco-systemic perspective which recognizes the importance of positive and fluid interactions between the different spheres of a child's life. According to Bronfenbrenner and his ecological theory (1987), the interrelations between schools and families play an essential role in ensuring a child's socioemotional and cognitive development. It is thus key that both spheres be considered in the development of comprehensive child protection systems. Consistent with the ecosystem perspective, Epstein (2013) overlapping of spheres of influence model was developed specifically in order to explain and guide research and intervention in the field of family-school relations. This model combines symbolic interactionism, Merton's reference group theory and Elder's life cycle thus including three relevant spheres that interact in children's learning: the school, the community and the family.

As explained before, much has been published in Anglo Saxon journals in regard to psychosocial interventions within schools and their impacts on a wide range of areas including student behavior, school climate, academic achievement and school retention, among others. For example, the “WSCC” model from Atlanta (Lewallen et al., 2015) is a model similar to the EPIC model. This model addresses family school relations from

a systemic, integrated, and collaborative approach to health and learning. It is designed to provide a framework for collaborative decision making involving multiple institutions found within schools in order to achieving greater alignment and integration of educational policies and programs as well as incorporating family and community participation, differentiating the role each plays in children's learning and the potential of partnerships between families and schools.

Regarding the aspects of the EPIC model that are visible in the schools' implementation, the idea of an integral approach and that of contextualized co-construction stand out. It was possible to observe that within participating schools, the EPIC model was implemented in an articulated manner with programs already operating in the schools. This articulation was led by directive teams and implemented by social workers and psychologists thus establishing coordination in regards to family interventions. Furthermore, the participatory methodology allowed for the identification of each school's strengths, needs, and projections thus the action plans were pertinent to each schools' and families' contextual reality.

Regarding family involvement, the results of our study indicated that families who participated in the experimental group reported significantly higher rates of home involvement than the control group. These are positive findings since the EPIC model seeks to encompass the family-school relationship from an integral and ecological perspective. These results confirm similar findings to other studies in which family involvement at home can be stimulated and strengthened by different types of interventions (Bellei et al., 2002; Hoover-Dempsey and Sandler, 2005). This finding is particularly promising since home involvement in its different expressions (such as: *someone in this family (father, mother and/or guardian) helps the child study for test* or *"someone in this family (father, mother and/or guardian) practices spelling, math or other skills with the child"*) may be more highly related to positive student outcomes than other more visible forms of parental school involvement (such as *"someone in this family attends parent-teacher association meetings"* or *"someone in this family attends special events at school"*).

Relating cognitive processes, one of the aims of this study was to evaluate the influence of the EPIC Family-School Collaboration Model on the results of some cognitive tests of attention and memory, considered as predictors of academic trajectories, in particular for the early elementary grades, (i.e., Stipek et al., 2015). Results of our study indicated better performance of children participating in the intervention group in comparison to the control group, partially confirming a positive and significant influence of EPIC on cognitive processes and academic achievement (i.e., Fan and Chen, 2001). Another important result is the improvement over time of cognitive functions evaluated, irrespective the intervention, in line with neurocognitive studies (i.e., Nagy et al., 2004).

Finally, we found the intervention had a positive and significative influence over intrapersonal skill (ability to understand one's own emotions and communicate them to others). Literature has highlighted the results of the positive influence of family involvement in school over the socioemotional development of children (Garbacz et al., 2017).

Although available literature is scarcer regarding the effectivity of the interventions over socioemotional outcomes in comparison with academic ones, there is also a robust body of studies in concordance with the results founded in our study. For example, in a recent meta-analysis of the effects of family-school interventions on children's social-emotional functioning (Sheridan et al., 2019) conclude that these effects are positive and significant when analyzing data from 117 different studies. In a similar way, in another recent meta-analysis of the effects of family-school partnership interventions on academic and social-emotional functioning (Smith et al., 2019) the results are concordant.

One of the main weaknesses is that the study utilized a thematic or convenience sample, furthermore the sample size was small. Therefore, one of the main challenges for future research in Chile and Latin America is the need for studies with probabilistic and larger samples. On the other hand, the time factor may have possibly hindered the possibility of reaching more decisive results considering that establishing trusting professional relationships between schools, families, and the research teams take time and are key in these types of interventions. Therefore, we suggest the need to undertake quasi-experimental designs of a greater time scope.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Universidad de La Frontera (Acta 066-2017, Folio 036-17). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

MS developed the study concept, the study design and drafted the manuscript. DM, TR, and LL performed the data collection. HM and JL-L performed the data analysis and interpretation under the supervision of MS. DM, TR, LL, HM, and JL-L substantially contributed to the interpretation of the data and provided important critical revisions. All authors approved the final version of the manuscript and also agreed to be accountable for all aspects of the work.

FUNDING

This work was supported by the CONICYT/FONDECYT 1170078, FONDECYT 1181472 and FONDECYT 1190945 of the National Commission for Scientific and Technological Research of Chile.

REFERENCES

- Baker, T. L., Wise, J., Kelley, G., and Skiba, R. J. (2016). Identifying barriers: creating solutions to improve family engagement. *Sch. Commun. J.* 26, 161–184.
- Bar-On, R., and Parker, J. D. A. (2000). *Emotional Quotient Inventory: Youth Version (EQ-i:YV). Technical manual*. Toronto: Multi-Health Systems.
- Bellei, C., Gubbins, V., and Lopez, V. (2002). *Participación de los Centros de Padres en la Educación. Expectativas, Demandas, Desafíos y Compromisos*. Santiago, MN: UNICEF/CIDE.
- Caspe, M., Lopez, M. E., and Wolos, C. (2006). Family involvement in elementary school children's education. *Fam. Invol. Makes Differ.* 2, 1–12.
- Castro, M., Expósito-Casas, E., López-Martín, E., Lizasoain, L., Navarro-Asencio, E., José Luis, et al. (2015). Parental involvement on student academic achievement: a meta-analysis. *Educ. Res. Rev.* 14, 33–46. doi: 10.1016/j.edurev.2015.01.002
- Chavkin, N. F. (2017). *Family Engagement with Schools: Strategies for School Social Workers and Educators*. New York, NY: Oxford University Press.
- Christenson, S. L., and Reschly, A. L. (eds) (2010). *Handbook of School-Family Partnerships*. New York, NY: Routledge.
- Conover, W., and Iman, R. (2012). Rank transformations as a bridge between parametric and nonparametric statistics]: rejoinder. *Am. Stat.* 35, 124–129. doi: 10.1080/00031305.1981.10479327
- Cowan, G., Bobby, K., St.Roseman, P., and Echandia, A. (2002). *Evaluation Report: The Home Visit Project. 1-18*. Available at: <https://eric.ed.gov/?id=ED466018> (accessed May 11, 2020).
- Eichin, N., and Volante, P. (2018). Leading school, family and community partnerships: a critical review. *Rev. Compl. Educ.* 29, 595–611. doi: 10.5209/RCED.53526
- Epstein, J. L. (2013). *Programas Efectivos de Involucramiento Familiar en las Escuelas: Estudios y Prácticas*. Santiago, MN: Fundación CAP.
- Fan, X., and Chen, M. (2001). Parental involvement and students' academic achievement: a meta-analysis. *Educ. Psychol. Rev.* 13, 1–22. doi: 10.1023/A:1009048817385
- Ferrández, C., Hernández, D., Bermejo, R., Ferrando, M., and sáinz, M. (2012). Social and emotional intelligence in childhood and adolescence: spanish validation of a measurement instrument. *Rev. Psicodidact.* 17, 309–338. doi: 10.1387/revpsicodidact.2814
- Frey, A. J., and Dupper, D. R. (2005). A broader conceptual approach to clinical practice for the 21st century. *Child. Sch.* 27, 33–44. doi: 10.1093/cs/27.1.33
- Galindo, C., and Sheldon, S. (2012). School and home connections and children's kindergarten achievement gains: the role of family involvement. *Early Childh. Res. Q.* 27, 90–103. doi: 10.1016/j.ecresq.2011.05.004
- Garbacz, S. A., Herman, K. C., Thompson, A. M., and Reinke, W. M. (2017). Family engagement in education and intervention: implementation and evaluation to maximize family, school, and student outcomes. *J. Sch. Psychol.* 62, 1–10. doi: 10.1016/j.jsp.2017.04.002
- Garbarcz, S. A., Stormshak, E., Lee, L., and Kosti, D. (2019). Examining family-school engagement in a randomized controlled trial of the family check-up. *Sch. Psychol.* 34, 433–443. doi: 10.1037/spq0000284
- García, J., and González, D. (2006). *Pruebas Psicopedagógicas EVALÚA*. Santiago de Chile: Editorial EOS.
- Hernández, R., Fernández-Collado, C., and Baptista, P. (2006). *Metodología de la Investigación*. Mexico: McGraw-Hill Interamericana.
- Hoover-Dempsey, K., and Sandler, H. (2005). *The Social Context of Parental Involvement: A Path to Enhanced Achievement*. Final Report, OERI/IES grant #R305T010673. Nashville, TN: Vanderbilt University.
- Jeynes, W. H. (2012). A meta-analysis of the efficacy of different types of parental involvement programs for urban students. *Urban Educ.* 47, 706–742. doi: 10.1177/0042085912445643
- Kerlinger, F. Y., and Lee, H. (2002). *Investigación del Comportamiento*. México: McGraw Hill/ Interamericana.
- Lara, L., and Saracostti, M. (2020). *Avanzando Hacia Relaciones más Colaborativas entre Familias y Escuela: Experiencias desde Países Iberoamericanos*. Chile: Le Monde Diplomatique. (aceptado).
- Lewallen, T., Hunt, H., Potts-Datema, W., Zaza, S., and Wayne, G. (2015). The whole school, whole community, whole child model: a new approach for improving educational attainment and healthy development for students. *J. Sch. Health* 85, 729–739. doi: 10.1111/josh.12310
- Lukas, J. F., and Santiago, K. (2004). *Evaluación Educativa*. Madrid: Alianza.
- Ma, X., Shen, J., Krenn, H. Y., Hu, S., and Yuan, J. (2016). A meta-analysis of the relationship between learning outcomes and parental involvement during early childhood education and early elementary education. *Educ. Psychol. Rev.* 28, 771–801. doi: 10.1007/s10648-015-9351-1
- Maynard, B. R., McCrear, K. T., Pigott, T. D., and Kelly, M. S. (2012). Indicated truancy interventions: effects on school attendance among chronic truant students. *Campbell Syst. Rev.* 8, 1–84. doi: 10.4073/csr.2012.10
- MINEDUC (2017). *Política de Participación de la Familia y la Comunidad en Instituciones Educativas. Chile*. Available at: <https://basica.mineduc.cl/wp-content/uploads/sites/25/2017/04/Pol%C3%ADtica-de-Participaci%C3%B3n-de-la-Familia-y-la-Comunidad-en-instituciones-educativas.pdf> (accessed May 11, 2020).
- Newrnan, R. M., Smith, W. B., and Speed, F. M. (1999). Properties of profile parallelism tests in repeated measures designs. *Commun. Stat. Simul. Comput.* 28, 1073–1098. doi: 10.1080/03610919908813593
- Patrikakou, E., Weisberg, R. P., Redding, S., and Walberg, H. J. (2005). "School-family partnerships: enhancing the academic, social, and emotional learning of children," in *School-family partnerships for children's success*, eds E. P. Patrikakou, R. P. Weisberg, S. Redding, and H. J. Walberg (New York, NY: Teachers College Press), 1–20.
- Phelan, P., Davidson, A. L., and Yu, H. C. (1998). *Adolescents' Worlds: Negotiating Family, Peers, and School*. New York, NY: Teachers College Press.
- Raczynski, D., and Muñoz, G. (2007). *Reforma Educacional Chilena: El Difícil Equilibrio Entre la Macropolítica y la Micropolítica*. Documento de Trabajo CIEPLAN.
- Reininger, T. (2014). *Parental Involvement in Municipal Schools in Chile: Why do Parents Choose to Get Involved?*. Ph.D. Dissertation, Fordham University Graduate School of Social Service, New York, NY
- Saracostti, M. (2013). *Familia – Escuela – Comunidad I: Una alianza Necesaria para una Intervención Biopsicosocial Positiva*. Santiago: Universitaria.
- Saracostti, M., and Villalobos, C. (2015). *Familia, Escuela y Comunidad III: Implementando el Modelo de Intervención Biopsicosocial*. Santiago: Editorial Universitaria.
- Sarría-Santamera, A. (2020). Diseños y metodologías para evaluar el impacto de las intervenciones. *Rev. Española Cardiol.* 73:689.
- Shadish, W. R., Cook, T. D., and Campbell, D. T. (2002). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. New York, NY: Houghton Mifflin Company.
- Sheridan, S. M., Smith, T. E., Kim, E. M., Beretvas, S. N., and Park, S. (2019). A meta-analysis of family-school interventions and children's social-emotional functioning: moderators and components of efficacy. *Rev. Educ. Res.* 89, 296–332.
- Smith, T. E., Sheridan, S. M., Kim, E. M., Park, S., and Beretvas, S. N. (2019). The effects of family-school partnership interventions on academic and social-emotional functioning: a meta-analysis exploring what works for whom. *Educ. Psychol. Rev.* 32, 511–544. doi: 10.1007/s10648-019-09509-w
- Stipek, D., and Valentino, R. A. (2015). Early childhood memory and attention as predictors of academic growth trajectories. *J. Edu. Psychol.* 107, 771–788. doi: 10.1037/edu0000004
- UNESCO (2014). *Enseñanza y Aprendizaje, Lograr la Calidad Para Todos: una Mirada Sobre América Latina y Caribe*. Available at: <http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Santiago/pdf/Mirada-regional-Informe-EPT-2013-2014.pdf> (accessed May 11, 2020).
- Wilson, S., Tanner-Smith, M., Lipsey, W., Steinka-Fry, K., and Morrison, J. (2011). Dropout prevention and intervention programs: effects on school completion and dropout among school-aged children and Youth. *Campbell Syst. Rev.* 7, 1–61. doi: 10.1002/cl2.66
- Wyrick, A., and Rudasill, Y. K. (2009). Parent involvement as a predictor of teacher child relationship quality in third grade. *Early Educ. Dev.* 20, 845–864. doi: 10.1080/10409280802582803

Yamauchi, L. A., Ponte, E., Ratliffe, K. T., and Traynor, K. (2017). Theoretical and conceptual frameworks used in research on family-school partnerships. *Sch. Commun.* 27, 9–34.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2020 Saracostti, Lozano-Lozano, Miranda, Lara, Martella and Reininger. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Cross-Cultural Adaptation and Validation of the Physical Disability Resiliency Scale in a Sample of Chinese With Physical Disability

Wenjie Duan^{1,2}, Wenlong Mu^{3*} and Hongxia Xiong⁴

¹ School of Law and Public Administration, Yibin University, Yibin, China, ² Social and Public Administration School, East China University of Science and Technology, Shanghai, China, ³ School of Economics and Management, Wuhan University, Wuhan, China, ⁴ Sichuan Charity Center, Chengdu, China

OPEN ACCESS

Edited by:

Wanzhen Chen,
East China University of Science
and Technology, China

Reviewed by:

Maria Carbó Carreté,
University of Barcelona, Spain
Maryam Rassouli,
Shahid Beheshti University of Medical
Sciences, Iran

*Correspondence:

Wenlong Mu
Mu.wenlong@outlook.com

Specialty section:

This article was submitted to
Health Psychology,
a section of the journal
Frontiers in Psychology

Received: 04 September 2020

Accepted: 23 November 2020

Published: 17 December 2020

Citation:

Duan W, Mu W and Xiong H
(2020) Cross-Cultural Adaptation
and Validation of the Physical
Disability Resiliency Scale in a Sample
of Chinese With Physical Disability.
Front. Psychol. 11:602736.
doi: 10.3389/fpsyg.2020.602736

This study adapted the Physical Disability Resilience Scale (PDRS) to Chinese conditions and evaluated the psychometric characteristics of the Chinese version in individuals with physical disability. A total of 438 individuals with physical disability were included in this study. The PDRS was translated to Chinese using a backward translation method. Construct validity, internal consistency reliability, and convergent validity were examined. Confirmatory factor analysis failed to replicate the original five-factor structure of the PDRS. After removing the Spirituality factor and an underperformed item (Item 22), exploratory factor analysis yielded four trait factors (i.e., Emotional and Cognitive Strategies, Physical Activity and Diet, Peer Support, and Support from Family and Friends) and a method-effect factor. A correlated trait–correlated method model that included the four trait factors and a method-effect factor reported better model fit than the four-factor model, which did not consider method effects. The four subscales of the revised PDRS showed adequate internal consistency. The convergent validity of the revised PDRS was established by the moderate-to-strong associations between its four subscales and theoretically related constructs. We conclude that the revised PDRS is a reliable and valid measure in assessing resilience among Chinese people with physical disability.

Keywords: resilience, physical disability resilience scale, psychological characteristics, people with physical disability, Chinese

INTRODUCTION

Disability is defined as “an umbrella term for impairments, activity limitations, and participation restrictions” (World Health Organization [WHO], 2018). Disability arises from the interaction of health condition (e.g., diseases and injuries) with contextual factors—personal (e.g., motivation and self-esteem) and environmental (e.g., social supports, transportation, and public buildings) factors (World Health Organization [WHO], 2018). The population with disability has reached 85 million in China (China Disabled Persons’ Federation, 2012). People with physical disability (PWPD) take up about 30% of the disabled population (China Disabled Persons’ Federation, 2012). The ability of PWPD to maintain health is a great public health issue in China (Zheng et al., 2011). Substantial empirical studies have shown that PWPD are at risk of damaged mental health. For example, a study using the nationally representative panel data showed that individuals reported a significant

decline in life satisfaction and a significant increase in psychological distress following the onset of physical disability (Lucas, 2007). Another longitudinal study conducted by Noh et al. (2016) found that PWPd reported higher levels of depression than the general population. Physical disability has also been associated with maladaptive coping, such as substance abuse (Smedema and Ebener, 2010), suicidal ideation (Khazem et al., 2015), and suicidal behavior (Fässberg et al., 2016).

Given the extreme adversity these people experience, recent attention has sought to find protective factors that alleviate the detrimental influence of physical disability. Resilience is such a protective factor that has received a considerable amount of attention (Stewart and Yuen, 2011). Resilience refers to a person's capacity to successfully maintain or restore physical and mental health through positive adaptation in the face of major life stressors or adversities (Bonanno, 2008). Resilience has been proven to contribute to the protection against developing mental health problems and maladaptive coping among PWPd (Quale and Schanke, 2010; Stewart and Yuen, 2011). For example, a study with 1,949 individuals with physical disability showed that resilience is linked to quality of life and satisfaction with social roles (Battalio et al., 2017). Another longitudinal study indicated that an increased resilience in PWPd can significantly predict decreased depression and fatigue, improved sleep quality, and ameliorative physical functions (Edwards et al., 2017). Therefore, building resilience in PWPd is an important strategy in ameliorating their psychological, physical, and social functions (Runswick-Cole and Goodley, 2013; Silverman et al., 2015). Accurate measurement of resilience is vital to screen the population at-risk regarding mental health problems and maladaptive coping from others for further intervention (Duan et al., 2020). Given a large group of PWPd and the severe shortages of qualified specialists in China (You and Jackson, 2020), there is a need for a fully validated instrument to identify PWPd who are lack of resilience.

Many measures have been developed to assess resilience. A system review conducted by Windle et al. (2011) indicated that the Connor-Davidson Resilience Scale (CD-RISC; Kathryn and Jonathan, 2003), the Resilience Scale for Adults (Friborg et al., 2003), and the Brief Resilient Scale (Smith et al., 2008) received the highest ratings among the existing instruments for measuring resilience. Among the three abovementioned measures, the CD-RISC available in 20- and 10-item version, is the mostly used under the clinical and disability context (Terrill et al., 2016; Edwards et al., 2017). Although the CD-RISC is widely used, it has been criticized from several aspects. First, the factor structure of the CD-RISC is mixed and unstable (Wang et al., 2010). The five-factor model was only shown in the original study (Kathryn and Jonathan, 2003). Subsequent studies have yielded a four-factor model (Lamond et al., 2008) or a three-factor model (Yu and Zhang, 2007). Second, the CD-RISC measures trait-like capacities that are likely to generalize across circumstances, whereas it cannot capture the specific types of experience or source of adversity (You and Jackson, 2020). Third, the CD-RISC captures only the cognitive/individual aspect of resilience, but does not consider the social/interpersonal protective factor (Madewell and Ponce-Garcia, 2016). Overall, when the CD-RISC was used in the

PWPd, the inadequate construct and content validity did not meet the criteria of COSMIN (Consensus-based Standards for the selection of health status Measurement Instruments checklist; Mokkink et al., 2010).

There is a lack of a valid resilience measure that is able to be used in PWPd. Recently, Gromisch et al. (2018) developed the Multiple Sclerosis Resiliency Scale (MSRS) to measure the extent of resilience for people with multiple sclerosis. The MSRS is composed of five subscales that evaluate specific types of experiences associated with resilience in people with multiple sclerosis. The MSRS features adequate internal consistency reliability, convergent validity, and divergent validity among people with multiple sclerosis (Gromisch et al., 2018; Hughes et al., 2020). Multiple sclerosis is considered a potential disabling disease (Ramagopalan et al., 2010; Cawley et al., 2015). Most people with multiple sclerosis will have physical disability (Ochoa-Morales et al., 2019). Numerous studies that have focused on physical disability treated multiple sclerosis as a form of physical disability and used this population with multiple sclerosis to conduct their studies (cf. Grue and Lærum, 2002; Silverman et al., 2015; Alschuler et al., 2016; Edwards et al., 2017; Terrill and Molton, 2019). The measures developed using people with multiple sclerosis are also frequently used in individuals with physical disability, such as the Stigma Scale for Chronic Illness (Deepa et al., 2009; Molero et al., 2019). Therefore, we deduced that the MSRS can be adopted to the population with physical disability after minor revisions of the items.

The psychometric properties of the MSRS were only examined in a Western context. As of this writing, no evidence has reported the validity and reliability of the MSRS for Chinese people with physical disability. Therefore, the present study aims to assess the MSRS's psychometric characteristics in a sample of Chinese PWPd.

MATERIALS AND METHODS

Study Design

A cross-sectional study design was conducted to apply the MSRS to Chinese PWPd and examine its psychometric characteristics. Specifically, construct validity, internal consistency reliability, and convergent validity of this scale was evaluated. For concurrent validity, Sippel et al. (2015) suggested that social support played a critical role in enhancing resilience in the trauma-exposed individual. Resilience has also been associated with negative emotion symptoms (Wu et al., 2020) and psychological wellbeing (Bermejo-Toro et al., 2020). We expected similar findings in the Chinese PWPd. Convenience sampling method was applied to recruit the target population.

Participants

Study participants were community-dwelling PWPd who received social care services from the Kunming Disabled Persons' Federation. A total of 520 individuals responded to invitations after receiving the social care services. All participants were in possession of the physical disability certificate issued by the China Disabled Persons' Federation. They were diagnosed

of physical disability by the medical specialist according to the National Practical Evaluation Standards of Disabled People (China Disabled Persons' Federation, 1995). Eligibility criteria included aged above 18 years old, and being able to read and write in Chinese. Four hundred fifty-nine participants remained after considering the eligibility criteria. One participant who repeatedly answered the survey was excluded from the sample. Of the remaining participants, people who selected the same answer for at least 70% of the items ($N = 19$) were removed (Finnigan and Vazire, 2018). Excluding invalid questionnaires, 438 participants were left (276 males and 162 females, mean age = 46.29, SD = 10.14, range = 18 – 73). The sample size satisfied the requirement for conducting CFA (≥ 200 for appropriate, ≥ 300 for good; Comrey and Lee, 2013; Wang et al., 2020). **Table 1** presents the demographic characteristics of the 438 participants.

Procedure

Participants were recruited from Kunming City, the capital of Yunnan Province in southwestern frontier of China. This city has a population of 6.85 million with approximately 69,000 individuals with disabilities (Yunnan-Provincial-Federation-of-the-Disabled, 2017). During April to July 2019, the Kunming Disabled Persons' Federation cooperated with the Sichuan Yuanmeng Disabled Service Center to provide social care services for PWPd. After receiving social care services, participants were invited to take part in an online survey by scanning a QR code. The online survey included demographic information and five questionnaires: revised MSRS, Depression Anxiety Stress Scale-21(DASS-21), Flourishing Scale (FS), Multidimensional Scale of Perceived Social Support (MSPSS), and Resilience Style Questionnaire (RSQ). The online survey took around 20 – 30 min to complete. We specified that each question must be answered before the questionnaire can be submitted; thus, no missing values were allowed.

Ethical approval was granted by the Human Subjects Ethics Sub-committee of the corresponding author's university. The participants' written informed consents were provided through the online survey system before completing the questionnaire, and they were given notice that all data were solely used for scientific purposes.

Measurements

Revised MSRS

The MSRS was originally developed to assess resilience for people with multiple sclerosis (Gromisch et al., 2018). The MSRS comprises 25 items, among which 8 items are reversed-scored (Items 2, 3, 4, 5, 7, 12, 22, and 25). Participants rated on a four-point Likert-type scale (1 = strongly disagree, 4 = strongly agree). In the original publication, Gromisch et al. (2018) found that a five-factor structure (i.e., emotional and cognitive strategies, physical activity and diet, peer support, support from family and friends, and spirituality) resulted from EFA was the most concise structure. Confirmatory factor analysis (CFA) was not used to confirm the scale's dimensionality. The reliability coefficients of subscales of the MSRS based on a U.S. sample with multiple sclerosis were $\alpha = 0.92$ for emotional and cognitive strategies,

TABLE 1 | Demographic characteristics of the sample.

	N M \pm SD	% Range
Age	46.29 \pm 10.14	18 – 73
Sex		
Male	276	63.01%
Female	162	36.99%
Education	9.22 \pm 2.45	0 – 14
Employment status		
Employed for wages	202	46.12%
Self-employed	16	3.65%
Volunteer work	7	1.60%
Homemaker	27	6.16%
Students	5	1.14%
Retired	8	1.83%
Unable to work	173	39.50%
Marital status		
Married/Living with partner	325	74.20%
Never Married	72	16.44%
Separate/Divorced	34	7.76%
Widowed	7	1.60%
Disability conditions		
Acquired	356	81.74%
Congenital	80	18.26%
Length of Disability (Year)	29.69 \pm 15.66	1 – 67
Long-Term Control Medications		
Yes	108	24.66%
No	330	75.34%
Care giving		
No caregivers	129	29.5%
By partner, family and friends (Unpaid)	262	59.8%
By staffs in nursing home	1	0.2%
Others	46	10.5%
Living		
Living at home	419	95.7%
Others	19	4.3%
Monthly income (CNY)		
0–3,000	412	94.06%
3,001–6,000	19	4.34%
6,001–9,000	4	0.92%
>9,000	3	0.68%
Subjective socioeconomic status		
1	41	9.36%
2	39	8.90%
3	51	11.64%
4	51	11.64%
5	107	24.43%
6	67	15.30%
7	33	7.53%
8	29	6.62%
9	10	2.28%
10	10	2.28%
Total	438	100%

Subjective socioeconomic status was measured by the MacArthur Scale of Subjective Social Status, which is a ladder with ten rungs. Individuals who placed themselves on a high position on the ladder indicated that they had high income, education, and occupational prestige in relation to others in China.

$\alpha = 0.77$ for physical activity and diet, $\alpha = 0.82$ for peer support, $\alpha = 0.79$ for support from family and friends, and $\alpha = 0.91$ for spirituality. The total scale also showed good reliability ($\alpha = 0.88$). The total MSRS score showed strong and negative associations with depression ($r = -0.72$) and anxiety ($r = -0.56$). The current study developed a revised version of MRSR through cross-cultural adaptation, and adopted the revised MSRS to Chinese PWPD. The cross-cultural adaptation was described in the next section.

DASS-21

The DASS-21, a brief version of the 42-item DASS, is a self-reported questionnaire that measures negative emotion symptoms (i.e., depression, anxiety, and stress; Lovibond and Lovibond, 1995). The DASS-21 requires participants to report their feeling in the past week. Each subscale comprises seven items scored on a four-point Likert scale, ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). A higher mean score for each subscale indicates a higher level of depression, anxiety, and stress symptoms. The total mean score reflects the negative emotion symptoms (Mu and Duan, 2020). The Chinese version of DASS-21 has been validated in various clinical and non-clinical populations (Wang et al., 2016). In the present sample, the reliability coefficients were good for the DASS-21 total ($\alpha = 0.95$) and three subscales ($\alpha = 0.91$ for depression, $\alpha = 0.85$ for anxiety, and $\alpha = 0.87$ for stress).

FS

The FS is an eight-item self-report instrument that measures a person's psychological wellbeing. Each item is scored on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The FS has documented a one-factor structure and adequate psychometric characteristics among Chinese context (Tang et al., 2016). The Cronbach's α of the scale in the current study was 0.93.

MSPSS

The MSPSS is a 12-item self-report instrument that evaluates subjective social support from family, friends, and others. Each subscale comprises of four items scored on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The MSPSS has shown good psychometric characteristics in various samples (Jermaine et al., 2018). The present study adopted the Chinese version of the MSPSS. This version demonstrated a three-factor structure and acceptable reliability among patient sample in China (Zhou et al., 2015). The reliability coefficients of subscales were $\alpha = 0.88$ for family support, $\alpha = 0.91$ for friend support, and $\alpha = 0.87$ for others' support. The total scale also exhibited excellent reliability ($\alpha = 0.93$).

RSQ

The RSQ is a self-report measure of resilience that considers the influence of Confucianism and Chinese culture (Mak et al., 2019). The RSQ contains 16 items, which are divided into two 8-item subscales: perseverance and optimistic approach to life. Each item corresponds to a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The Chinese version of the RSQ shows adequate psychometric characteristics among clinical and

non-clinical populations (Mak et al., 2019; Duan et al., 2020). In the present study, the reliability coefficients were 0.93 for perseverance, $\alpha = 0.90$ for optimistic approach to life, and $\alpha = 0.96$ for the total scale.

Translation Procedures

Cross-cultural adaptation followed the forward-backward translation procedure (Beaton et al., 2000). A research team consisting of eight members was formed to conduct the cross-cultural adaptation. The team included one full professor in clinical psychological, three social workers who had extensive practice experiences working with PWPD, and four Ph.D. students who were well versed in scale development and assessment. The members in the team are all bilingually fluent (Chinese and English). The translation procedure consisted of four steps. First, two independent students translated the original MSRS from English to Chinese. The two translators compared the two translated versions and obtained a consensus Chinese version. Disagreements and ambiguities were resolved by discussion with the three social workers. Second, another two independent students translated the consensus Chinese version back to English. The two translators evaluated the similarity of the items on wording and sentence structure and obtained a back-translated version. Third, the full professor compared the back-translated and original versions of the MSRS. The back-translated version was found to be nearly identical to the original version. Fourth, the term multiple sclerosis was replaced with physical disability in the items of the Chinese version of MSRS.

To ensure that the content of the items reflect the specific experiences associated with physical disability and are applicable to this population, we evaluated the content validity of the Chinese version of MSRS. The procedure for content validity consisted of two stages. First, the eight members of the research team evaluated whether the items could capture the specific experiences associated with physical disability and provided their suggestions for amelioration. Synthesizing feedbacks from team members, some minor changes in wordings of the items were made. Second, pilot tests including survey and interview were applied among 15 participants with physical disability to examine the appropriateness and clarity of each item. Based on their responses and comments, minor revisions including reducing redundancy and refining wording were made for non-spiritual items. The spiritual items were not well understood by those participants. Previous studies with Chinese population always removed this dimension from their scales because most of Chinese people are atheists (Duan et al., 2012). Given the rapid religious growth in China (Lu and Gao, 2017), we did not delete this dimension after pilot tests. We renamed this resilience scale as the Physical Disability Resilience Scale (PDRS) to make it convenient to be used among population with physical disability. The MSRS was hereafter called PDRS. Therefore, items in the PDRS reflected the emotional, cognitive, physical, social, and spiritual responses to physical disability.

Statistical Procedures

We performed a preliminary analysis with CFA to test the five-factor model. Mardia's test (Korkmaz et al., 2014) showed

that the distribution of the data was multivariate non-normal for skewness (6,501.26, $p < 0.001$) and kurtosis (43.08, $p < 0.001$). Therefore, the robust maximum likelihood estimation was used (Rhemtulla et al., 2012). Given the usage of negatively worded items in the PDRS, correlated trait-correlated method (CT-CM) was also used (DiStefano and Motl, 2006). To evaluate the model fit of the estimated models, we used several indices suggested by Hu and Bentler (1999), namely, the root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), and standardized root mean residual (SRMR). RMSEA and SRMR < 0.08 indicate acceptable model fit, whereas values < 0.05 indicate excellent model fit. CFI and TLI > 0.90 indicate acceptable model fit, whereas values > 0.95 indicate good model fit. Given that the five-factor model could not be replicated in the present study, EFA was performed to explore the possible structure of the PDRS for Chinese PWPD. The sample was randomly split into two subsamples. In the first subsample ($N = 219$), we performed EFA with principal axis factoring and Promax rotation. Eigenvalues greater than 1.0 were used to confirm the number of factors. Factor loadings ($\lambda > 0.40$) and corrected item-total correlations ($r > 0.30$) were used as cutoff to select reliable items (Clark and Watson, 1995). Subsequently, CFA and CT-CM were conducted to examine the construct validity of the PDRS using the second subsample ($N = 219$). Cronbach's α values were calculated to assess the internal consistency reliability for the factors scores of the PDRS. For the Peer Support subscale measured by two items, the Spearman-Brown coefficient (r_{SB}) was also computed (Eisinga et al., 2013). Finally, the convergent validity of the PDRS was tested by the Pearson's correlations between its subscales and theoretically related constructs.

RESULTS

Preliminary Analysis

CFA was conducted to test whether the factor structure of the PDRS in the current study might replicate Gromisch et al.'s (2018) findings. The fit indices are shown in **Table 2**. The results showed a poor goodness-of-fit of the five-factor model [$\chi^2(265) = 1,629.989$, $\chi^2/df = 6.15$, CFI = 0.656, TLI = 0.610, RMSEA = 0.108 (90% CI = 0.103–0.114), SRMR = 0.114], with none of the indices satisfying the suggested criteria. The two items (Items 24 and 25) of the Spirituality factor presented insignificant factor loadings. The negatively worded items showed marginal significant (Items 2, 3, 5, 7, and 12) or insignificant (Items 4 and 22) factor loadings. Subsequently, CT-CM was used, which considered the potential method effects caused by negatively worded items. The CT-CM model evidenced acceptable fit [$\chi^2(256) = 570.447$, $\chi^2/df = 2.23$, CFI = 0.921, TLI = 0.907, RMSEA = 0.053 (90% CI = 0.047–0.059), SRMR = 0.051]. However, all factor loadings associated with the two items of the Spirituality factor remained insignificant. Item 22 still showed small factor loadings on the target factor ($\lambda = 0.117$) and method-effect factor ($\lambda = 0.329$). Most of the people in Mainland China are atheists (Yao, 2007); thus, a previous study has argued that the Spirituality factor is inappropriate in Mainland China (Duan

et al., 2012). Therefore, Items 24 and 25 of the Spirituality factor were removed from the scale.

Exploratory Factory Analysis

The first subsample ($N = 219$) was used to perform EFA on the PDRS. The Kaiser-Meyer-Olkin measure was 0.87, indicating sample adequacy. The Bartlett's test of sphericity was significant, $\chi^2(253) = 2,611.74$, $p < 0.001$, further indicating that factor analysis was appropriate. The results showed that five factors with eigenvalues greater than 1.0 were extracted. The five factors in combination explained 67.90% of the variance. All of the reversed-worded items (Items 2, 3, 4, 5, 7, 12, and 22) were loaded on the first factor, indicating a possible method effect resulting from the reversed-worded items. The remaining 16 items were loaded on their target factors (i.e., emotional and cognitive strategies, physical activity and diet, peer support, and support from family and friends). However, Item 22 did not load sufficiently onto each factor with all loadings below 0.40. Additionally, Item 22 showed inadequate corrected item-total correlations ($r < 0.30$). We combined the performance of Item 22 in the preliminary analysis and deleted it. EFA was repeatedly conducted to investigate the potential factor structure of the PDRS. The results yielded a five-factor model that explained 65.59% of the variance. The remaining six reversed-worded items were loaded on the first factor (see **Table 3**). The other 16 items were loaded on their target factors. All items exhibited adequate loadings on their target factors ($\lambda > 0.40$) and corrected item-total correlations ($r > 0.30$).

Confirmatory Factor Analysis

Four-Factor Model

We performed CFA to assess the fit of the four-factor model, which did not consider method effects. The results showed poor model fit for the four-factor model [$\chi^2(203) = 653.369$, $\chi^2/df = 3.22$, CFI = 0.759, TLI = 0.726, RMSEA = 0.101 (90% CI = 0.092–0.109), SRMR = 0.098].

CT-CM Model

We adopted a CT-CM model to control for method effects. The reversed-worded items in the CT-CM model were allowed to cross-load on the method-effect factor and their target factor (see **Table 3**). This model yielded adequate model fit [$\chi^2(197) = 328.367$, $\chi^2/df = 1.67$, CFI = 0.930, TLI = 0.918, RMSEA = 0.055 (90% CI = 0.044–0.066), SRMR = 0.054]. All reversed-worded items showed significant factor loadings on the method-effect factor ($\lambda = 0.46$ – 0.72) and their target factors ($\lambda = 0.33$ – 0.48). All positively worded items were also significantly loaded on their target factors, with factor loadings ranging from 0.52 to 0.92. These results provided evidence for the use of a four-factor model that includes a method-effect factor.

Reliability

The results showed adequate reliability for Emotional and Cognitive Strategies ($\alpha = 0.87$), Physical Activity and Diet ($\alpha = 0.85$), Peer Support ($\alpha = 0.90$, $r_{SB} = 90$), and Support from

TABLE 2 | Goodness-of-fit indexes for estimated models.

Model	χ^2 (df)	CFI	TLI	RMSEA	90% CI	SRMR
Model 1 (N = 438)	1,629.989 (265)	0.656	0.610	0.108	0.103 – 0.114	0.114
Model 2 (N = 438)	570.447 (256)	0.921	0.907	0.053	0.047 – 0.059	0.051
Model 3 (N = 219)	653.369 (203)	0.759	0.726	0.101	0.092 – 0.109	0.098
Model 4 (N = 219)	328.36 (197)	0.930	0.918	0.055	0.044 – 0.066	0.054

CFI = comparative fit index, TLI = Tucker-Lewis Index, RMSEA = root mean square error of approximation, CI = confidence interval, SRMR = standardized root mean residual. Model 1: original five-factor model, Model 2 = original five-factor model that includes a method-effect factor, Model 3: revised four-factor model, Model 4: revised four-factor model that includes a method-effect factor.

TABLE 3 | Parameter estimates from the EFA and CT-CM solutions of the revised PDRS.

	EFA					CT-CM				
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor1	Factor2	Factor3	Factor4	Factor5
PDRS3	0.834	−0.102	0.058	−0.025	0.136	0.724	0.481			
PDRS4	0.808	−0.228	0.032	0.085	−0.086	0.694	0.332			
PDRS2	0.776	0.103	−0.113	−0.033	0.086	0.673	0.482			
PDRS5	0.768	0.013	0.004	0.116	−0.066	0.609	0.480			
PDRS7	0.641	−0.045	0.039	0.008	0.024	0.552	0.410			
PDRS12	0.553	0.326	−0.109	−0.289	0.063	0.456	0.446			
PDRS9	0.049	0.777	−0.116	0.102	0.077		0.875			
PDRS10	0.108	0.607	0.221	−0.012	−0.050		0.851			
PDRS11	0.138	0.583	0.158	0.075	−0.249		0.698			
PDRS6	−0.223	0.562	0.027	−0.064	0.121		0.492			
PDRS8	−0.130	0.502	0.007	0.013	0.239		0.651			
PDRS13	0.028	0.484	0.010	0.152	−0.180		0.519			
PDRS1	0.031	0.454	−0.015	−0.001	0.239		0.519			
PDRS21	−0.018	0.058	0.812	0.018	0.009			0.740		
PDRS20	0.029	0.027	0.752	−0.102	−0.001			0.632		
PDRS19	−0.049	0.000	0.713	−0.068	0.119			0.698		
PDRS23	−0.036	0.075	0.478	0.156	0.065			0.587		
PDRS15	0.005	0.042	−0.055	0.798	0.102				0.814	
PDRS14	−0.054	0.071	−0.093	0.747	0.147				0.806	
PDRS16	0.016	0.155	0.101	0.598	−0.054				0.694	
PDRS18	0.034	0.064	−0.002	0.130	0.787					0.873
PDRS17	0.101	−0.100	0.196	0.123	0.695					0.921

Factor loadings > 0.300 in EFA are in boldface. Factor loadings in CFA are all significant at $p < 0.001$. EFA = exploratory factor analysis, CT-CM = correlated trait-correlated method, PDRS = Physical Disability Resiliency Scale, Factor1 = method-effect factor, Factor2 = emotional and cognitive strategies, Factor3 = support from family and friends, Factor4 = physical activity and diet, Factor5 = peer support.

Family and Friends ($\alpha = 0.79$). The method-effect factor also presented good reliability ($\alpha = 0.88$).

Convergent Validity

The Pearson's correlations between the subscales of the PDRS and other theoretically related constructs were calculated to evaluate convergent validity. As reflected in **Table 4**, the subscales of the PDRS showed moderate to strong negative correlations with negative emotion symptoms, including depression, anxiety, and stress ($r = -0.38$ to -0.56). In addition, the four subscales of the PDRS showed moderate to strong positive correlations with perceived support (i.e., family, friends, and others support), general resilience (i.e., perseverance and optimistic approach to life), and psychological wellbeing ($r = 0.30$ to 0.56). These results demonstrated the convergent validity of the PDRS.

DISCUSSION

Although the concept of resilience has received increasing attention and importance among the Chinese population with physical disability (Yang and Wen, 2015; Mu et al., 2017), no validated instruments were available to evaluate the resilience for this population. The present study translated the MSRS into Chinese and examined its psychological characteristics in a sample of PWP. The results indicated that the revised MSRS (i.e., PDRS) with four trait factors and a method-effect factor had adequate psychological properties.

This study was the first to examine the factor structure of the PDRS in the Chinese context. The results of the CFA showed poor model fit for the original proposed five-factor construct. All the items of the Spiritual factor reported insignificant loadings.

TABLE 4 | Correlation matrix between the subscales of PDRS and theoretical related constructs.

	ECS	PAD	PS	SFF
DASS total	−0.556	−0.405	−0.475	−0.425
Depression	−0.556	−0.418	−0.483	−0.442
Anxiety	−0.490	−0.338	−0.424	−0.362
Stress	−0.521	−0.385	−0.431	−0.392
MSPSS total	0.454	0.366	0.428	0.433
Family support	0.322	0.306	0.390	0.483
Friends support	0.456	0.334	0.374	0.344
Others support	0.426	0.326	0.362	0.303
RSQ total	0.479	0.435	0.422	0.335
Perseverance	0.453	0.438	0.407	0.303
Optimistic approach to life	0.485	0.409	0.417	0.357
Psychological wellbeing	0.555	0.447	0.434	0.420

PDRS = Physical Disability Resiliency Scale, ECS = emotional and cognitive strategies, PAD = physical activity and diet, PS = peer support, SFF = support from family and friends. DASS = Depression Anxiety Stress Scale, MSPSS = Multidimensional Scale of Perceived Social Support, RSQ = Resilience Style Questionnaire.

All correlations are significant at the $p < 0.001$ level.

Furthermore, the reversed-worded items reported marginal significant or insignificant loadings. Although the CT-CM model that included method effects yielded significant changes of the model fit, the Spiritual factor still presented insignificant loadings. This result might be caused by the context of Chinese culture. Previous studies have found that Spiritual factor is inappropriate for Mainland Chinese people. For example, Yu and Zhang (2007) found that the Spiritual factor cannot be identified in the Chinese version of the CD-RISC. Duan et al. (2012) suggested that the Spiritual factor should be deleted from the measures used in Mainland China due to its less religious environment.

After deleting the Spiritual factor, the EFA showed that most of the items were consistent with their scale assignment with significant loadings. However, all reversed-worded items were loaded on an independent factor. This finding was in line with previous studies that indicated that reversed-worded items might affect the structure of self-report measures (Marsh, 1996; Ye, 2009; Gnambs and Schroeders, 2020). The reversed-worded items are mainly used to decrease the occurrence of response acquiescence or agreement bias (DeVellis, 1991; DiStefano and Motl, 2006). However, the recent literature found that the reversed-worded items might lead to method bias because of respondent inattention and differences in relevant cognitive abilities (Duan et al., 2018; Gnambs and Schroeders, 2020). In the present study, the average education level of the participants was relatively low ($M = 9.22$, $SD = 2.45$), which might lead to poor cognitive abilities (e.g., reasoning and reading competence; Ritchie et al., 2015). Individuals with poor cognitive abilities had a difficulty understanding negatively worded items and would provide biased responses (Gnambs and Schroeders, 2020). To address this issue, a method-effect factor should be added to consider the influences of reversed-worded items (DeVellis, 1991; DiStefano and Motl,

2006). As expected, the CT-CM model that includes a method-effect factor generated a generally good fit with the data. Overall, the present study supported the construct validity of the revised PDRS in Chinese PWPd when considering the method effect.

We also admitted that Item 22 was deleted in the PDRS. One possible explanation is that parts of the participants are inborn with physical disability, which implies that they have not experienced the change from being healthy to being disabled. Another possible explanation is a potential issue in translation. The original meaning of this item (i.e., “People who were there when I was healthy are not there when I am disabled”) wanted to represent that when one is disabled, people around him might leave or abandon him; however, in the Chinese language, participants might interpret it as passing away.

The reliability results supported that the four subscales of the 22-item PDRS had adequate internal consistency. These findings indicated that the 22-item PDRS was an internally consistency measure. The convergent validity of the 22-item PDRS was confirmed by the moderate-to-strong associations between its four subscales and established measures. Positive correlations were evident between PDRS factors and perceived social support, general resilience, and psychological wellbeing; and negative correlations were observed with negative emotion symptoms. These findings were consistent with previous studies that indicated that resilience is a constellation of positive adaptive skills that contribute to the mental health of people with physical disability (Stewart and Yuen, 2011; Yang and Wen, 2015; Battalio et al., 2017).

Limitations and Future Research

Several potential limitations should be mentioned. First, although the current sample included individuals receiving social care services from the Kunming Disabled Persons' Federation and was relatively representative of people with different extents and types of physical disability, the convenience sampling method might reduce the generalizability of the findings. Moreover, whether these findings could be generalized to individuals with other types of disability (e.g., visual and hearing disability) is considerably unknown. Second, the test-retest reliability of the revised PDRS was not examined. Established test-retest reliability indicates a stable construct of the scale, which is crucial for time-series and intervention study designs. Third, the discriminant validity of the revised PDRS was not examined. Finally, the 22-item PDRS is too lengthy to be conveniently used in clinical settings and interventions. Future study may develop a shorter version of the PDRS for Chinese people with physical disability.

With the limitations set aside, the present study indicated that the revised 22-item PDRS is a reliable and valid instrument for measuring resilience among Chinese people with physical disability. Future studies can adopt this validated measure to further explore the protective effect of resilience for individuals with physical disability. This measure also reflected the sources that build up resilience, such as support from peers, families, and friends. These findings could help service providers use

appropriate strategies that aid individuals with physical disability to build up resilience.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Human Subjects Ethics Sub-Committee of

Wuhan University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

WD collected and analyzed the data, interpreted the results, and revised the manuscript critically. WM conducted the analyses, wrote the manuscript, prepared the submission materials, and revised the manuscript. HX designed the study, collected the data, and wrote the manuscript. All authors contributed to the article and approved the submitted version.

REFERENCES

- Alschuler, K. N., Kratz, A. L., and Ehde, D. M. (2016). Resilience and vulnerability in individuals with chronic pain and physical disability. *Rehabil. Psychol.* 61, 7–18. doi: 10.1037/rep0000055
- Battalio, S. L., Silverman, A. M., Ehde, D. M., Amtmann, D., Edwards, K. A., and Jensen, M. P. (2017). Resilience and function in adults with physical disabilities: an observational study. *Arch. Phys. Med. Rehabil.* 98, 1158–1164. doi: 10.1016/j.apmr.2016.11.012
- Beaton, D. E., Bombardier, C., Guillemin, F., and Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine* 25, 3186–3191. doi: 10.1097/00007632-200012150-00014
- Bermejo-Toro, L., Sánchez-Izquierdo, M., Calvete, E., and Roldán, M. A. (2020). Quality of life, psychological well-being, and resilience in caregivers of people with acquired brain injury (ABI). *Brain Inj.* 34, 480–488. doi: 10.1080/02699052.2020.1725127
- Bonanno, G. A. (2008). Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? *Am. Psychol.* 59, 20–28. doi: 10.1037/1942-9681.59.1.101
- Cawley, N., Solanky, B. S., Muhler, N., Tur, C., Edden, R. A. E., Wheeler-Kingshott, C. A. M., et al. (2015). Reduced gamma-aminobutyric acid concentration is associated with physical disability in progressive multiple sclerosis. *Brain* 138, 2584–2595. doi: 10.1093/brain/awv209
- China Disabled Persons' Federation (1995). Notification of China Disabled Persons' Federation of Issuing Certificates of Persons with Disabilities (CDPF[1995]-61). Available online at: http://www.cdpf.org.cn/zcwj/zxwj/200804/t20080408_38100.shtml (accessed July 12, 2020).
- China Disabled Persons' Federation (2012). *The Total Number of Disabled Persons in China at the end of 2010*. Available online at: http://www.cdpf.org.cn/sjzx/cjgk/201206/t20120626_387581.shtml (accessed July 12, 2020).
- Clark, L. A., and Watson, D. (1995). Constructing validity: basic issues in objective scale development. *Psychol. Assess.* 7, 309–319. doi: 10.1037/14805-012
- Comrey, A. L., and Lee, H. B. (2013). *A First Course in Factor Analysis*. England: Psychology press.
- Deepa, R., Seung, W. C., David, V., Rita, B., Amy, P., Allen, H., et al. (2009). Measuring stigma across neurological conditions: the development of the stigma scale for chronic illness (SSCI). *Q. Life Res.* 18, 585–595. doi: 10.1007/s11136-009-9475-1
- DeVellis, R. F. (1991). *Scale Development: Theory and Applications*. Thousand Oaks: Sage.
- DiStefano, C., and Motl, R. W. (2006). Further investigating method effects associated with negatively worded items on self-report surveys. *Struct. Equ. Modeling* 13, 440–464. doi: 10.1207/s15328007sem1303-6
- Duan, W., Fei, Y., and Tang, X. (2020). Latent profiles and grouping effects of resilience on mental health among poor children and adolescents. *Child Indic. Res.* 13, 635–655. doi: 10.1007/s12187-019-09662-2
- Duan, W., Ho, S. M. Y., Yu, B., Tang, X., Zhang, Y., Li, T., et al. (2012). Factor structure of the Chinese virtues questionnaire. *Res. Soc. Work Pract.* 22, 680–688. doi: 10.1177/1049731512450074
- Duan, W., Li, J., and Mu, W. (2018). Psychometric characteristics of strengths knowledge scale and strengths use scale among adolescents. *J. Psychoeduc. Assess.* 36, 756–760. doi: 10.1177/0734282917705593
- Edwards, K. A., Alschuler, K. A., Ehde, D. M., Battalio, S. L., and Jensen, M. P. (2017). Changes in resilience predict function in adults with physical disabilities: a longitudinal study. *Arch. Phys. Med. Rehabil.* 98, 329–336. doi: 10.1016/j.apmr.2016.09.123
- Eisinga, R., Te Grotenhuis, M., and Pelzer, B. (2013). The reliability of a two-item scale: Pearson, Cronbach, or Spearman-Brown? *Intl. J. Public Health* 58, 637–642. doi: 10.1007/s00038-012-0416-413
- Fässberg, M. M., Cheung, G., Canetto, S. S., Erlangsen, A., Lapierre, S., Lindner, R., et al. (2016). A systematic review of physical illness, functional disability, and suicidal behaviour among older adults. *Aging Ment. Health* 20, 166–194. doi: 10.1080/13607863.2015.1083945
- Finnigan, K. M., and Vazire, S. (2018). The incremental validity of average state self-reports over global self-reports of personality. *J. Pers. Soc. Psychol.* 115, 321–337. doi: 10.1037/pspp0000136
- Friborg, O., Hjemdal, O., Rosenvinge, J. H., and Martinussen, M. (2003). A new rating scale for adult resilience: what are the central protective resources behind healthy adjustment? *Intl. J. Methods Psychiatr. Res.* 12, 65–76. doi: 10.1002/mpr.143
- Gnams, T., and Schroeders, U. (2020). Cognitive abilities explain wording effects in the Rosenberg self-esteem scale. *Assessmen* 27, 404–418. doi: 10.1177/1073191117746503
- Gromisch, E. S., Sloan, J., Zemon, V., Tyry, T., Schairer, L. C., Snyder, S., et al. (2018). Development of the multiple sclerosis resiliency scale (MSRS). *Rehabil. Psychol.* 63, 357–364. doi: 10.1037/rep0000219
- Grue, L., and Lærum, K. T. (2002). 'Doing motherhood': some experiences of mothers with physical disabilities. *Disabil. Soc.* 17, 671–683. doi: 10.1080/0968759022000010443
- Hu, L. T., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Modeling* 6, 1–55. doi: 10.1080/10705519909540118
- Hughes, A. J., Patel, K., Fitzgerald, K. C., Brown, A., Gromisch, E. S., and Mowry, E. M. (2020). Reliability and validity of the multiple sclerosis resiliency scale (MSRS). *J. Neurol. Sci.* 418:116983. doi: 10.1016/j.jns.2020.116983
- Jermaine, M. D., Lieselotte, C., Matthew, C., Helen, J., Tecla, M., and Jennifer, J. (2018). A systematic review of the psychometric properties of the cross-cultural translations and adaptations of the multidimensional perceived social support scale (MSPSS). *Health Q. Life Outcomes* 16, 1–19. doi: 10.1186/s12955-018-0912-0
- Kathryn, M. C., and Jonathan, R. T. D. (2003). Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress. Anxiety* 18, 76–82. doi: 10.1002/da.10113
- Khazem, L. R., Jahn, D. R., Cukrowicz, K. C., and Anestis, M. D. (2015). Physical disability and the interpersonal theory of suicide. *Death Stud.* 39, 641–646. doi: 10.1080/07481187.2015.1047061
- Korkmaz, S., Goksuluk, D., and Zararsiz, G. (2014). MVN: an R package for assessing multivariate normality. *R J.* 6, 151–162. doi: 10.32614/RJ-2014-031
- Lamond, A. J., Depp, C. A., Allison, M., Langer, R., Reichstadt, J., Moore, D. J., et al. (2008). Measurement and predictors of resilience among community-dwelling older women. *J. Psychiatr. Res.* 43, 148–154. doi: 10.1016/j.jpsychires.2008.03.007
- Lovibond, S. H., and Lovibond, P. F. (1995). *Manual for the Depression Anxiety Stress Scales (DASS)*. Australia: Psychology Foundation Monograph.

- Lu, J., and Gao, Q. (2017). Faith and happiness in China: roles of religious identity, beliefs, and practice. *Soc. Indicators Res.* 132, 273–290. doi: 10.1007/s11205-016-1372-8
- Lucas, R. E. (2007). Long-term disability is associated with lasting changes in subjective well-being: evidence from two nationally representative longitudinal studies. *J. Pers. Soc. Psychol.* 92, 717–730. doi: 10.1037/0022-3514.92.4.717
- Madewell, A. N., and Ponce-García, E. (2016). Assessing resilience in emerging adulthood: the resilience scale (RS), connor–davidson resilience scale (CD-RISC), and scale of protective factors (SPF). *Pers. Individ. Dif.* 97, 249–255. doi: 10.1016/j.paid.2016.03.036
- Mak, W. W. S., Ng, I. S. W., Wong, C. C. Y., and Law, R. W. (2019). Resilience Style Questionnaire: Development and validation among college students and cardiac patients in Hong Kong. *Assessment* 26, 706–725. doi: 10.1177/1073191116683798
- Marsh, H. W. (1996). Positive and negative global self-esteem: a substantively meaningful distinction or artifacts? *J. Pers. Soc. Psychol.* 70, 810–819. doi: 10.1037/0022-3514.70.4.810
- Mokkink, L. B., Terwee, C. B., Patrick, D. L., Alonso, J., Stratford, P. W., Knol, D. L., et al. (2010). The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: an international Delphi study. *Q. Life Res.* 19, 539–549. doi: 10.1007/s11136-010-9606-8
- Molero, F., Recio, P., García-Ael, C., and Pérez-Garín, D. (2019). Consequences of perceived personal and group discrimination against people with physical disabilities. *Rehabil. Psychol.* 64, 212–220. doi: 10.1037/rep0000277
- Mu, G. M., Hu, Y., and Wang, Y. (2017). Building resilience of students with disabilities in China: the role of inclusive education teachers. *Teach. Teacher Edu.* 67, 125–134. doi: 10.1016/j.tate.2017.06.004
- Mu, W., and Duan, W. (2020). Evaluating the construct validity of Stress Overload Scale-Short using exploratory structural equation modeling. *J. Health Psychol.* 25, 913–921. doi: 10.1177/1359105317738322
- Noh, J. W., Kwon, Y. D., Park, J., Oh, I. H., and Kim, J. (2016). Relationship between physical disability and depression by gender: a panel regression model. *PloS One* 11:e0166238. doi: 10.1371/journal.pone.0166238
- Ochoa-Morales, A., Hernandez-Mojica, T., Paz-Rodriguez, F., Jara-Prado, A., Trujillo-De Los Santos, Z., Sanchez-Guzman, M. A., et al. (2019). Quality of life in patients with multiple sclerosis and its association with depressive symptoms and physical disability. *Mult. Scler. Relat. Disord.* 36:101386. doi: 10.1016/j.msard.2019.101386
- Quale, A. J., and Schanke, A. K. (2010). Resilience in the face of coping with a severe physical injury: a study of trajectories of adjustment in a rehabilitation setting. *Rehabil. Psychol.* 55, 12–22. doi: 10.1037/a0018415
- Ramagopalan, S. V., Dobson, R., Meier, U. C., and Giovannoni, G. (2010). Multiple sclerosis: risk factors, prodromes, and potential causal pathways. *Lancet Neurol.* 9, 727–739. doi: 10.1016/S1474-4422(10)70094-6
- Rhemtulla, M., Brosseau-Liard, P. É., and Savalei, V. (2012). When can categorical variables be treated as continuous? a comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychol. Methods* 17, 354–373. doi: 10.1037/a0029315
- Ritchie, S. J., Bates, T. C., and Deary, I. J. (2015). Is education associated with improvements in general cognitive ability, or in specific skills? *Dev. Psychol.* 51, 573–582. doi: 10.1037/a0038981
- Runswick-Cole, K., and Goodley, D. (2013). Resilience: a disability studies and community psychology approach. *Soc. Pers. Psychol. Compass* 7, 67–78. doi: 10.1111/spc3.12012
- Silverman, A. M., Molton, I. R., Alschuler, K. N., Ehde, D. M., and Jensen, M. P. (2015). Resilience predicts functional outcomes in people aging with disability: a longitudinal investigation. *Arch. Phys. Med. Rehabil.* 96, 1262–1268. doi: 10.1016/j.apmr.2015.02.023
- Sippel, L. M., Pietrzak, R. H., Charney, D. S., Mayes, L. C., and Southwick, S. M. (2015). How does social support enhance resilience in the trauma-exposed individual? *Ecol. Soc.* 20:10. doi: 10.5751/ES-07832-200410
- Smedema, S. M., and Ebener, D. (2010). Substance abuse and psychosocial adaptation to physical disability: analysis of the literature and future directions. *Disabil. Rehabil.* 32, 1311–1319. doi: 10.3109/09638280903514721
- Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., and Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *Int. J. Behav. Med.* 15, 194–200. doi: 10.1080/10705500802222972
- Stewart, D. E., and Yuen, T. (2011). A systematic review of resilience in the physically ill. *Psychosomatics* 52, 199–209. doi: 10.1016/j.psych.2011.01.036
- Tang, X., Duan, W., Wang, Z., and Liu, T. (2016). Psychometric evaluation of the simplified Chinese version of flourishing scale. *Res. Soc. Work Pract.* 26, 591–599. doi: 10.1177/1049731514557832
- Terrill, A. L., and Molton, I. R. (2019). Frequency and impact of midlife stressors among men and women with physical disability. *Disabil. Rehabil.* 41, 1760–1767. doi: 10.1080/09638288.2018.1448466
- Terrill, A. L., Molton, I. R., Ehde, D. M., Amtmann, D., Bombardier, C. H., Smith, A. E., et al. (2016). Resilience, age, and perceived symptoms in persons with long-term physical disabilities. *J. Health Psychol.* 21, 640–649. doi: 10.1177/1359105314532973
- Wang, K., Shi, H. -S., Geng, F. -L., Zou, L. -Q., Tan, S. -P., Wang, Y., et al. (2016). Cross-cultural validation of the depression anxiety stress scale–21 in China. *Psychol. Assess.* 28, e88–e100. doi: 10.1037/pas0000207
- Wang, L., Shi, Z., Zhang, Y., and Zhang, Z. (2010). Psychometric properties of the 10-item Connor-davidson resilience scale in chinese earthquake victims. *Psychiatry Clin. Neurosci.* 64, 499–504. doi: 10.1111/j.1440-1819.2010.02130.x
- Wang, X., Tang, L., Howell, D., Shao, J., Qiu, R., Zhang, Q., et al. (2020). Psychometric testing of the Chinese version of the coping and adaptation processing scale-short form in adults with chronic illness. *Front. Psychol.* 11:1642. doi: 10.3389/fpsyg.2020.01642
- Windle, G., Bennett, K. M., and Noyes, J. (2011). A methodological review of resilience measurement scales. *Health Q. Life Outcomes* 9:8. doi: 10.1186/1477-7525-9-8
- World Health Organization [WHO] (2018). *Disability and Health*. Geneva: World Health Organization
- Wu, Y., Sang, Z. Q., Zhang, X. C., and Margraf, J. (2020). The relationship between resilience and mental health in Chinese college students: a longitudinal cross-lagged analysis. *Front. Psychol.* 11:108. doi: 10.3389/fpsyg.2020.00108
- Yang, Y., and Wen, M. (2015). Psychological resilience and the onset of activity of daily living disability among older adults in China: a nationwide longitudinal analysis. *J. Gerontol. B Psychol. Sci. Soc. Sci.* 70, 470–480. doi: 10.1093/geronb/gbu068
- Yao, X. (2007). Religious belief and practice in urban China 1995–2005. *J. Contemporary Religion* 22, 169–185. doi: 10.1080/13537900701331031
- Ye, S. (2009). Factor structure of the general health questionnaire (GHQ-12): the role of wording effects. *Pers. Individ. Dif.* 46, 197–201. doi: 10.1016/j.paid.2008.09.027
- You, B., and Jackson, T. (2020). Factor structure and construct validity of the pain resilience scale within chinese adult chronic musculoskeletal pain samples. *J. Pers. Assess.* doi: 10.1080/00223891.2020.1801700 [Online ahead of print].
- Yu, X., and Zhang, J. (2007). Factor analysis and psychometric evaluation of the connor-davidson resilience scale (CD-RISC) with Chinese people. *Soc. Behav. Pers. Intl. J.* 35, 19–30. doi: 10.2224/sbp.2007.35.1.19
- Yunnan-Provincial-Federation-of-the-Disabled (2017). *Annual Statistical Report on the Disabled in Yunnan Province in 2017*. Available online at: <http://www.clyn.gov.cn/pages/19376.shtml> (accessed July 12, 2020).
- Zheng, X., Chen, G., Song, X., Liu, J., Yan, L., Du, W., et al. (2011). Twenty-year trends in the prevalence of disability in China. *Bull. World Health Organ.* 89, 788–797. doi: 10.2471/BLT.11.089730
- Zhou, K., Li, H., Wei, X., Yin, J., Liang, P., Zhang, H., et al. (2015). Reliability and validity of the multidimensional scale of perceived social support in Chinese mainland patients with methadone maintenance treatment. *Compr. Psychiatry* 60, 182–188. doi: 10.1016/j.comppsy.2015.03.007

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2020 Duan, Mu and Xiong. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



A Pilot Study for Forgiveness Intervention in Adolescents With High Trait Anger: Enhancing Empathy and Harmony

Linjin Tao¹, Mingxia Ji², Tingting Zhu^{3*}, Hong Fu¹ and Ruoying Sun⁴

¹ School of Psychology, Nanjing Normal University, Nanjing, China, ² Guangming Branch of Shenzhen Institute of Education Sciences, Shenzhen, China, ³ Institute of Medical Humanities, Nanjing Medical University, Nanjing, China, ⁴ Personnel Department, Suzhou Vocational Institute of Industrial Technology, Suzhou, China

OPEN ACCESS

Edited by:

Wanzhen Chen,
East China University of Science
and Technology, China

Reviewed by:

Geert Jan Stams,
University of Amsterdam, Netherlands
Chad Posick,
Georgia Southern University,
United States

*Correspondence:

Tingting Zhu
zttseesaw@njmu.edu.cn

Specialty section:

This article was submitted to
Health Psychology,
a section of the journal
Frontiers in Psychology

Received: 03 June 2020

Accepted: 23 November 2020

Published: 23 December 2020

Citation:

Tao L, Ji M, Zhu T, Fu H and Sun R (2020) A Pilot Study for Forgiveness Intervention in Adolescents With High Trait Anger: Enhancing Empathy and Harmony.
Front. Psychol. 11:569134.
doi: 10.3389/fpsyg.2020.569134

Forgiveness interventions benefit victims' mental health, reduce levels of anger, and promote forgiveness. However, forgiveness interventions are rarely used to improve the offender's anger and mental health, especially in specific situations such as juvenile correctional facilities. The offender is often also a victim, and reducing the offender's excessive anger may prevent or decrease the likelihood of future interpersonal violence. This study examined the effects of forgiveness interventions on anger, forgiveness, empathy, and harmony of juvenile delinquents with high levels of trait anger. Eighteen adolescents with trait anger in a juvenile correctional facility volunteered to participate in group counseling. A pretest–posttest method of quasi-experimental design was used, with 8 participants in the intervention group and 10 in the control group; the intervention group received forgiveness group counseling, and the control group did not. The results revealed that the intervention group had significantly higher scores for forgiveness, empathy, and harmony than the control group, although no significant differences in the scores of state and trait anger were found. The forgiveness intervention had significantly improved the levels of forgiveness toward specific perpetrators of childhood victimization for the juvenile delinquents with high levels of trait anger, raising their levels of empathy and harmony; there was no significant increase in trait anger. The findings indicated that forgiveness intervention provides an effective way to improve the positive mental strength of adolescents with high levels of trait anger.

Keywords: forgiveness intervention, trait anger, adolescent, empathy, harmony, juvenile delinquents

INTRODUCTION

Agnew's general strain theory (GST) posits that crime is a consequence of "negative relationships with others" or strain (Agnew, 1992; Jang and Agnew, 2015). GST defines strains as events and conditions that are disliked. Those specific strains most conducive to crime are high in magnitude, are seen as unjust, are associated with low social control, and provide some pressure or incentive for crime. Examples include parental rejection; harsh, erratic parental discipline; child abuse and neglect; and negative secondary school experiences (Sigfusdottir et al., 2012). Agnew proposes that strain generates negative effective states, such as anger and frustration, which create pressure for corrective action, including crime. For Agnew, anger is the "most critical emotional reaction for the

purpose of the general strain theory” and is said to energize individuals for action, reduce concern for the consequences of one’s behavior, and create a desire for revenge. Anger has been identified as a basic, primary emotion that leads to violence and aggression (Siever, 2008). People with a stable and context-irrelevant tendency to experience anger are easily provoked by a variety of situations; such persons are referred to as individuals with “trait anger” (Spielberger et al., 1983) (i.e., “high-trait-anger individuals”). Adolescents with high trait anger are often accompanied with psychological and behavioral problems such as anxiety, depression, and violence, which bring potential risks to themselves, families, and society.

Trait anger has a significantly positive correlation with negative life events (Puskar et al., 2008), as frustration and a sense of injustice caused by negative life events are important triggers of anger (Potegal and Stemmler, 2010). Recent studies have identified that multiplicity and severity of victimization exposure in a prison sample were positively associated with chronic anger (Erzar et al., 2018). The relationship between early victimization, violent behavior, and crime has been supported by several studies, and anger plays an important role in this relationship. Studies of juvenile delinquents have found that juvenile offenders experience more trauma, are less supported by their families, receive less schooling, and are less able to cope with social challenges and stress than their non-offending peers (Dierkhising et al., 2013; Baglivio et al., 2014). Additionally, adverse childhood experiences relate to repeat offenses by juvenile offenders (Wolff et al., 2017). Therefore, Reavis et al. (2013) suggested that attention should be paid to the influence of early life experience in the treatment and intervention of criminals. However, few studies have explored how to help criminals identify and cope with stressors in life and deal with past injuries again (Toma et al., 2018). Some researchers believe that if we can define our clinical work more broadly, it may help us to identify the sources of frustration and anger, especially to promote the process of family repair of hatred and dissatisfaction. In this way, not only can individuals “manage” their anger, but also more importantly, they will not be so angry from the beginning (Barish, 2009).

However, frustration does not necessarily lead to stable anger or aggression. According to the integrative cognitive model proposed, individual differences in three cognitive processes jointly contribute to a person’s level of trait anger and reactive aggression (Wilkowski et al., 2010): (1) “an automatic tendency to attribute hostile traits to others” (Wilkowski et al., 2007); (2) “rumination on hostile thoughts”; (3) “effortful control” (Wilkowski et al., 2010). The key mechanism in the process of effortful control in regulating anger and aggressive behavior is forgiveness (Wilkowski and Robinson, 2010), which is the process in which, after the transgression, the victim’s negative cognitive, affective, and behavioral reactions toward the offenders gradually disappear and are replaced by positive cognitive, affective, and behavioral reactions (Enright et al., 1989). Forgiveness also includes the process of a victim undergoing a series of prosocial intent changes so as to feel empathy for the offender (McCullough et al., 1998). Forgiveness intervention (FI) has been scientifically demonstrated to decrease

excessive anger in victims (Enright and Fitzgibbons, 2015), but there is still a need to test whether FIs have an effect on trait anger in adolescents who are victimized early in their lives. This study attempts to use FI to help trait-anger adolescents in juvenile facilities successfully engage in the process of forgiving early offenders in order to reduce their trait-anger levels.

According to positive psychology theory, an effective approach to dealing with a problem is to help individuals find resources that will aid them in becoming healthier and happier instead of focusing on the problem. Psychological harmony is an important aspect of mental health (Nie et al., 2015). The harmony of one’s mental state and interpersonal relationships is important for achieving psychological harmony. Moreover, the quality of one’s interpersonal relationships is a particularly important sign of mental health. Empathy facilitates satisfactory interpersonal contact (Carnicer and Calderon, 2014). With a high level of anger, a lack of empathetic responsiveness toward others has also been identified as an antecedent to aggressive behavior (Day et al., 2012). Empathy is the capacity to understand or feel what another person is thinking and experiencing within that person’s frame of reference. Individuals who tend to perceive ambiguous situations as hostile (such as trait-anger adolescents) often lack the capacity to place themselves in another’s position. Meta-analysis has found that FIs can produce significant positive effects, including satisfaction, happiness, confidence, hopefulness, energy, soft-heartedness, warmth, and compassionate (Akhtar and Barlow, 2018). Therefore, if FI can increase the level of empathy and mental harmony, it may be an effective method of psychological construction. This study aims to explore whether we can establish a positive psychological construction for trait-anger adolescents in juvenile facilities to increase their positive mental strength so that they might confront potential risks in life with more resources.

Given the above background, this study focused on the negative life events and offensive experiences of trait-anger adolescents, employing FI to this end. We screened 18 adolescents with high trait anger from the juvenile delinquency center, where such kind of adolescents relatively concentrated.

From the perspective of restorative justice (RJ), FI is also the proper meaning of RJ to intervene in the source of these crimes. RJ is an approach to criminal justice that considers crime an act of harm committed by a perpetrator against an individual or community (Lloyd and Borrill, 2020). This interpersonal transgression creates an obligation for the offender to repair the damage done by such an act and restore the stakeholders to their prior status (Zehr, 1990). For the juvenile delinquents, there are many possibilities for their future, and it is often difficult to recover the interpersonal injuries caused by crimes. However, it is often overlooked what kind of people they will become in the future and whether they will continue to cause harm to society and others because of their unfinished events. Forgiving intervention can work in this area. Through engaging in restorative activities, it is suggested that the individual comes to redefine himself/herself as a law-abider and subsequently no longer engages in criminal activity (Tyler et al., 2007). In addition, trait anger may be used as an indicator of identification. It is

TABLE 1 | Group structure of the intervention and control groups.

	Level of education (n)			Gender (n)		Age (n)				Region (n)		Trait anger (mean rank)
	Primary School	Middle School	High School	Male	Female	16	17	18	19	Urban	Rural	
Intervention	2	5	1	6	2	1	4	2	1	1	7	9.44
Control	2	8	0	7	3	1	4	3	2	2	8	9.55
Chi-square tests	χ^2	1.49			0.06			0.32		0.18		U-Test $U = 39.50$ $p > 0.05$
	p	$p > 0.05$			$p > 0.05$			$p > 0.05$		$p > 0.05$		

more socially meaningful to intervene when adolescents have not committed illegal behaviors but have such tendencies.

The research hypotheses were that—for adolescents with high trait anger—FI (1) will increase the levels of forgiveness toward a particular offender, (2) improve the levels of empathy and harmony, and (3) decrease the levels of trait anger.

MATERIALS AND METHODS

Participants

This study combined random sampling with cluster sampling. The subjects for the study were 180 volunteers (male = 160, female = 20) from a juvenile correctional facility who participated in an assessment to find individuals who had been severely victimized and who also had high levels of trait anger. An offense event questionnaire (recalling and describing a specific offender and offending event), the 12-item form of the Transgression-Related Interpersonal Motivations Scale (TRIM-12; McCullough et al., 1998), and the Trait Anger Scale (TAS; Spielberger et al., 1983) were administered to the 18 participants who met both conditions above and who were willing to participate in group counseling. Participants' ages ranged from 16 to 19 years (mean = 17.50, $SD = 0.924$), the majority were male [13 (72.22%)]. On average, they had 7.61 ($SD = 1.54$, range = 5–11) years of education. Taking into consideration the factors of age, consistency of trait-anger scores, sex ratio, group size, and group counseling settings (the content of the consultation arrangement required each group to have an even number of members), we assigned 8 of the 18 adolescents to the intervention group and the remaining 10 to the control group. There was no significant difference in trait anger of pretest [$U(8, 10) = 39.50$, $p > 0.05$]. The group structure and demographic information are shown in **Table 1**.

Experimental Procedure

Nanjing Normal University Ethics Committee approval was received. Confidentiality of the participant was ensured in several ways, i.e., name of all participants was anonymized, and all recordings were kept confidentially. Twenty-minute intake interviews were conducted with all 18 participants. The questions mainly focused on (1) whether the participant believed he/she became angry easily, (2) whether people around the participant (relatives, friends, etc.) considered him/her easily angered, and (3) whether there was any connection between the offensive

TABLE 2 | Pretest-posttest of quasi experimental design with the intervention and control groups.

Group	Pretest	Intervention program	Posttest	Comparison
Intervention	Test (m1)	Forgiveness group counseling, twice a week, 120 min each session for consecutively 14 times	Test (m3)	$M1 = m3 - m1$
Control	Test (m2)	No intervention	Test (m4)	$M2 = m4 - m2$

The experimental effects of intervention were revealed by the Mann-Whitney U-test of the difference between M1 and M2.

experience described in the initial screening questionnaire and the participant's tendency to get angry as a personality trait.

This study applied a pretest-posttest quasi-experimental design: the participants in the intervention group received forgiveness counseling, and those in the control group participated only in their regular work and activities. Participants in both groups were administered the same psychological tests before and after the intervention. The experimental effects of the intervention are shown in **Table 2**. Considering the limitation of testing only state anger before and after the intervention, after each intervention session, the participants in the intervention group were given the State Anger Scale (SAS) (because of constraints, the control group was not monitored) to complete at 20:00 every day so as to observe the dynamic changes of the state anger.

Instruments

The FI Program

This study's intervention program was based on the framework of the Enright Forgiveness Intervention Model (Enright, 2001; Knutson et al., 2008), which emphasizes four key phases: (1) the uncovering phase, in which the individual confronts the nature of the offense and uncovers the consequences of having been offended; (2) the decision phase, in which one makes a decision to commit to forgiveness; (3) the work phase, in which one actually works on forgiving and practices empathy and compassion for the offender; and (4) the deepening phase, in which one deepens one's will and ability to forgive, overcoming obstacles standing in the way of forgiveness. Following the basic group counseling principles, such as group dynamics theory, and combining specific counseling theories (cognitive reconstructing, etc.) and

positive psychology conceptions, we designed the preliminary intervention group program for forgiveness. We then performed an expert validity test, integrating opinions collected from five experts to refine the intervention program. The new designs for the intervention program were presented to experts until there were no more suggestions. The final design included 14 sessions of group counseling in six units, with each session lasting 2 h and sessions being held twice a week. Researchers interested in this intervention should contact the corresponding author.

Assessment Scales

Forgiveness scales

The revised Enright Forgiveness Inventory (EFI) was designed to assess a subject's level of forgiveness toward the offender (Subkoviak et al., 1995). The revised Chinese version consists of 50 items with six factors: positive affect, positive cognition, negative affect (NA), negative cognition (NC), negative behavior-avoidance (NB), and positive behavior (PB) (Tao, 2011). The EFI is a six-point Likert inventory with scores ranging from 50 to 300. The higher the score, the higher the level of forgiveness. The Cronbach's coefficient for this scale was 0.98. The revised Chinese version of the TRIM-12 includes 12 items (Chen and Zhu, 2006) and two factors—revenge-seeking behavior and avoidance—and is measured on a five-point Likert inventory, with total scores ranging from 0 to 48. The higher the score, the lower the level of forgiveness. Cronbach's coefficient for this scale was 0.87.

Anger scale

Spielberger's State-Trait Anger Expression Inventory-2 was designed to assess state and trait anger (STAXI-2; Spielberger, 2010). The revised Chinese version of STAXI-2 includes two scales (Tao, 2011). The TAS assesses an individual's frequency of experiencing anger (for example, "I have a hot temper"), including 10 items and two factors: angry temperament and angry reaction. The questions are measured on a four-point Likert scale (1 = rarely true, 4 = always true), with total scores ranging from 10 to 40. A higher score represents a stronger tendency to be angry. The SAS assesses the intensity of anger as an emotional state at a particular time (for example, "I feel angry"), including 10 items with three factors: anger affect, speech/action, and anger unleash. Responses are given on a four-point Likert scale ranging from 10 to 40. The SAS was used as a dynamic evaluation tool, and the participants were asked to complete the questionnaire at 20:00 every evening to continuously evaluate their state anger.

Harmony scale

A subscale of the Chinese Personality Assessment Inventory for Adolescents (CPAI-A) was jointly established by the Chinese University of Hong Kong and the Chinese Academy of Sciences Institute of Psychology. This scale includes 14 items and uses binary scoring (0 = false, 1 = true), for a total score ranging from 0 to 14. It is designed to assess the factor of harmony in personality, with a higher score meaning more harmony in personality. The average of the CPAI-A Cronbach's was 0.72 (Cheung and Fan, 2008).

Empathy scale

The Chinese version of the Interpersonal Reactivity Index-Chinese (IRI-C) was revised by Wu Jingjie from Davis's Interpersonal Reactivity Index (Davis, 1983; Wei, 2007) and includes 22 items with responses measured on a five-point Likert scale. This study used the "perspective taking" subscale to assess cognitive empathy and measured emotional empathy with the "compassionate care" subscale. The Cronbach's alpha of the IRI-C was between 0.53 and 0.78. We also applied the Interpersonal Sensitivity scale (from CPAI-A, the same scale applied in the previous paragraph as the "Harmony Scale") to test individuals' sensitivity to others' thoughts and feelings. This scale included 12 items and used binary scoring ranging from 0 to 12. The higher the score, the more sensitive the individual.

Statistical Processing

The normal distribution test showed that the data in this study did not conform to the normal distribution, while the non-parametric test was applicable. As rank sum test of two independent samples, Mann-Whitney U tests were performed to identify if there were significant differences between the two groups (the intervention group versus control group) for high-trait-anger adolescents in regard to their ordinal scores in the changes of forgiveness, harmony, empathy, state anger, and trait anger before and after the FI and calculated the effect value. The effect value is an index of statistical efficacy used to measure the intensity of the intervention effect in intervention research (Durlak, 2009). In a study with a sample size of fewer than 20, researchers recommend the use of Hedges' *d* (Hedges and Olkin, 1985) as an indicator of effect value (Nakagawa and Cuthill, 2007). The formula is as follows:

$$\text{Hedges' } d = g \left[1 - \frac{3}{4(n_1 + n_2 - 2) - 1} \right]$$

in which

$$g = \frac{\bar{X}_1 - \bar{X}_2}{s_{\text{pooled}}}$$

in which

$$s_{\text{pooled}} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

Data were processed and analyzed using SPSS 22.0.

RESULTS

Comparison of Changes in Forgiveness Level

Table 3 indicates that there was a significant difference between the intervention group and the control group in regard to their changes of ordinal scores on EFI and TRIM-12 from pretest to posttest [EFI: $U(8, 10) = 17.00$, $p < 0.05$, $d = 1.06$; TRIM-12: $U(8, 10) = 16.50$, $p < 0.05$, $d = -1.24$]. As for the dimensions of EFI, there were significant differences between the groups in regard to their changes of ordinal scores of EFI's NA and NC, although there was no significant difference for

positive emotion and cognition. There was a significant difference between the groups in regard to their changes of ordinal scores of EFI's PB. As no significant differences had been found in EFI's negative behavior–revenge and NB as shown in **Table 3**, similar dimensions of “avoidance” and “revenge” in TRIM-12 showed significant differences between the two groups. Thus, on the whole, adolescents with high trait anger in the FI group performed better than did those in the control group, with a mean rank difference equal to 5.18 and -5.29 , respectively, in EFI and TRIM-12. Thus, the first hypothesis of this study—FI can help trait-anger adolescents enhance the level of forgiveness toward a particular offender—is supported.

Comparison of Harmony and Empathy Levels

As shown in **Table 4**, Mann–Whitney U -test showed that there were significant differences between the groups in regard to their changes of ordinal scores on harmony and IRI-C–empathy concern from pretest to posttest [Harmony: $U(8, 10) = 11.50$, $p < 0.05$, $d = 1.46$; IRI-C–empathy concern: $U(8, 10) = 5.50$, $p < 0.01$, $d = -1.86$]. On the whole, adolescents with high trait anger in the FI group changed more than did those in control group, with a Mean Rank difference equal to 6.41 and 7.76, respectively, in Harmony and IRI-C–empathy concern. Although there was only a marginally significant difference on Interpersonal Sensitivity, the D value was greater than 0.8. The difference in “perspective taking” was not significant. Despite this, the second hypothesis of this study—FI can improve trait-anger adolescents' level of empathy and harmony—has been almost validated.

Comparison of Changes in Anger Level

Mann–Whitney U -test indicated that there was no significant difference between the intervention group and the control group for all the anger outcomes, while in the change of some dimensions of trait anger and the total state anger and its speech/action dimension, the effect values were greater than 0.5, reaching the middle levels (**Table 5**). Therefore, although the third hypothesis of this study—FI can decrease trait-anger adolescents' tendency to anger—has not been verified, it is necessary to expand the sample to further verify the role of FI regarding anger-related variables.

As for the dynamic changes of the state anger that were recorded every day, we combined 7 days' worth of SAS replies and considered them as one unit, and the curve of the overall state anger of the intervention group was drawn (**Figure 1**). In general, the state anger level of the intervention group showed a slight downward trend.

DISCUSSION

German positive psychotherapist Nossrat Peseschkian made a classical analogy: if a person's left leg is lame, in addition to training his left leg to restore its function, he can also train his right leg to strengthen it to compensate for the lost function of his left leg. This principle is very close to the idea of tai chi in

TABLE 3 | Mann-Whitney U -test comparison of the effect of forgiveness intervention on EFI in different subjects.

Variables	M (Mean Rank)	U	ΣN	p	Hedges' d
EFI total scores_d		17.00	18	0.041*	1.06
Intervention group	12.38				
Control group	7.20				
-Positive emotion and cognition_d		23.00	18	0.130	0.86
Intervention group	11.63				
Control group	7.80				
-Negative affect_d		12.00	18	0.013*	1.02
Intervention group	13.00				
Control group	6.70				
-Negative cognition_d		18.00	18	0.049*	0.97
Intervention group	12.25				
Control group	7.30				
-Negative behavior_d		22.00	18	0.102	0.73
-Revenge ^a					
Intervention group	11.75				
Control group	7.70				
-Negative Behavior_d		21.00	18	0.090	0.76
-Avoidance ^a					
Intervention group	11.88				
Control group	7.60				
-Positive behavior_d		16.50	18	0.036*	1.20
Intervention group	12.44				
Control group	7.15				
TRIM-12 unforgiveness_d		16.50	18	0.036*	-1.24
Intervention group	6.56				
Control group	11.85				
-Avoidance ^a _d		14.00	18	0.020*	-1.18
Intervention group	6.25				
Control group	12.10				
-Revenge ^a _d		20.00	18	0.072 ^Δ	-1.04
Intervention group	7.00				
Control group	11.50				

^aThe “revenge” and “avoidance” factors of EFI had been reversely scored, reflecting the tendency same as “forgiveness.” While what TRIM-12 measured was the opposite of “forgiveness.” The scale score decreased with the intervention. * $p < 0.05$; ^Δ $p < 0.1$, marginal significant.

Chinese traditional culture. Yin and yang can be transformed into each other. When yin occupies the dominant position, yang is naturally weakened, and once yang increases, the dominant

TABLE 4 | Mann-Whitney *U*-test comparison of the effect of forgiveness intervention on harmony and empathy in different subjects.

Variables	M (mean rank)	U	ΣN	<i>p</i>	Hedges' <i>d</i>
Harmony_d		11.50	18	0.011*	1.46
Intervention group	13.06				
Control group	6.65				
Interpersonal sensitivity_d		20.00	18	0.073 ^Δ	0.86
Intervention group	12.00				
Control group	7.50				
IRI-C-Perspective-taking_d		38.50	18	0.883	-0.12
Intervention group	9.69				
Control group	9.35				
IRI-C-Empathy Concern_d		5.50	18	0.001**	1.86
Intervention group	13.81				
Control group	6.05				

P* < 0.05; *p* < 0.01; ^Δ*p* < 0.1, marginal significant.

position of yin will naturally decrease (Cui, 2009). The FI in this study showed a similar positive effect on trait-anger adolescents.

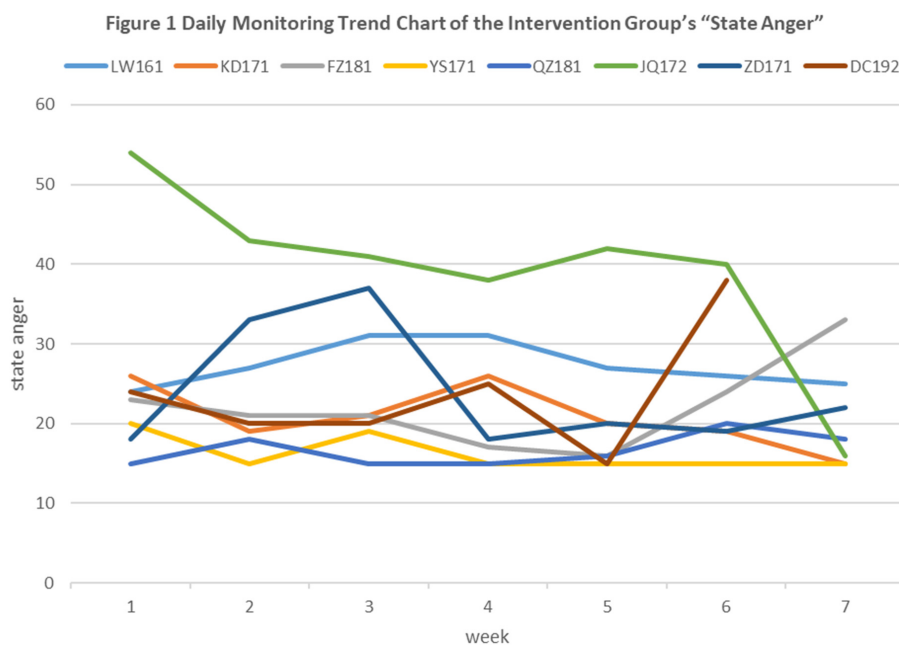
The Influence of FI on Forgiveness

FI has been found to have an effect on common people (e.g., Hui and Chau, 2009; Ji et al., 2016), whereas few studies have used such approach among individuals with high trait anger except Gambaro's pioneering work, which helped five people with high trait anger forgive (Gambaro, 2002). This present study, according to the forgiveness scales (EFI and

TABLE 5 | Mann-Whitney *U*-Test comparison of the effect of forgiveness intervention on anger in different subjects.

Variables	M (Mean Rank)	U	ΣN	<i>P</i>	Hedges' <i>d</i>
Trait anger_d		31.00	18	0.421	-0.26
Intervention group	8.38				
Control group	10.40				
-Anger temperament_d		25.50	18	0.188	-0.59
Intervention group	7.69				
Control group	10.95				
-Anger reaction_d		32.00	18	0.462	0.52
Intervention group	10.50				
Control group	8.70				
State Anger_d		22.50	18	0.115	-0.60
Intervention group	7.31				
Control group	11.25				
-Anger Affect_d		35.00	18	0.641	-0.08
Intervention group	8.88				
Control group	10.00				
-Speech/action_d		23.00	18	0.106	-0.78
Intervention group	7.38				
Control group	11.20				
-Anger unleash_d		36.50	18	0.738	-0.17
Intervention group	9.06				
Control group	9.85				

TRIM-12), confirms Gambaro's result with a significant increase in the level of forgiveness toward the offenders among the intervention group, although it was a hard work. Researchers have found that the higher the level of trait anger, the less likely it is to forgive others (Macaskill, 2012; Luo et al., 2013). For

**FIGURE 1 |** Daily Monitoring Trend Chart of the Intervention Group's "State Anger."

these, people experience more hostility and higher stress levels (Maan Diong et al., 2005). The current study suggests that FI plays an effective role in helping high-trait-anger adolescents reduce negative attitudes and increase positive attitudes toward offenders, without which it may take a long period of time. Time is generally regarded as good medicine for healing. Some studies have indeed shown that the degree of forgiveness increases with time (McCullough et al., 2003). However, Mann–Whitney *U*-test for the intervention and control groups revealed that the intervention group showed more increase than the control group did, with a mean rank difference from 4.5 to 6.3 in EFI and its dimensions as well as TRIM-12 and its dimensions. What's more, FI effectively helped the individual stop accumulating negative emotions with a mean rank difference equal to 6.3 in EFI's NA dimension. This result is also in line with Pronk et al. (2010), who demonstrated that the degree of forgiveness would increase over time only for people who had high executive functioning. In other words, it may be difficult for some people to forgive only through time, so more external intervention is needed for those difficult ones. We are not to say that trait anger is equivalent to low executive function, but to say that our study suggests that while forgiving a more serious injury event is difficult, FI can help precisely those who have difficulty in forgiving.

The Influence of FI on Trait Anger

Harris et al. (2006) found FI could decrease trait anger after 6-week sessions among common adults who had experienced a hurtful interpersonal transgression, whereas Rye et al. (2005) did not find the same result in trait anger after 8-week sessions among divorced individuals, neither did Feng et al. (2018) among Chinese angry bus drivers. This suggests that FI is likely to have different effects on reducing trait anger among different people. In the present study, we captured a slight downward trend in state anger level of the intervention group, but non-significant change in trait anger based on the changes in the TAS. Possible reasons might be that (1) trait anger is more difficult to change in trait-anger adolescents than common people; (2) changes in trait anger are difficult to elucidate from statistical data with fewer than 2 months of intervention. The formation of trait anger is the accumulation of years of adverse experiences, which needs continuous FI toward different offender and offense. The FI may have a long-term effect on trait anger, which is different from a general suppression of anger in that, although individuals may reduce their explicit anger tendencies through suppression in the short run, they do not get rid of their internal desire for revenge and have only a limited effect in terms of altering their emotional experiences (Gross and Thompson, 2007), while forgiveness changes the intrinsic motivation of a person (McCullough et al., 2003), and therefore, sufficient time is needed to achieve this goal (Finkel et al., 2002; Fincham et al., 2006). Probably, once changed, it will last long. Harris's study on an FI for 259 adults who had been subject to severe aggression showed that the training produced improvements in trait anger at 6-week posttest and even at 4-month follow-up (Harris et al., 2006).

In the current study, the daily record of “state anger” showed that the state of persistent anger had decreased. This, at the very least, suggests that FIs for trait-anger adolescents provide an effective way to decrease their anger. Even though forgiveness does not directly affect anger itself, it is still important for character formation. At this point, time is a very important factor. In addition, the rebound in the anger level of some subjects in this study might be related to sudden offensive events in their environment.

The Influence of FI on Empathy and Harmony

Empathy is one of the indicators that are considered closely related to mental health (Carnicer and Calderon, 2014; Khajeha et al., 2014). It promotes a satisfying connection between people, helps increase altruistic behavior, and reduces aggressive behavior (Carlo et al., 1999; Bjorkqvist et al., 2000; Carnicer and Calderon, 2014). All FI programs consider raising the victims' empathy level a necessary step, but few researchers have evaluated whether participants' empathy levels have actually improved from the implementation of FIs.

In this study, based on the scale data of “Interpersonal Sensitivity” and “IRI-C–empathy concern,” the intervention led participants to be more keenly aware of the thoughts and feelings of others and to be more willing and able to sympathize and care for others, increasing their level of empathy (especially emotional empathy). A previous study has shown that the higher the level of empathy, the more forgiving the individual (Macaskill et al., 2002). Our study also supported this finding from an intervention perspective, as increasing empathy levels correlated with an increase in the level of forgiveness.

Psychological harmony is also an important sign of mental health (Nie et al., 2015). The harmony of a person's inner mind or their interpersonal relationships is an important aspect of psychological harmony. A person with a good state of mental harmony will have characteristics such as high satisfaction with life and work; optimistic, positive, and open-minded personality; fewer negative emotional experiences; good family relationships and interpersonal relationships; more social support; and so on (Research Project Group of Psychological Harmony, 2008). These are characteristics that individuals with high trait anger often lack. Cheung et al. (2005) compiled the CPAI-A, in which “harmony” was used to measure the degree of harmony in the individual's personality. This concept combined the two aspects of inner harmony and interpersonal harmony (Cheung et al., 2005; Fu, 2006).

The data of the “Harmony Scale” in this study reflected that FI makes the interpersonal and inner aspects of an intervention group more harmonious. This is of great significance for high-trait-anger adolescents. At the beginning of the intervention, several members expressed their hopes that by participating in the group, they would become more peaceful and would learn to control their emotions. If a person can become more peaceful and harmonious by increasing their positive power, this will also play a positive role in their ability to manage irritability, and it will become a protective factor for them in the face of negative life events.

Limitations and Implications

These findings should be interpreted with caution, mainly because of the small sample size. To compensate, we adopted Hedges' d , which is suitable for small sample effect-size estimation. Although the FI in this study did not change the trait anger in adolescents as significantly as expected, the total and speech/action dimensions of state anger—as well as the temperament and reaction dimensions of trait anger—had moderate effect sizes, and the downward trend can also be seen intuitively in the dynamic evaluation chart of state anger. All of this suggests that the intervention is likely to have some effect, and so, it will be necessary to expand the sample size in a follow-up study.

Although in this study the effects of FI were of good size on interpersonal forgiveness, empathy, and harmony, all effects were measured through self-reported outcomes. The impact of FI on actual behavior and long-term attitudes to the offender were not measured. In addition, like most interventions, the internal validity of the study was high, but external validity may not be high. This intervention took place in a highly controlled setting at a juvenile correctional facility.

The present study was also influenced by other circumstances. For example, at the time the study was carried out, at least two of the subjects were soon to reach the end of their sentence, as a result of which we were unable to follow up with them. The daily environment of the juvenile correctional facility often involved many unexpected conflicts, which was another direct factor that may have impacted our results. This suggests that future studies need to increase the number and longevity of interventions and explore more effective research methods, exploring the optimal frequency at which interventions can be effective and consolidated.

We also produced some novel results. FIs have effectively improved trait-anger adolescents' levels of forgiveness, harmony, and empathy. This further suggests that the FI for trait-anger adolescents provides an effective way to improve their personality. Even if FIs cannot directly affect anger itself during a short period of time, they can still influence the development of personality as a whole. Therefore, future research needs to explore the psychological mechanism of FIs in trait-anger adolescents. If so, it is not only an effective way of RJ, but also an effective way to prevent crime.

CONCLUSION

The conclusions of this study are as follows: (1) the FI significantly improved the level of forgiveness toward specific offenders for trait-anger adolescents; (2) there was no significant

increase of the level of trait anger with participants after the intervention, while there was a tendency for improvement, which should be explored further in future research; and (3) the trait-anger adolescents showed an increase in the levels of empathy and harmony after the FI, and these aspects could be protective factors for individuals coping with stressful situations in the future.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Review Committee of Nanjing Normal University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

LT was responsible for the study design, implementation, analysis, interpretation of data, drafting the work and revising it critically for important intellectual content, and reprocesses the data as revising the manuscript. MJ participated the study design, interpretation of data, and revision the draft. TZ participated in the whole process of writing this manuscript, working hard with the LT on the final revision of the manuscript and responsible for the submission process and at the same time, her project also supported this study, and accountable for all aspects. All authors contributed to manuscript revision, read and approved the submitted version.

FUNDING

This paper was partly funded by the National Social Science Fund of China, which mainly funded the publication of this paper. The grant number is 14CSH073.

ACKNOWLEDGMENTS

The authors thank Yuanhui Chen for her support in searching for the target journal and also appreciate Yu Shen for her valuable support in proofreading this manuscript.

REFERENCES

- Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency*. *Criminology* 30, 47–88. doi: 10.1111/j.1745-9125.1992.tb01093.x
- Akhtar, S., and Barlow, J. (2018). Forgiveness therapy for the promotion of mental well-being: a systematic review and meta-analysis. *Trauma Violence Abuse* 19, 107–122. doi: 10.1177/1524838016637079
- Baglivio, M., Epps, N., Swartz, K., Sayedul Huq, M., Sheer, A., and Hardt, N. S. (2014). The prevalence of adverse childhood experiences (ACE) in the lives of juvenile offenders. *J. Juv. Justice* 3, 1–23.
- Barish, K. (2009). *Emotions in Child Psychotherapy: An Integrative Framework*. Oxford: Oxford University Press, Inc.
- Bjorkqvist, K., Osterman, K., and Kaukiainen, A. (2000). Social intelligence minus empathy = aggression? *Aggress. Violent Behav.* 5, 191–200. doi: 10.1016/S1359-1789(98)00029-9

- Carlo, G., Allen, J. B., and Buhman, D. C. (1999). Facilitating and disinhibiting prosocial behaviors: the nonlinear interaction of trait perspective taking and trait personal distress on volunteering. *Basic Appl. Soc. Psychol.* 21, 189–197. doi: 10.1207/S15324834BASP2103_3
- Carnicer, J. G., and Calderon, C. (2014). Empathy and coping strategies as predictors of well being in Spanish university students/Empatia y estrategias de afrontamiento como predictores del bienestar en estudiantes universitarios españoles. *Electron. J. Res. Educ. Psychol.* 12:129. doi: 10.14204/ejrep.32.13117
- Chen, Z. Y., and Zhu, N. N. (2006). Psychometric features of wade forgiveness scale and transgression-related interpersonal motivation scale-12-item form in chinese college students. *Chin. Ment. Health J.* 20, 617–620. (In Chinese).
- Cheung, F. M., and Fan, W. (2008). Standardization of the cross-cultural [Chinese] personality assessment inventory for adolescents in Hong Kong: a combined emic-etic approach to personality assessment. *Acta Psychol. Sin.* 40, 839–852. doi: 10.3724/SP.J.1041.2008.00839
- Cheung, F. M., Leung, K., and Cheung, S. F. (2005). *The Cross-Cultural (Chinese) Personality Assessment Inventory-Adolescent form (CPAI-A)*. (Available from F. M. Cheung, Department of Psychology, The Chinese University of Hong Kong, Hong Kong SAR).
- Cui, J.-G. (2009). A brief introduction of the german positive psychotherapy paradigm. *J. Jiangsu Sec. Norm. Univ.* 25, 1–5. doi: 10.3969/j.issn.1008-0627.2009.03.006
- Davis, M. (1983). Measuring individual differences in empathy: evidence for a multidimensional approach. *J. Personal. Soc. Psychol.* 44, 113–126. doi: 10.1037/0022-3514.44.1.113
- Day, A., Mohr, P., Howells, K., Gerace, A., and Lim, L. (2012). The role of empathy in anger arousal in violent offenders and university students. *Int. J. Offender Ther. Comp. Criminol.* 56, 599–613. doi: 10.1177/0306624X11431061
- Dierkhising, C. B., Ko, S. J., Woods-Jaeger, B., Briggs, E. C., Lee, R., and Pynoos, R. S. (2013). Trauma histories among justice-involved youth: findings from the national child traumatic stress network. *Eur. J. Psychotraumatol.* 4:20274. doi: 10.3402/ejpt.v4i0.20274
- Durlak, J. A. (2009). How to select, calculate, and interpret effect sizes. *J. Pediatr. Psychol.* 34, 917–928. doi: 10.1093/jpepsy/jsp004
- Enright, R. D. (2001). *Forgiveness is a Choice*. Washington, DC: American Psychological Association.
- Enright, R. D., and Fitzgibbons, R. P. (2015). *Forgiveness Therapy*. Washington, DC: American Psychological Association.
- Enright, R. D., Santos, M. J. D., and Al-Mabuk, R. (1989). The adolescent as forgiver. *J. Adolesc.* 12, 95–110. doi: 10.1016/0140-1971(89)90092-4
- Erzar, T., Yu, L., Enright, R. D., and Kompan Erzar, K. (2018). Childhood victimization, recent injustice, anger, and forgiveness in a sample of imprisoned male offenders. *Int. J. Offender Ther. Comp. Criminol.* 63, 18–31. doi: 10.1177/0306624X18781782
- Feng, Z., Zhan, J., Ma, C., Lei, Y., Liu, J., Zhang, W., et al. (2018). Is cognitive intervention or forgiveness intervention more effective for the reduction of driving anger in chinese bus drivers? *Transp. Res. Part F Traffic Psychol. Behav.* 55, 101–113. doi: 10.1016/j.trf.2018.02.039
- Fincham, F. D., Hall, J., and Steven, R. H. B. (2006). Forgiveness in marriage: current status and future directions. *Fam. Relat.* 55, 415–427. doi: 10.1111/j.1741-3729.2005.callf.x-i1
- Finkel, E. J., Rusbult, C. E., Kumashiro, M., and Hannon, P. A. (2002). Dealing with betrayal in close relationships: does commitment promote forgiveness? *J. Personal. Soc. Psychol.* 82, 956–974. doi: 10.1037/0022-3514.82.6.956
- Fu, H. (2006). Factor analysis of forgiveness and relative personalities based on chinese college students samples. *Educ. Res. Exp.* 25, 58–63. (In Chinese).
- Gambaro, M. E. (2002). *School-Based Forgiveness Education in the Management of Trait Anger in Early Adolescents*. Unpublished doctoral dissertation., University of Wisconsin-Madison, Madison, WI.
- Gross, J. J., and Thompson, R. A. (2007). “Emotion regulation: conceptual foundations,” in *Handbook of Emotion Regulation*, ed. J. J. Gross (New York, NY: Guilford Press), 3–24.
- Harris, A. H. S., Luskin, F., Norman, S. B., Standard, S., Bruning, J., Evans, S., et al. (2006). Effects of a group forgiveness intervention on forgiveness, perceived stress, and trait-anger. *J. Clin. Psychol.* 62, 715–733. doi: 10.1002/jclp.20264
- Hedges, L. V., and Olkin, I. (1985). *Statistical Methods for Meta-Analysis*. Orlando: Academic Press.
- Hui, E. K. P., and Chau, T. S. (2009). The impact of a forgiveness intervention with Hong Kong Chinese children hurt in interpersonal relationships. *Br. J. Guid. Coun.* 37, 141–156. doi: 10.1080/03069880902728572
- Jang, S. J., and Agnew, R. (2015). Strain theories and crime. *Int. Encycl. Soc. Behav. Sci.* 495–500. doi: 10.1016/B978-0-08-097086-8.45088-9
- Ji, M., Hui, E., Fu, H., Watkins, D., Tao, L., and Lo, S. K. (2016). Effects of a culture-adaptive forgiveness intervention for Chinese college students. *Br. J. Guid. Coun.* 44, 335–346. doi: 10.1080/03069885.2015.1130798
- Khajeha, A., Baharlooa, G., and Soliemanib, F. (2014). The relationship between psychological well-being and empathy quotient. *Manage. Sci. Lett.* 4, 1211–1214. doi: 10.5267/j.msl.2014.5.005
- Knutson, J., Enright, R., and Garbers, B. (2008). Validating the developmental pathway of forgiveness. *J. Couns. Dev.* 86, 193–199. doi: 10.1002/j.1556-6678.2008.tb00497.x
- Lloyd, A., and Borrill, J. (2020). Examining the effectiveness of restorative justice in reducing victims' post-traumatic stress. *Psychol. Inj. Law* 13, 77–89. doi: 10.1007/s12207-019-09363-9
- Luo, X., Deyin, Z., Wenling, L., and Yanling, L. (2013). The relationship between empathy and forgiveness in Vocational College students: the moderating effect of trait anger. *Chin. Spec. Educ.* 155, 7789–7793. (In Chinese).
- Maan Diong, S., Bishop, G. D., Enkelmann, H. C., Tong, E. M. W., Why, Y. P., Ang, J. C. H., et al. (2005). Anger, stress, coping, social support and health: modelling the relationships. *Psychol. Health* 20, 467–495. doi: 10.1080/0887044040512331333960
- Macaskill, A. (2012). Differentiating dispositional self-forgiveness from other-forgiveness: associations with mental health and life satisfaction. *J. Soc. Clin. Psychol.* 31, 28–50. doi: 10.1521/jscp.2012.31.1.28
- Macaskill, A., Maltby, J., and Day, L. (2002). Forgiveness of self and others and emotional empathy. *J. Soc. Psychol.* 142, 663–665. doi: 10.1080/00224540209603925
- McCullough, M. E., Fincham, F. D., and Tsang, J.-A. (2003). Forgiveness, forbearance, and time: the temporal unfolding of transgression-related interpersonal motivations. *J. Personal. Soc. Psychol.* 84, 540–557. doi: 10.1037/0022-3514.84.3.540
- McCullough, M. E., Rachal, K. C., Sandage, S. J., Worthington, E. L., Brown, S. W., and Hight, T. L. (1998). Interpersonal forgiving in close relationships: II. theoretical elaboration and measurement. *J. Personal. Soc. Psychol.* 75, 1586–1603. doi: 10.1037/0022-3514.75.6.1586
- Nakagawa, S., and Cuthill, I. C. (2007). Effect size, confidence interval and statistical significance: a practical guide for biologists. *Biol. Rev.* 82, 591–605. doi: 10.1111/j.1469-185X.2007.00027.x
- Nie, Y. G., Mao, L. P., and Wang, M. (2015). Correlations of adolescents' interpersonal harmony, social support and resilience. *J. Ningbo Univ.* 37, 1–5. (In Chinese).
- Potegal, M., and Stemmler, G. (2010). *Cross-Disciplinary Views of Anger: Consensus and Controversy*. New York, NY: Springer, 3–7.
- Pronk, T. M., Karremans, J. C., Overbeek, G., Vermulst, A. A., and Wigboldus, D. L. H. J. (2010). What it takes to forgive: when and why executive functioning facilitates forgiveness. *J. Personal. Soc. Psychol.* 98, 119–131. doi: 10.1037/a0017875
- Puskar, K., Ren, D., Bernardo, L. M., Haley, T., and Stark, K. H. (2008). Anger correlated with psychosocial variables in rural youth. *Issues Compr. Pediatr. Nurs.* 31, 71–87. doi: 10.1080/01460860802023513
- Reavis, J., Looman, J., Franco, K. A., and Rojas, B. (2013). Adverse childhood experiences and adult criminality: how long must we live before we possess our own lives? *Perm. J.* 17, 44–48. doi: 10.7812/TPP/12-072
- Research Project Group of Psychological Harmony (2008). The research on psychological harmony of chinese common people. *Bull. Chin. Acad. Sci.* 23, 168–174.
- Rye, M. S., Pargament, K. I., Pan, W., Yingling, D. W., Shogren, K. A., and Ito, M. (2005). Can group interventions facilitate forgiveness of an ex-spouse? A randomized clinical trial. *J. Consult. Clin. Psychol.* 73, 880–892. doi: 10.1037/0022-006x.73.5.880
- Siever, L. J. (2008). Neurobiology of aggression and Violence. *Am. J. Psychiatry* 165, 429–442. doi: 10.1176/appi.ajp.2008.07111774

- Sigfusdottir, I. D., Kristjansson, A. L., and Agnew, R. (2012). A comparative analysis of general strain theory. *J. Crim. Justice* 40, 117–127. doi: 10.1016/j.jcrimjus.2012.01.001
- Spielberger, C. D. (2010). *State-Trait Anger Expression Inventory*. Hoboken, NJ: John Wiley & Sons, Inc.
- Spielberger, C. D., Jacobs, G., Russell, S., and Crane, R. (1983). *Assessment of Anger: The State-Trait Anger Scale*. Hillsdale, NJ: LEA.
- Subkoviak, M. J., Enright, R. D., Wu, C.-R., Gassin, E. A., Freedman, S., Olson, L. M., et al. (1995). Measuring interpersonal forgiveness in late adolescence and middle adulthood. *J. Adolesc.* 18, 641–655. doi: 10.1006/jado.1995.1045
- Tao, L. (2011). *Forgiveness Intervention on Adolescents with High Trait Anger*. Unpublished doctoral dissertation, Nanjing Normal University: Nanjing.
- Toma, E., Lifan, Y., Enright, R. D., and Kompan, E. K. (2018). Childhood victimization, recent injustice, anger, and forgiveness in a sample of imprisoned male offenders. *Int. J. Offender Ther. Comp. Criminol.* 63, 18–31.
- Tyler, T. R., Sherman, L., Strang, H., Barnes, G. C., and Woods, D. (2007). Reintegrative shaming, procedural justice, and recidivism: the engagement of offenders' psychological mechanisms in the canberra RISE drinking-and-driving experiment. *Law Soc. Rev.* 41, 553–586. doi: 10.1111/j.1540-5893.2007.00314.x
- Wei, Y. (2007). Analysis of characteristics of empathy for college students. *Chin. J. Sch. Health* 28, 135–137. doi: 10.3969/j.issn.1000-9817.2007.02.033
- Wilkowski, B. M., and Robinson, M. D. (2010). The anatomy of anger: an integrative cognitive model of trait anger and reactive aggression. *J. Personal.* 78, 9–38. doi: 10.1111/j.1467-6494.2009.00607.x
- Wilkowski, B. M., Robinson, M. D., Gordon, R. D., and Troop-Gordon, W. (2007). Tracking the evil eye: trait anger and selective attention within ambiguously hostile scenes. *J. Res. Personal.* 41, 650–666. doi: 10.1016/j.jrp.2006.07.003
- Wilkowski, B. M., Robinson, M. D., and Troop-Gordon, W. (2010). How does cognitive control reduce anger and aggression? The role of conflict monitoring and forgiveness processes. *J. Personal. Soc. Psychol.* 98, 830–840. doi: 10.1037/a0018962
- Wolff, K. T., Baglivio, M. T., and Piquero, A. R. (2017). The relationship between adverse childhood experiences and recidivism in a sample of juvenile offenders in community-based treatment. *Int. J. Offender Ther. Comp. Criminol.* 61, 1210–1242. doi: 10.1177/0306624x15613992
- Zehr, H. (1990). *Changing Lenses: A New Focus for Crime and Justice*. Harrisonburg, VA: Herald Press.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2020 Tao, Ji, Zhu, Fu and Sun. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Cultural Capital as Class Strength and Gendered Educational Choices of Chinese Female Students in the United Kingdom

Siqi Zhang¹ and Xiaoqing Tang^{2*}

¹ Moray House School of Education and Sport, The University of Edinburgh, Edinburgh, United Kingdom, ² School of Philosophy, Zhongnan University of Economics and Law, Wuhan, China

OPEN ACCESS

Edited by:

Hyemin Han,
University of Alabama, United States

Reviewed by:

Chuan Wang,
Southeast University, China
Carol Fuller,
University of Reading,
United Kingdom

*Correspondence:

Xiaoqing Tang
xqtang@outlook.com

Specialty section:

This article was submitted to
Educational Psychology,
a section of the journal
Frontiers in Psychology

Received: 24 September 2020

Accepted: 17 December 2020

Published: 18 January 2021

Citation:

Zhang S and Tang X (2021)
Cultural Capital as Class Strength
and Gendered Educational Choices
of Chinese Female Students
in the United Kingdom.
Front. Psychol. 11:584360.
doi: 10.3389/fpsyg.2020.584360

The present qualitative study analyzes how cultural capital, gender, class, and family involvement impact Chinese female students' aspirations of studying in the United Kingdom. We investigated how these factors facilitate or limit female students' choice of study destination, as well as choices of subject and program. Data were gathered through participant observation and semi-structured interviews in a British university. A total of 25 young Chinese female students from different subject areas took part in the semi-structured interviews. Out of those, five students are undergraduates, 11 are taught master's students, and the other nine students are doctoral candidates. Most of the undergraduates and postgraduates are from middle-class families, while some of the Ph.D. students are from working-class families. The results of the content analysis were examined in light of gender and cultural capital theory. It was found that although there exist differences within the middle-class families regarding the possession of cultural capital, many female students from middle-class families obtained high levels of cultural capital, and these students usually internalized the idea of pursuing a place in the United Kingdom's tertiary education system as a way of enhancing women's competency in future job markets. Furthermore, compared with working-class students, many respondents' choice of subject and program was highly gendered, as their families expect them to live a feminine life by choosing "appropriate" feminine subjects. Therefore, despite having the privilege to study abroad, female middle-class students' educational choices are still constrained by gender and class.

Keywords: gender, class, study aspiration, international higher education, strength

INTRODUCTION

With the rapid rise in popularity of international education, more students are seeking higher education in foreign countries. For most students, studying abroad is largely regarded as a new life experience, which provides opportunities for personal development and the exploration of another country's culture (King and Gelices, 2003). According to 2019 study, Chinese students now make

up the largest and most rapidly growing group of international students in British universities (Studying-in-UK Report, 2019). With the implementation of the one-child policy, enhancing women's standing in the Chinese family is the key to understanding the rise of transnational education among young urban middle-class Chinese women (Kajanus, 2015). Urban Chinese women, particularly those who were born after the 1980s, tend to pursue higher education abroad at an increasing rate (Center for China and Globalisation, 2015). Studying abroad, thus, became a common form of transnational mobility for young affluent middle-class Chinese women between the ages of 18 and 35 (Kajanus, 2015).

Cultural capital refers to high status cultural signals. It is a term coined by Pierre Bourdieu to analyze how culture and education contribute to social status reproduction (Lamont and Lareau, 1988). According to Bourdieu (1986), cultural capital comes in three forms—embodied (e.g., ways of acting, thinking, talking, and perceiving), objectified (e.g., cultural items such as books, instruments, and paintings), and institutionalized (e.g., qualifications and education credentials), which can be accumulated, exchanged, and transmitted. It is different from other two dimensions of capitals, i.e., economic capital, which refers to the assets that are “immediately and directly convertible into money and may be institutionalized in the form of property rights” (Bourdieu, 1986: 242), and social capital, which is seen as a property of the individual derived primarily from one's social position and status, which enables the actor to exert power on group or individuals to position themselves (Bourdieu, 1986). Most of the research in the field of sociology of education and transnational mobility focuses on how middle-class families secure their privileged status and ensure social reproduction for their offspring. For instance, getting higher educational degrees, especially from western countries, is regarded as a kind of institutionalized cultural capital and considered an effective way to enable their offspring to get the most valued and highly sought-after occupations (Waters, 2006, 2009; Sin, 2009; Waters and Brooks, 2010; and Kim, 2011). Current literature indicates that the choices of destination, institution, and subject of study are part of a strategy ultimately aimed at maintaining social status and increasing cultural capital (Sin, 2014; Sheng, 2015; Tindal et al., 2015). For instance, students' subject choices are usually closely aligned to specific career and “employability” objectives, such as business, management, and engineering. In terms of destination countries, the United States is the top host country for Chinese international students, while the United Kingdom normally ranks as the second most popular host country. According to the statistics of UK Council for International Students Affairs (2017), during the 8 years from 2010 to 2017, the number of Chinese students in the United Kingdom grew at an average rate of 9% annually, and China is the top one non-EU sending country of the international students. However, it is still not clear whether Chinese families believe that achieving social mobility or social status reproduction through pursuing international higher education in developed countries is an effective method for their daughters or what the specific educational choices of young middle-class Chinese women rather than Chinese students in general are.

Social class status was found to significantly influence family educational expectations and students' study performance (Byun et al., 2012). On the one hand, parental involvement plays a crucial role in influencing an offspring's educational choices, such as whether to pursue advanced degrees after graduation or not, when to study abroad, and the choice of potential universities (Devine, 2004; Sin, 2014). It is believed that middle-class families' expectations of educational success, which serve as an important means of class reproduction, shape their offspring's aspirations to achieve success in their educational and career goals (Devine, 2004). On the other hand, students from privileged families obtain more educational resources, and they tend to have higher academic achievement (Bourdieu, 1986; Byun et al., 2012; Duan et al., 2018). It should be noted that educational resources particularly cultural capital, for middle-class students, is primarily accumulated within their families. Exposure to activities such as reading, learning to play classical instruments, and going on educational visits provides middle-class children with cultural capital. There exists a positive link between the possession of certain types of cultural capital, such as the British storybooks, and middle-class children's decision to study in the United Kingdom (Sin, 2014). These middle-class students are more likely to succeed because the early accumulation of cultural capital gives them various strengths, such as a sense of independence and self-confidence, aesthetic disposition, and modified behaviors and lifestyles (Sin, 2014; Xu, 2017). All of these are more likely to provide them with an advantage at school and future workplaces. Devine (2004) study found that a multitude of middle-class families employ their family advantages and middle-class privilege to help their offspring achieve high academic goals and to acquire decent occupations. In this way, middle-class children's academic and occupational advantages are reproduced by middle-class families. However, Devine (2004) also suggested that middle-class families do not have possession of all the same kinds of economic capital or cultural capital and were also stratified by degrees of their access to economic, cultural, and social capital.

In terms of gender and transnational educational mobility, the current literature on international students has discussed how gender impacts international students' mobility. For example, Kajanus (2015) research shows that young urban Chinese women have obtained the greatest power to get sufficient educational resource from families in their role as daughters. Most of the students and returnees in the study are from urban cities with only a few participants from rural areas of China. Many young Chinese women pursue gender equality before studying abroad and dare to challenge Chinese gender norms during educational mobility. Bamber (2014) study suggested that although it is quite common to see more Chinese female students participating in the transnational educational flow, gender equality or freedom remains one of the significant aspirations of these students. In order to seek what motivated Asian female students to study abroad, Kim (2010) addresses the function of media in motivating female students' aspirations to participate in the educational migration process. Through interviewing Asian women from Japan, China, and Korea who aspired to study abroad, Kim (2010) argues that these young women's imaginary travel from

western media generates a rising individualization for female students and influences women's attitudes toward femininity. In Sin (2014) research, western media is interpreted as a form of cultural capital for international Asian students. Female individualization operates as "a self-reflexive and social practice" through engagement with Western media in their homeland before they move (Kim, 2010, p. 25).

Most of the current literature positively considers Chinese female students as privileged women (Martin, 2016). Pursuing higher education abroad can help female students to be independent and to be more competitive in future job markets. However, the traditional gender norms of getting married at certain ages and being mothers/wives might continuously exert influence to different extents or shape their perceptions through transnational ties they established with parents and relatives during their studies, which still restrict their future career and life choices (Kajanus, 2015). Female students' choices of subjects are still gendered, and these made their future career choices gendered again (Sheng, 2015). In traditional Confucian thought, women were subordinate to men, which has exerted long-lasting influence in Chinese society, while in the post-reform China, such belief has been changed, gender equality has been promoted, and many Chinese women's participation in paid labor market improved their status markedly (Hughes and Maurer-Fazio, 2002). However, with the fierce competition in the workplace and increasing life expenses in urban China (i.e., the skyrocketing housing prices and children's education), the gender view that "doing well is inferior to marrying well" becomes increasingly popular in Chinese (Zhao et al., 2019).

Currently, research regarding how gender and the possession of different types of cultural capital within middle-class Chinese families can impact their offspring's educational aspirations is still lacking. Therefore, it is important to explore how the interplay of gender, class, and family involvement impacts the aspirations of Chinese female students who come from different social class backgrounds. In order to address the gap existing in current literature, this study proposes the following research question: How do family cultural capital and gender construct Chinese women's educational aspirations (particularly decisions on study destination, subject, and programs) before their travel? We will define the key concepts used in this paper. This paper begins by exploring the relationship between the accumulation of cultural capital in middle-class families and students' aspirations of studying in United Kingdom. After examining how their families transmit cultural capital to them, we will look at how gender, age, and class facilitate or limit female students' decisions when choosing subjects and programs as anticipated and experienced by the participants.

Conceptual Framework

The middle class in China is emerging along with the rapid modernization and urbanization of the country (Xiao, 2001; Lu, 2002). Due to the reform and the opening-up policy, starting in the 1990s, private entrepreneurs as well as self-employed individual businesses experienced rapid growth and became the new middle class. Li C. (2011), Li M. (2011) argues that many Chinese do not fall into easily identifiable

class divisions. Among many resources and standards to identify social stratification, income, occupation, and education are three indicators commonly used for measuring individual socioeconomic status (Li and Zhang, 2008). The middle class in China involves those who occupy white-collar jobs, hold middle and advanced educational degrees, and possess wealth on and above the average level, and they are mainly in urban areas. Generally, according to the two sources of "redistribution and market" for producing middle class in contemporary China, there is a typified distinction of middle-class in China: *inside the system*, which refers to those who are beneficial, occupying jobs as governmental officials, public school and university teachers, and doctors as well as the managerial staff in state-owned enterprises; and *outside the system*, which refers to entrepreneurs and managerial staff in non-state-owned and foreign enterprises or business (Wang, 2004). Comparatively, those *inside the system* are the intellectual and well-educated and hold more official power or resources in political or institutional system, while those *outside the system* are the wealthy and are mostly educated; both of them have the motivation and capability to get access to better education and resources in society. As a matter of fact, even within the middle-class Chinese system, the upper middle-class inside system and lower middle-class system have accumulated different levels of social and cultural capital (Chen, 2013). Besides, industrial service workers, laid-off workers, and rural-urban migrant workers are generally regarded as the Chinese working class. The possession of different levels of cultural capital influences middle-class families' educational aspirations. In this study, middle-class students are from both inside system backgrounds and outside system backgrounds.

Cultural capital functions as status markers, conferring individuals who possesses cultural capital with superior power to legitimate their values, tastes, and cultural practices in a certain site (Bourdieu, 1984). The "students' educational aspiration" in this study is shaped by their parental institutionalized cultural capital, and the objectified cultural capital and embodied cultural capital in their families. All these cultural capitals facilitate students' internationalization of family educational aspirations. Among these three forms of cultural capital, we focus more on the embodied form of cultural capital. Bourdieu (1977, p. 47) conceptualizes embodied cultural capital as "long-lasting dispositions of the mind and body." The long-lasting embodied cultural capital students possessed particularly the gendered disposition of mind that is directly related to the class-based families. Although students may have their own individual aspirations and own agency to go against the family aspiration, this research addresses more on the issue of how their internalized habitus, especially family expectation influences their education choices; thus, we tend to address the data from the students' own belief and thoughts, which are regarded as the reflection of their embodied class-based family cultural capital.

Gender in this research is understood as complicated social relations and involves social activities, including students' understanding of how gender is related to their educational choices. Whether gender norms such as getting married at a certain age, a desirable woman is a good daughter, virtuous wife, and selfless mother, as well as "doing well is inferior to marrying

well” mentioned before, have exerted influence on Chinese female students is rarely known. To be specific, the gendered practices in this research focus more on how gendered expectation, including the marriage expectation and educational expectation, impacts female students’ educational choices, such as their decisions of choosing subjects, programs, and study destination.

MATERIALS AND METHODS

Participants

In order to address the research questions, a British university was chosen as a site of investigation. From the 2018 Student Body by Level of Study and Gender Report from this university where the researchers conducted this research, female students outnumber the male students in the total number of all the students who are studying in this university. This university attracts high numbers of students from China, so we consider that it might be one of the proper cases to show Chinese female students’ educational choices.

Purposive sampling was employed to conduct a semi-structure interview because this research has a special target. This research relates to international student migrants (King, 2002); it requires international students to have already resided in the host country for not less than 1 year. So visiting students, exchange students, or scholars were not included in this project. However, the 1-year taught master’s students were still involved in this research because their program is equal to 1 year, and according to their visa, they can reside in the host country for 16 months. It was ensured that the participants were women from Mainland China in the 18–35 age group. There are 25 interviewees who came from different backgrounds, including diverse study subjects, birthplaces, ages, educational levels, and social classes. Among the semi-structured interview respondents, five students are undergraduates, 11 students are taught master’s, and the other nine are Ph.D. students. Twenty-one students are from middle-class families, while four Ph.D. students are from working-class families. All the respondents are from a broad array of disciplines ranging from engineering and sciences to humanities and social sciences. **Table 1** presents participants’ names (pseudonyms) in semi-structured interviews and main characteristics, such as subjects and programs. **Table 2** presents the information on the informal interview from participant observation with participants’ names (pseudonyms). The respondents were recruited with an advertisement posted in WeChat groups, student accommodations, and students whom the researchers interacted with daily.

Data Collection

The mixed qualitative methods of participant observation and semi-structured interviews were conducted, which allowed for the exploration of individual and personal attitudes and beliefs, to generate an in-depth account of the gendered and classed aspirations of Chinese female students in this research. Observations took place throughout the whole research process. The formal duration of the fieldwork was from November 2015 to November 2016. Interviews took place in their preferred

TABLE 1 | Profile of semi-structured interview cases.

Pseudonym	Subjects	Programs	Class
Jianeng	Science and engineering	Ph.D.	Working class
Mingjing	Arts, humanities, and social sciences	Undergraduate	Middle class
Yami	Science and engineering	Ph.D.	Working class
Xiaolin	Arts, humanities, and social sciences	Master	Middle class
Luyi	Science and engineering	Ph.D.	Working class
Lucy	Arts, humanities, and social sciences	Master	Middle class
Jennifer	Arts, humanities, and social sciences	Undergraduates	Middle class
Mianjia	Science and engineering	Ph.D.	Middle class
Coco	Arts, humanities, and social sciences	Master	Middle class
Lilan	Arts, humanities, and social sciences	Undergraduates	Middle class
Wenyu	Arts, humanities, and social sciences	Master	Middle class
Feifei	Arts, humanities, and social sciences	Undergraduates	Middle class
Licui	Arts, humanities, and social sciences	Master	Middle class
Wangqi	Arts, humanities, and social sciences	Undergraduates	Middle class
Lingpin	Science and engineering	Master	Middle class
Liyu	Arts, humanities, and social sciences	Master	Middle class
Tianrun	Arts, humanities, and social sciences	Ph.D.	Middle class
Lulin	Arts, humanities, and social sciences	Master	Middle class
Louise	Arts, humanities, and social sciences	Ph.D.	Middle class
Yilian	Arts, humanities, and social sciences	Ph.D.	Middle class
Mingyu	Science and engineering	Master	Middle class
Lidan	Science and engineering	Ph.D.	Middle class
Monica	Science and engineering	Master	Middle class
Jiahui	Arts, humanities, and social sciences	Master	Middle class
Pingping	Science and engineering	Ph.D.	Working class

places such as their study campus, their accommodations, a meeting room in the library, in their departments, and a café near the campus. Sometimes, interviews and participant observations overlapped due to the fact that the mutual conversation, in and of itself, provides an important amount of data for both the methods. To identify the participants’ family social class backgrounds, firstly, information about three commonly used objective indicators was collected during the interviews, i.e., their parents’ occupations, educational levels, and annual family income. Meanwhile, in the participant observation, the researchers observed participants’ family background through their daily interaction, such as their lifestyles, clothes, and consumption ability as well as past experiences of education, travels, and other culture and leisure activities; then their

TABLE 2 | Profile of informal interview cases from participant observation.

Pseudonym	Subjects	Programs	Class
Mimo	Science and engineering	Master	Working class
Ying	Arts, humanities, and social sciences	Ph.D.	Middle class
Lingxiao	Science and engineering	Ph.D.	Working class
Linchang	Arts, humanities, and social sciences	Ph.D.	Working class
Yili	Arts, humanities, and social sciences	Master	Middle class
Sue	Arts, humanities, and social sciences	Master	Middle class
Fenfen	Arts, humanities, and social sciences	Master	Middle class
Wupin	Arts, humanities, and social sciences	Master	Middle class
Jade	Science and engineering	Master	Middle class

observations were confirmed by the social class information of the participants. The data presented in this research are from both a formal interview and participant observation. A formal interview in this research is defined as a mutual 1-h conversation between one respondent and one researcher only, with formal consent from the respondents, held a quiet place. Other kinds of conversations, those less than 30 min and are referred to as informal interviews in participant observation during daily interaction with participants, were also included in this study. Participants were informed in advance that they could speak either English or Mandarin Chinese in their daily conversations or formal interviews. Open-ended questions were used during interviews, which allowed flexibility to explore in-depth responses (Knox and Burkard, 2009). Respondents were informed that the whole interview would be recorded for the use of transcription. Participants were also informed that they were free to stop the conversation at any point if they felt uncomfortable in both semi-structured interviews and participant observation. It was guaranteed that all the respondents understood the aim of this research and agreed to be participants. In semi-structured interviews, all participants signed the consent form. In participant observation, on some occasions, especially in the big public activities organized by the student leaders, the researchers informed the student leaders. When it comes to a private occasion such as a private party of limited people, researchers gave the research information to participants.

In qualitative research, researchers also have certain assumptions, beliefs, and values. Gender and class influence researchers' position (McCorkel and Myers, 2003). Researchers' positionality plays a vital role in how they conduct fieldwork, how they select useful data, and what they obtained from the research field (Chiseri-Strater, 1996). The researchers' positionality in this research is considered an insider, as the researchers, when this research was conducted, were also middle-class Chinese female international students. By sharing a similar experience of studying abroad with informants, the cultural background enabled researchers to establish rapport with respondents. The disadvantage of being an insider is that it is easy for researchers to blur the boundaries of being respondents' friends and being researchers. Thus, the researchers kept a balance of the role as both an insider and a female student migrant, avoided blurring the roles, and minimized personal bias as much as possible.

Data Analysis

All the interviewees preferred to use Mandarin Chinese, with the occasional insertion of an English phrase to capture an exact meaning. In order to ensure the coherence of the conversation and sort out the useful data, all the data taken during researchers' fieldwork were in Chinese. The translations were done by the first author in accord with her understanding of respondents' narrations. At the very beginning of the translation and transcription process, researchers attempted to transcribe and translate all data in the formal or informal interviews at the same time. However, due to the time limit, researchers transcribed all the data in Chinese. Looking at the Chinese transcripts, different themes and codes were identified according to respondents' narration. Thematic analysis was used as an analytical tool, which captures certain themes that emerged from the data (Flick, 2015). The three defined themes are as follows: female students' study destination, class and gender constraint for their educational mobility, and family involvement.

The data from informal/formal interviews and participant observation were analyzed by using color coding. In this way, it is very easy for the researchers to identify which part of the interview texts or particular responses belong to which themes (Stottok et al., 2011). Codes, in this research, are keywords or short sentences related to each certain theme. Certain codes were chosen and were categorized under the three themes mentioned above in response to the research questions that we proposed. Different codes under the three themes were marked with three different colors. For example, according to the certain themes, the codes in the theme of "family involvement" are as follows: considering the length of study, choosing feminine jobs, and understanding of marriage and career/job. The color for these codes that appeared in the participants' responses are all marked in red. Then, having on hand the classified color codes, researchers selectively translated the useful data into English in the places needed for analysis.

RESULTS

Cultural Capital and Female Students' Study Destination Country

Middle-class families are more likely to focus on their offspring's educational achievements by transmitting high levels of cultural capital inside the family before students move abroad. The objectified cultural capital that Chinese female students' possessed motivates their aspiration of pursuing higher educational degrees in the United Kingdom. In terms of the destination country for doing a degree, most of the respondents' decisions largely relied on Britain's long-lasting cultural impact on the media. As participant Wenyu claimed:

From primary school to university, I kept reading different English novels as there are a lot books in my home. I also watched many English films. My father obtained his Master degree in the United Kingdom . . . he always shared his experience. When I was young, I decided I wanted to study there.

According to her narrations above, watching films, videos, and reading novels related to United Kingdom's culture can be seen as a vital accumulation of objectified cultural capital before her move, which also facilitated a strong desire to participate in the United Kingdom's cultural events. Meanwhile, the parents' institutionalized cultural capital (i.e., academic credentials or professional qualifications) has an influence on these students' aspirations of studying in the United Kingdom. The common denominator among this group of participants who possess high levels of cultural capital is that they share similar family backgrounds; most of their parents are part of the middle-class inside system, such as university (professors), school (teachers), and government officers (public server); or they study similar subjects in the humanities and arts.

For some of the students who come from the middle-class outside system families, these students do not obtain much cultural capital, but the high level of economic capital they possessed can actually convert to embodied cultural capital as well (such as changing lifestyle) or enable them to consume material goods. For example, Fenfen was born into a middle-class family outside the system, and her parents are business people in China. It seems that when she was learning English, she read few British novels, but her reason for reading was just to learn a language:

Apart from studying, the reason I am coming here is that ... I suppose that the United Kingdom is a shopping paradise with many international brands and sales in winter and summer holidays ... after coming here, I think one of the big changes I have is that I quite often go to gyms because my western friends always go to gym.

As can be seen, Fenfen was born into a family with a great deal of economic capital, so her desire for material consumption is quite strong, while those whose parents are inside the system (university professors, teachers, governmental officials, and public servants) preferred cultural consumption before and during their stay in the United Kingdom. Middle-class families might possess different forms of cultural capital: some possess more economic capital, while others possess more cultural capital. The economic capital that Fenfen possessed made it easier for her to consume material goods in the United Kingdom. Also, her transnational life in the United Kingdom changed her lifestyle and behavior: going to the gym can be seen as embodied cultural capital.

After arriving in the United Kingdom, most students from families of the middle-class inside system and some students from families of the middle-class outside system accumulated more embodied cultural capital through participating in cultural activities and consuming cultural goods, which is considered by them as a means to enhance their competitiveness in job and marriage market and further secure their middle-class social status. From respondents' perspectives, especially for those who had accumulated high levels of cultural capital before going abroad, their study destination enables them to participate in various cultural events, which facilitates further accumulation of cultural capital abroad.

Participant Mingjing, an undergraduate humanities student, was reluctant to go to countries like Australia, Canada, or

New Zealand because she believed that these are countries with a very short history as compared with the United Kingdom, which is a place where she can fulfill her need of "absorbing a fruitful culture." According to her description:

The meaning of studying abroad is not only to get a degree, but also absorbing a fruitful culture in its country such as going to its local museums, etc. I will be more competitive if I have more knowledge about the United Kingdom and the world when finding my preferred jobs, which need more cultural knowledge.

Like Mingjing, many female students often go to local museums, art galleries, and theaters in their spare time. A testimonial from participant Yili, a student whose parents are business people working in a foreign-owned enterprise, supports this:

I often go to Blackwell's bookshop to buy books and attend local book launches. I think going to local museums, art galleries, theaters and book launches gives women natural elegance and confidence. I suppose this make me more attractive to potential proper partner who are also from middle-class families.

Attending new local book launches is also a kind of cultural event. Compared with the case of participant Fenfen, this indicates that not all students from families of business people are reluctant to participate in cultural activities. The similarity of Mingjing and Yili's cases is that they both attach great importance to the embodied cultural capital and regard it as important strength to enhance their competitiveness in future job and marriage markets, which further facilitates middle-class status reproduction.

Apart from that, few female students are from working-class families. Aspirations and experiences of these students are different from those of their middle-class counterparts, and they generally possess less cultural capital. For instance, participant Lingxiao revealed that:

I did not go to cultural activities before I came to United Kingdom. When I came here, I don't do this either because I think this might not be directly useful to find a decent job. But a good degree with high scores will be. So I work very hard ... I think high scores and a degree with distinction will help me to find a good job.

For working-class students, getting international institutionalized cultural capital, particularly good degrees and high scores, seems to be more significant for them in order to achieve upward social mobility. The cases above clearly show that a respondent's focus and choice of a certain destination country are largely influenced by the capital (either economic capital or cultural capital) owned by the family. Also, there exists a level of complexity within different class-based families. Even for middle-class families, the capital that students obtained is quite diverse.

Class and Gender Constraint for Educational Mobility

Chinese female students' choices related to studying abroad are still complex and constrained by their age, gender, and class, especially when they are considering what kinds of programs

to study and when to study abroad. Most respondents revealed that their families required them to pursue a degree abroad at an appropriate age (especially not over the age of 27) if they are still single. Being single over the age of 27 designates a woman as a “leftover woman” in China’s dominant cultural norms (Nakano, 2014). This means that once a respondent’s age is over the so-called age limit, they have to make greater efforts to persuade their family to support them. In terms of social class background, respondents, particularly from lower-class or lower-middle-class families, sometimes even had to make huge sacrifices to realize their dreams of seeking an overseas education.

For example, participant Licui, a single female master’s degree student revealed:

My parents hesitated to support me to study abroad when I was 29. Considering a taught master’s in Britain only cost 1 year, they finally let me (study abroad). They were against my decision to do Ph.D. as it is hard to find an appropriate partner in China afterward.

Apart from her age, being born into a lower middle-class family made it more difficult for her to afford the large expense of the overseas tuition fee for a 4-year Ph.D. program:

I got my Ph.D. offer but I did not apply for a scholarship successfully. If I stick to my choice, my family said that they would have to sell their house in the city in order to get sufficient money for the 4 years of study.

From Licui’s narration, the lack of sufficient economic capital to support overseas higher-education pursuits is a prominent issue. Age is another important issue in influencing her decision to study abroad. The central logic of this phenomenon is that single women face earlier marriage deadlines. Participant Xiaolin, a student from an affluent middle-class family also indicated that:

Most of female students study abroad from 22 to 25. My family told me their support was conditional: I should go for it before 25, otherwise, I will lose their support.

Doing a 1-year taught master’s degree in Britain indeed saves these respondents’ time. Like them, most of our respondents who are around 27 years old expressed conflicting feelings over their studies since getting an advanced degree could enhance their job competency, but they still have to worry (if they spent a year or two in transnational study) about being less competitive in the Chinese marriage market.

However, interestingly, a few respondents from working-class families revealed that Chinese marriage gender norms are not always disadvantageous for them when making decisions about pursuing higher education abroad. With the privatization of the housing market in China, a new trend emerged. It is expected by the bride (or her family) that the groom should own a flat in preparation for their marriage (To, 2013). This is a relatively new gender norm, which increases men’s burden but relieves pressure on women to prepare flats for marriage. Mimo, a 22-year-old master’s student, recounted:

My family is not rich. ...I think they support me studying because they do not have the pressure to buy a flat in preparation of a marriage after my return, so they can invest all their money in my 1-year master’s education.

Mimo’s parents are industrial workers in the southern part of China. Their parents had spent their entire life savings to support her 1-year study in the United Kingdom. Mimo’s example shows that, for the families with limited economic capital, the relatively new gender norm, which requires Chinese men to buy a flat before marriage, does not always have a negative effect on families’ decisions to support their daughters in studying abroad, especially when they are young.

Although respondents’ exact choices of programs and study duration are constrained by gender, age, and class, some respondents still regard overseas education in the United Kingdom as a positive and useful means to fight against gender discrimination in China’s labor market. For example, Jade, a 30-year-old student, holds the belief that studying abroad will increase her competitiveness in the job market. Before she studied abroad, she was a doctor working in a state hospital with a limited salary, but she aspired to transfer to a private hospital, which might offer her a better salary. According to her accounts, private hospitals require female employees to have English fluency and an overseas background, so she decided to pursue an overseas qualification to enhance her competitiveness in order to transfer to a more lucrative job.

Moreover, as for Ph.D. students, their awareness of needing to be more outstanding than their male peers is also related to the gender discrimination in China’s job market. Tianrun, a Ph.D. student in the arts, also pointed out that:

My mother told me that because I am a woman I should be more outstanding. That is why I was determined to pursue a Ph.D. degree. But I still need to be hard-working. A female Ph.D. job-hunter must be far more outstanding than her male counterpart.

These respondents’ stories show that women should be more distinguished than male counterparts in order to get more opportunities, either in finding a good job or for future progress. It is expected that an overseas education in the United Kingdom will greatly enhance their job competitiveness in China’s labor market.

Family Involvement and Gendered Choice of Subjects

Subject choices for overseas study were also found to be related to gender and social class. Middle-class respondents normally attach more significance to either the success of their marriage or to striking a balance between their future career and marriage. However, working-class female respondents and/or their families do not concern themselves too much with gender-related issues when choosing subjects for overseas study because studying practical subjects that enhance competitiveness in the job market and enables their possible upward mobility, is their primary concern.

Chinese female students from middle-class families are more likely to be found in subjects such as arts, business, humanities, and social sciences. Informants from middle-class families choosing subjects of hard sciences were less numerous. For example, participant Louise, a Ph.D. student in humanities, did well in chemistry when she was young and showed an interest in chemical engineering. As she revealed:

My father is a higher-degree holder and my family, especially my father, wanted me to study subjects suitable for girls, it is definitely not a good idea to learn subjects like engineering ... They would like me to choose a subject which is easy to learn.

Louise's example is a typical example, as other respondents in this study convey similar sentiments. As is shown by her excerpts, although Louise can pursue a master's degree or even a Ph.D. degree abroad, the available choice of subjects is still gendered. This means that, even if she is a high-degree holder, she was still cultivated to be an elite only in a field that is considered feminine and socially acceptable. Thus, her family encouraged her to study a stereotypically feminine subject, as they hoped that she would be able to get an easy job as well as avoid the fierce competition of the male-dominated hard science subjects. It was interesting to find that even if Louise's family members were high-degree holders, they still held strong gender-biased attitudes toward different subjects.

Louise's story also showed that her father believes that he possessed a high level of cultural capital, so he himself feels that he is superior and more knowledgeable than other family members. Then during the decision-making process, he helps his daughter choose a subject that might direct her to a prospective "appropriate" feminine job. However, at the time when Louise was interviewed, she expressed her regret over not pursuing a science subject.

It is obvious that some respondents from middle-class families still regarded following a traditional feminine path, especially marriage, as equally important as their academic achievements. For instance, participant Lidan, a Ph.D. student, also indicated that:

My intention to be a Ph.D. student is quite simple: to be outstanding. But my family expects me to get an academic job because such jobs have summer/winter vacations...it strikes a balance between my future career and family once I have obtained a Ph.D. degree and gotten married.

Besides, according to some middle-class participants' narrations, their families strongly emphasized that their happiness was related to marriage, which is also a kind of personal achievement. Although these respondents' families supported their daughters' decisions to study abroad, they still hoped their daughters would live a happy and relaxed life by following a traditional feminine path of having a good marriage instead of working too hard. In contrast to many participants, Sue believed that:

As long as I can obtain my degree, my parents did not require me to study extremely hard ... making a good marriage is more important for women. I also wish that I can have a happy marriage, instead of working hard in a famous company.

It seems to her that she has already internalized the typical feminine ideal, which suggests that working hard does not lead to a successful life for women. However, unlike Sue, another participant, Wupin, presents a complicated view:

I wanted to have my personal achievement in my future career. After I was 25, my family suddenly began to address the importance

of marriage. ... Maybe in the future I will try to strike a balance between my career and my marriage.

Wupin's perception of "striking a balance between career and marriage" is more common with most of the respondents.

As can be seen from the different examples, respondents from middle-class families are encouraged by their families to pursue a higher degree such as a master's or a Ph.D.. However, the available choices for them are often highly restricted by gender-stereotyped views as shown from their decisions on which subject areas to study and their future plans.

Hierarchies in Programs, Subjects, and Gendered Choices

There exist hierarchies within the choice of subject among female students from different social classes. To some extent, subject and program itself can serve as a form of symbolic capital to distinguish students' social status. In general, in terms of the three different types of programs (undergraduate, taught masters, and Ph.D.), students' decisions to pursue particular kinds of programs before studying abroad also reflect that family social status has its own set of hierarchies. Such differences can be particularly obvious when comparing undergraduates with Ph.D. students sponsored by scholarships.

For instance, participant Lilan, an undergraduate student whose father is a president of a famous supermarket chain, revealed that:

I did not do well in my studies. My family suggested to me that studying a bachelor's degree abroad might be a more effective solution to escape the fierce college entrance examination. The undergraduate programs here are all self-funded.

While the undergraduate's statement claims that getting accepted into a bachelor's degree abroad is far easier than obtaining a good national offer at home, Ph.D. students generally reveal that getting enrolled in a Ph.D. program, especially with a scholarship in Britain, seems to be much harder than getting a national Ph.D. offer from a Chinese university. It is normally acknowledged by respondents that only very outstanding students can get a Ph.D. offer in Britain together with Britain's local scholarship. Among nine interviewees who are Ph.D. students, four students got Ph.D. offers with scholarship, and three of them were from working-class families. It is more likely that most of the outstanding Ph.D. students come from working-class families in this research. As Jianeng, a second-year physics Ph.D., point outs:

If I did not have a full scholarship, I would never have the chance to do a Ph.D. abroad. I am determined to do a Ph.D. because this will change my destiny. I keep reminding myself to be more excellent than others.

The two opposite examples above show that the choice to do a bachelor's degree or a Ph.D. abroad is a class-based choice.

There may be many factors that motivate Chinese female Ph.D. students from working-class families to study in the United Kingdom, such as their personal interest in their studies. But some of the Ph.D. students in this research, like Jianeng,

strongly desire to achieve upward social mobility through the possession of a Ph.D. degree from abroad. However, it should be noted that not all the outstanding Ph.D. students are from working-class families; there also exist some very hardworking and outstanding Ph.D. students from affluent middle-class families in this study. A majority of affluent Ph.D. students are self-funded and pursuing programs in the arts, social sciences, and humanities. When sharing the reasons why these Ph.D. students are willing to pursue self-funded degree, participant Ying revealed:

My family believes that social sciences and humanities are good subject choices for me. It is hard to apply for funding successfully in United Kingdom universities, but pursuing a Ph.D. degree will be definitely advantageous for me in finding a decent job, such as working in a university.

Meanwhile, with regard to the choice of subjects, choosing feminine subjects, especially finance and management, are regarded as the privilege of wealthy middle-class families. It seems to some participants that a large number of students in these feminine subjects are from affluent family backgrounds. As Mianjia, a middle-class engineering Ph.D. student revealed:

My classmates were from very good family backgrounds. . .but only two female students chose to learn engineering. There are only two reasons: either because their family members' occupations are in the field of science or their family backgrounds is not well off.

Indeed, we noticed that although there are still respondents from middle-class families who choose subjects such as biology, chemistry, physics, and engineering, most of these respondents' family members are also working in related science fields. In Mianjia's case, one thing is clear: regardless of whether she is interested in science or not, her consideration is that studying a subject in the field where her family member is already established as a "safe" choice for her. Therefore, she can take advantage of the social capital (i.e., potential social network) provided by her family in finding a job after graduation. There are few other cases like Mianjia's case; we find that all of these students' family members are working in the engineering field regardless of middle-class inside system background or middle-class outside system background, while working-class respondents like Jianeng did not make gender-stereotypical choices because their primary concern is to gain upward social mobility through studying a practical subject in a tertiary education system in Britain.

DISCUSSION

This study has introduced a complicated interplay of cultural capital, gender, class, and family involvement, which all play a role in influencing Chinese women's aspirations to study in the United Kingdom. It reveals that cultural capital in middle-class families facilitates students' aspirations to study abroad and that middle-class reproduction makes the idea of pursuing a place in the United Kingdom's tertiary education system more likely to be internalized. Most respondents' aspirations

for an overseas educational experience are also cultivated from their middle-class family habitus. According to Bourdieu (1977), habitus, which reflects a set of behaviors and values, acts as embodied perception and actions based on an individual's social position in a society. Middle-class habitus is shown from the parents' educational levels, the respondents' media consumption, and in how the cultural capital accumulated in a family instigates the respondents' desire to study in Britain. Female students are motivated to pursue transnational educational mobility because they are inspired by the imaginary transnational world presented by western media (Kim, 2010). It is clear that there exists a degree of complexity even within middle-class families, for those who come from both the middle-class inside system and middle-class outside system. This finding is supported by Bourdieu's theory that the composition and numbers of the exact cultural capital in the middle class differ: for some businessmen who are from the middle-class outside system, they might have higher levels of economic capital but lack sufficient cultural capital to transmit it to their offspring (Bourdieu, 1986).

In terms of gender dimension, it is true that a driving force for female transnational mobility is their desire to get a higher qualification, which would make them distinct in comparison with male graduates in the labor market (Waters, 2009; Holloway et al., 2012). Many employers are unwilling to take the "risk" of hiring women in their twenties who, it is assumed, will soon marry and bear children, requiring them to care for a family instead of devoting all their time to a job (Holloway et al., 2012). In Kim (2011) study, Korean international students in the United States indicated that the main motivation for female Korean students to study abroad is that they aspire to be outstanding by obtaining a United States higher degree and hate Korea's patriarchal system, which leads to a phenomenon where female faculty members are always fewer and academic events were structured around males. Our findings are also in line with Bamber (2014) research, which determined that gender discrimination motivates young women's desire to be more outstanding by obtaining overseas qualification in order to be more competitive and secure in the fierce competition of today's job market.

Furthermore, it is notable that female students' actual educational choices when pursuing transnational studies (such as the study destination, programs, and subjects) are still constrained by Chinese gender norms and family class background. International Chinese female students' motivations for studying abroad also show that Chinese female students in the United Kingdom expressed great concerns about the length of time required to complete their studies (Bamber, 2014). It is likely that the aspiration of middle-class families is particularly gendered, so they tend to advise their daughters to choose "appropriate" subjects (i.e., humanities and arts) to construct their gender identities (Sheng, 2015; Tu, 2016). As McCall (1992) argues, in the socialization process, an individual internalizes appropriate gender behavior and values. According to Bourdieu (1998) views, it is just such gendered habitus of middle-class families that make parents' judgments valid and weigh heavily when influencing their offspring's

decision making. The dominant conventional femininity, which emphasizes making appropriately feminine career and life choices, plays a crucial role in shaping respondents' views regarding programs of study and even the future divisions of labor. Thus, our research expands the literature made by some feminists who link gender with class (Skeggs, 1997; Adkins and Skeggs, 2005).

Middle-class students' possession of a variety of privileged educational resources and their participation in international higher education in the United Kingdom further help them to accumulate cultural capital, which in return reproduces middle-class social status. This will not be the same in working-class families, as they do not have much cultural and economic capital. Therefore, working-class families need to pay attention to the unequal education resources obtained in families, which might lead to further unequal social class reproduction. Schools and universities could promote education equality by expanding the number of prospective students who come from working-class families and by allowing more opportunities for working-class students' self-development and encouraging them to participate in cultural events.

Middle-class Chinese young women have accumulated cultural capital in their families, which show various strength and potentials. Studying abroad in the United Kingdom helps them accumulate cultural capital, and students believe that this enhances their competitiveness in both job and marriage markets. It should be noted that in the process of choosing study subjects, considering the background of social class, student's personal interests, and ages, young female students could identify their own strengths and weaknesses. At the same time, it will be helpful for their parents to maintain an open mind, respecting their offspring's choices and personal interests. Some families tend to follow the trend of choosing popular subjects and hold strong gender-stereotyped ideas related to their daughters' studies. These families may put more pressure on their offspring if they are not interested in following the socially/familial accepted study choices. More mutual communication, discussion, and support are needed to ensure that parents and their offspring fully understand each other and make the most suitable study choices.

Among all the female students, there are some young working-class women who ambitiously attempt to change their destiny and enhance their job competitiveness through seeking higher education abroad. They are more likely to choose practical and realistic subjects and pay less attention to their ages or not hold gender-stereotyped views. Taking the practical approach of studying a science subject might offer working-class students more opportunities in the labor market (Sheng, 2015). For these groups of students, in order to achieve upward mobility, pursuing higher education abroad is a great opportunity for them to acquire the cultural capital that comes from getting higher educational degrees from western countries and learning knowledge or skills, which will be useful in job markets.

Limitations and Future Directions

The present study has some limitations. Firstly, participants in this research are only from one British university, and

the number of participants is limited, so the application of these findings to other Chinese students who study in other United Kingdom universities is inadvisable. In the future, students from different institutions in other places of Britain (England, Wales, or Northern Ireland) might add more value to the current study. Besides, although our research presents the complexity of the students among different groups (such as ages, programs, or subjects), most of them are middle-class students. The study aspirations of working-class students who study abroad should also receive attention. Compared with middle-class female students' educational choices of studying abroad, the working-class female students tend to choose practical subjects. Moreover, female middle-class students' intentions of social class reproduction and working-class women might also achieve upward mobility from a transnational study experience. It is not very clear whether there will be complexity within the group of working-class students, and it is still important to include more working-class students and have more comparisons of the educational choices between working-class and middle-class students. Therefore, another limitation that needs to be solved is that in this study, we identify participants' social class based on the limited information (such as their family income, parents' educational attainment, and occupations) reported by each participant and observations. In future studies, quantitative research with accurate socioeconomic status measures (both objective and subjective indicators), strict sampling procedure, and appropriate sampling size should be conducted to strengthen the representation of the participants and deepen our understanding of Chinese female international students.

Finally, the inclusion of participants' family members, such as parents, could be informative in casting another perspective on the topic of how they influence students' transnational study choices from their perspectives. This research has attached great importance to how respondents' families influence them to accumulate cultural capital before they study abroad. However, all of the data related to respondents' family and parents are from students' own narrations instead of from their parents' direct narration. Further research might also include the responses from international students' parents as another research sample group for the purpose of reflecting on their transnational educational aspirations.

In summary, this research shows that young Chinese female students' study choices in the United Kingdom are influenced by social class and cultural capital and still constrained by gender, class, and family involvement. It has uncovered fascinating insights and hopefully lays the groundwork for more detailed studies in the field of gender, sociology of education, and student transnational mobility. Influenced by a number of factors (such as ages and Chinese gender norms), female middle-class students' choice of subject tends to remain along the lines of socially appropriate subjects. It has been revealed that educational mobility should be understood as a complex trajectory rather than being a symbol of simple positive transition in female students' lives. Studying these "appropriate subjects" might potentially give these young women the push needed to

get into restricted fields and eventually enter into the limited future job market.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Edinburgh. The patients/participants provided their written informed consent to participate in this study.

REFERENCES

- Adkins, L., and Skeggs, B. (2005). *Feminism After Bourdieu*. Oxford: Blackwell / Sociological Review.
- Bamber, M. (2014). What motivates Chinese women to study in the UK and how do they perceive their experience? *Higher Educ.* 68, 47–68. doi: 10.1007/s10734-013-9679-8
- Bourdieu, P. (1977). *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.
- Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgement of Taste*. Cambridge: Harvard University Press.
- Bourdieu, P. (1986). “The forms of capital,” in *Handbook of Theory and Research for the Sociology of Education*, ed. J. G. Richardson (Santa Barbara, CA: Greenwood), 241–258.
- Bourdieu, P. (1998). *Practical Reason: On the Theory of Action*. Cambridge: Polity Press.
- Byun, S.-Y., Schofer, E., and Kim, K.-K. (2012). Revisiting the role of cultural capital in east asian educational systems: the case of South Korea. *Sociol. Educ.* 85, 219–239. doi: 10.1177/0038040712447180
- Center for China and Globalisation (2015). *CCG Report of Chinese Overseas Students in Britain*. Beijing: Center for China and Globalisation.
- Chen, J. (2013). *A Middle Class Without Democracy: Economic Growth and the Prospects for Democratization in China*. New York, NY: Oxford University Press.
- Chiseri-Strater, E. (1996). “Turning in upon ourselves: positionality, subjectivity and reflexivity in case study and ethnographic research,” in *Ethics and Representation in Qualitative Studies of Literacy*, eds P. Mortensen and G. Kirsch (Urbana: National Council of Teachers of English), 115–133.
- Devine, F. (2004). *Class Practices How Parents Help Their Children Get Good Jobs*. Cambridge: Cambridge University Press.
- Duan, W., Guan, Y., and Bu, H. (2018). The effect of parental involvement and socioeconomic status on junior school students’ academic achievement and school behavior in china. *(Brief article)*. *Front. Psychol.* 9:952. doi: 10.3389/fpsyg.2018.00952
- Flick, U. (2015). *Introducing Research Methodology: A Beginner’s Guide to Doing a Research Project*, 2nd Edn. London: SAGE.
- Holloway, S. L., O’Hara, S. L., and Pimlott-Wilson, H. (2012). Educational mobility and the gendered geography of cultural capital: the case of international student flows between Central Asia and the UK. *Environ. Plann. A Econ. Space* 44, 2278–2294. doi: 10.1068/a44655
- Hughes, J., and Maurer-Fazio, M. (2002). Effects of marriage, education and occupation on the female / male wage gap in China. *Pacific Econ. Rev.* 7, 137–156. doi: 10.1111/1468-0106.00156
- Kajanus, A. (2015). *Chinese Student Migration, Gender and Family*. Houndmills: Palgrave Macmillan.
- Kim, J. (2011). Aspiration for global cultural capital in the stratified realm of global higher education: why do Korean students go to US graduate schools? *Br. J. Sociol. Educ.* 32, 109–126. doi: 10.1080/01425692.2011.527725

AUTHOR CONTRIBUTIONS

SZ designed, conducted, and coordinated the realization of the study, and drafted the manuscript. XT revised the manuscript and made insightful comments with this article. Both authors contributed to the development of the article, manuscript revision, read, and approved the submitted version.

ACKNOWLEDGMENTS

We are deeply indebted to Ross Bond, Sophia Woodman, Cora Lingling Xu, and Mary Holmes for their guidance and inspiration for this research. We are grateful to all participants who enthusiastically took part in the study.

- Kim, Y. (2010). Female individualization?: transnational mobility and media consumption of Asian women. *Media Cult. Soc.* 32, 25–43. doi: 10.1177/0163443709350096
- King, R. (2002). Towards a new map of European migration. *Int. J. Popul. Geogr.* 8, 89–106. doi: 10.1002/ijpg.246
- King, R., and Gelices, E. (2003). International student migration and the European ‘Year Abroad’: effects on European identity and subsequent migration behaviour. *Int. J. Popul. Geogr.* 9, 229–252. doi: 10.1002/ijpg.280
- Knox, S., and Burkard, A. W. (2009). Qualitative research interviews. *Psychother. Res.* 19, 566–575. doi: 10.1080/10503300802702105
- Lamont, M., and Lareau, A. (1988). Cultural capital - allusions, gaps and glissandos in recent theoretical developments. *Sociol. Theory* 6, 153–168. doi: 10.2307/202113
- Li, C. (2011). Exploring revolution or remaining the status: the measurement of middle class’ social and political attitudes. *Society* 2, 125–152.
- Li, M. (2011). The rise of the working class and the future of the Chinese revolution. (Chinese Revolution of 1949) (Essay). *Mon. Rev.* 63:38. doi: 10.14452/MR-063-02-2011-06_3
- Li, P., and Zhang, Y. (2008). China’s middle class, belonging and social attitudes, society. 2, 1–19.
- Lu, X. (2002). Research report on contemporary china’s social classes. *Jiangsu Soc. Sci.* 4, 21–30.
- Martin, F. (2016). *Overseas Study as ‘Escape Route’ for Young Chinese Women*. China Policy Institute blog. Nottingham: University of Nottingham.
- McCall, L. (1992). Does gender fit? Bourdieu, feminism, and conceptions of social order. *Theory Soc.* 21, 837–867. doi: 10.1007/BF00992814
- McCorkel, J. A., and Myers, K. (2003). What difference does difference make? position and privilege in the Field. *Q. Sociol.* 26, 199–231. doi: 10.1023/A:1022967012774
- Nakano, L. Y. (2014). “Single women and cosmopolitan re-imaginings of gendered citizenship in shanghai, hong kong, and tokyo,” in *Transnational Trajectories in East Asia: Nation, Citizenship, and Region*, ed. Y. Soysal (London: Routledge), 157–178.
- Sheng, X. (2015). Gender and habitus: parental involvement in students’ subject choices in China. *J. Gen. Stud.* 24, 227–238. doi: 10.1080/09589236.2013.856752
- Sin, I. L. (2009). The aspiration for social distinction: Malaysian students in a British university. *Stud. Higher Educ.* 34, 285–299. doi: 10.1080/03075070802597093
- Sin, I. L. (2014). *Cultural Capital and Distinction: Malaysian Students and Recent Graduates of UK International Tertiary Education*. Edinburgh: The University of Edinburgh.
- Skeggs, B. (1997). *Formations of Class and Gender Becoming Respectable*. London: SAGE.
- Stottok, B., Bergaus, M. N., and Gorra, A. (2011). Colour Coding: an Alternative to Analyse Empirical Data via Grounded Theory.

- Studying-in-UK Report (2019). *International Student Statistics in UK 2020*. Available online at: <https://www.studying-in-uk.org/international-student-statistics-in-uk/> (accessed December 12, 2019).
- Tindal, S., Packwood, H., Findlay, A., Leahy, S., and McCollum, D. (2015). In what sense 'distinctive'? The search for distinction amongst cross-border student migrants in the UK. *Geoforum* 64, 90–99. doi: 10.1016/j.geoforum.2015.06.001
- To, S. (2013). Understanding Sheng Nu ("leftover women"): the phenomenon of late marriage among chinese professional women. *Symb. Interact.* 36, 1–20. doi: 10.1002/symb.46
- Tu, M. (2016). *For Chinese Women, Foreign Study Doesn't Bring Gender Equality*. Available online at: <http://www.sixthtone.com/news/1001634/for-chinese-women%2C-foreign-study-doesnt-bring-gender-equality> (accessed January 30, 2018).
- Uk Council for International Students Affairs (2017). *International Student Statistics*. London: UK higher education.
- Wang. (2004). Middle-class: definition and boundaries. *Acad. Forum* 1, 146–150.
- Waters, J., and Brooks, R. (2010). Accidental achievers? International higher education, class reproduction and privilege in the experiences of UK students overseas. *Br. J. Sociol. Educ.* 31, 217–228. doi: 10.1080/01425690903539164
- Waters, J. L. (2006). Geographies of cultural capital: education, international migration and family strategies between Hong Kong and Canada. *Trans. Inst. Br. Geogr.* 31, 179–192. doi: 10.1111/j.1475-5661.2006.00202.x
- Waters, J. L. (2009). In pursuit of scarcity: transnational students, 'Employability', and the MBA. *Environ. Plann. A* 41, 1865–1883. doi: 10.1068/a40319
- Xiao, W. (2001). The current situation and future development of China's Middle Stratum. *Sociol. Res.* 3, 93–98.
- Xu, C. L. (2017). Mainland Chinese students at an elite Hong Kong university: habitus-field disjuncture in a transborder context. *Br. J. Sociol. Educ.* 38, 610–624. doi: 10.1080/01425692.2016.1158642
- Zhao, W., Liu, S., and Shi, Y. (2019). Is a good marriage better than a good job? A study on the change in housing price and the marriage notion. *J. Financial Res.* 471, 94–111.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Zhang and Tang. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Positive Psychology Micro-Coaching Intervention: Effects on Psychological Capital and Goal-Related Self-Efficacy

Alina Corbu*, María Josefina Peláez Zuberbühler and Marisa Salanova

WANT Research Team, Department of Social Psychology, Universitat Jaume I, Castellón de la Plana, Spain

OPEN ACCESS

Edited by:

Wenjie Duan,
East China University of Science
and Technology, China

Reviewed by:

Rytis Pakrošnis,
Vytautas Magnus University, Lithuania
Paul T. P. Wong,
Trent University, Canada

*Correspondence:

Alina Corbu
corbu@uji.es

Specialty section:

This article was submitted to
Health Psychology,
a section of the journal
Frontiers in Psychology

Received: 27 May 2020

Accepted: 25 January 2021

Published: 11 February 2021

Citation:

Corbu A, Peláez Zuberbühler MJ
and Salanova M (2021) Positive
Psychology Micro-Coaching
Intervention: Effects on Psychological
Capital and Goal-Related
Self-Efficacy.
Front. Psychol. 12:566293.
doi: 10.3389/fpsyg.2021.566293

Positive Psychological Coaching is receiving increasing attention within the organizational field because of its potential benefits for employees' development and well-being (Passmore and Oades, 2014). The main aim of this study was to test the impact of a Positive Psychological Micro-Coaching program on non-executive workers' psychological capital, and analyze how goal-related self-efficacy predicts goal attainment during the coaching process. Following a control trial design, 60 non-executive employees (35 in the experimental group and 25 in the waiting-list control group) from an automotive industry company participated in a Positive Psychological Micro-Coaching program over a period of 5 weeks. The intervention was grounded in the strengths-based approach and focused on setting a specific goal for personal and professional growth. The program consisted of a group session, three individual coaching sessions, and individual inter-session monitoring. Pre, post, and 4-month follow up measurements were taken to assess the impact on the study variables. Our results reveal that psychological capital increased significantly at post and follow-up times compared to baseline levels. In addition, results confirmed that goal-related self-efficacy predicted goal attainment during the micro-coaching process. Practical implications suggest that short-term positive psychological coaching is a valuable method for developing personal resources, such as psychological capital and to facilitate the goal achievement in non-executive employees, in order to reach work-related goals.

Keywords: positive psychology coaching, goal-related self-efficacy, psychological capital, goal attainment, short-term coaching, control trial, strengths-based intervention

INTRODUCTION

More than ever, organizations must deal with a highly competitive environment where changes occur at an overwhelming speed, transforming the way they work and function, and requiring employees to learn new skills and expertise in order to execute their task effectively. Accepting negative situations, such as unpredictable environment or emotional complexity of human

Abbreviations: PPMC, positive psychological micro-coaching; PsyCap, psychological capital; PRE, pre-assessment time; POST, post-assessment time; FUP, follow up time; EX, experimental group; WL, waiting-list control group; ANOVA, Analyses of Variance.

nature, can lead to the development of different strategies for dealing with them (Wong, 2020). In order to achieve success, organizational change has become a necessity. The efficacy of any change effort relies on the employees' attitude and readiness for change (Madsen et al., 2005). Therefore, it is important to empower employees by increasing their personal resources (i.e., self-efficacy) (Emsza et al., 2016) in order to prepare them to deal with organizational changes. There are different mechanisms used by individuals to handle challenging circumstances, such as techniques that help to control thoughts, emotions, and behaviors (i.e., coping strategies) before, during and after difficulties (Skinner and Zimmer-Gembeck, 2007). Emerging research demonstrates that coaching is a valuable tool for organizations during turbulence because it helps to improve skills and attitudes for suitable change management and achieve work demands and goals (Kombarakaran et al., 2008; Grant, 2014; Bickerich et al., 2018). More recently, the increasing recognition that well-being plays a significant role in organizational performance has resulted in coaching becoming more holistic and focusing more on the health and well-being of employees (Green and Palmer, 2018).

As Walsh et al. (2018) reported, happy people tend to be more successful in different areas of life. One's happiness takes place not only when confronting the negative existential anxieties, but also as a result of focusing on the positive and developing positive resources (Wong, 2016). Therefore, higher levels of well-being-related positive psychological resources, such as optimism, self-efficacy, resilience, and hope, increase the probability of successfully facing organizational challenges. Taken together, these positive psychological resources build psychological capital (PsyCap), a psychological construct described as a state rather than a trait (Luthans and Youssef-Morgan, 2017) that can be developed, modified, and learned. Positive psychological coaching is an ideal methodology for building this positive construct because it offers an environment and characteristics that facilitate the learning process (Petersen, 2015). Similarly, goal-related self-efficacy (Grant and Greene, 2004), and goal attainment (Green and Spence, 2014) are other crucial factors that contribute to organizational success and can be worked on via positive psychological coaching (Palmer and Whybrow, 2005).

Accelerated advances at the legislative, technological, cultural, and economic levels have also influenced the automotive market. Addressing new challenges, such as product diversification, competition, and customer expectations requires higher levels of efficiency and resilience (Ivanov et al., 2018). Organizational flexibility has become a competitive advantage, and its development is related to the employees' ability to adjust to a volatile environment, which in turn determines the organization's success (Mendes and Machado, 2015). Organizations should focus on the employees' personal resources to achieve excellent organizational results (Van Wingerden et al., 2017). Therefore, coaching is suggested as a successful solution to promote resource development and, hence, reach high performance levels (Bodein et al., 2013).

Although there is research on the impact of executive coaching on well-being-related abilities and goal achievement

in organizational environments (Grant, 2013a, 2014, 2017), empirical studies that investigate these variables in non-executive employees or workplace coaching are still limited. In this study, we use workplace coaching as a more comprehensive concept that integrates coaching provided to all levels of employees (specifically non-executive employees) in a work environment, in order to improve work performance and job-related skills (Grant, 2013a). Therefore, scientific studies on the impact of positive psychological coaching, and particularly strengths-based coaching, on personal resources of non-executive employees (Green and Spence, 2014; Peláez et al., 2020) make an important contribution to the literature. Considering that positive psychological coaching aims to seek solutions rather than focusing on problems (Biswas-Diener, 2010; Green and Palmer, 2018), main indicators of its effectiveness are goal attainment (Grant et al., 2009, 2010; Minzlaff, 2019) and specific self-efficacy to accomplish goals (Moen and Allgood, 2009; de Haan et al., 2016). Thus, studying the influence of goal-related self-efficacy represents a step forward in further understanding the role of personal resources in the effectiveness of the coaching process.

To address this gap, a controlled design study is presented in order to provide scientific evidence about the effect of a Positive Psychological Micro-Coaching (PPMC; i.e., short-term and strengths-based) intervention on the PsyCap of non-executive workers and the relationship between goal attainment and goal-related self-efficacy. Our proposal is based on previous research indicating the effectiveness of PPMC in improving personal resources, well-being and performance, and that the coaching process is effective even with fewer sessions (i.e., micro-coaching) (Theeboom et al., 2013; Peláez et al., 2020).

THEORY AND HYPOTHESES

Positive Psychological Micro-Coaching

In the last decade, research on Positive Psychology arises to provide an evidence-based knowledge of human flourishing by studying the optimal functioning of people and organizations, focusing on their strengths, and positive characteristics (Salanova et al., 2019). Based on its existential-humanistic roots, Positive Psychology broadens its definition by integrating both negative and positive aspects of the human condition in order to grow and flourish (Wong, 2016). The way to cultivate positive emotions, cognitions, and behaviors is through positive psychology interventions (PPI). These interventions are designed to enhance: (1) positive aspects, (2) person-activity adjustment, (3) abilities of the individuals involved, and (4) the mechanisms of positive activities aimed at improving well-being (Lyubomirsky and Layous, 2013). The purpose of this approach, unlike traditional psychology, is to focus on positive experiences, factors and scenarios (Parks and Biswas-Diener, 2013). Previous research (Lomas and Ivztan, 2016; Wong, 2020) argued that this point of view ignore the balance between positive and negative experiences, and suggest that "the most promising strategy to accomplish the mission of positive psychology is to confront the dark side of human existence and understand the unique experience and expression of well-being" (Wong, 2020, p. 3).

In view of the world's uncertainty and challenge, handling and overcoming life's adversities is necessary to strengthen, and, even positively transform one's personal resources.

An approach to strengths developed by Linley (2008) suggests that strengths consist on the ability to think, feel, and behave in ways that allow full and optimal functioning in the pursuit of desirable and valuable results (Linley and Harrington, 2006). In the workplace environment, employees who make a deliberate effort to apply strengths on their daily work are more productive, successful, and happy (Miglianico et al., 2020).

Recently, an applied sub-discipline of psychology named Coaching Psychology has emerged and can be understood as a learning process tailored to the coachees' specific needs that strengthens their natural capacity for growth (Gallwey, 2014). A collaborative (Spence and Grant, 2007; Green and Spence, 2014), reflective, and goal-centered relationship is required to accomplish the desired outcomes (Smither, 2011). In order to optimize time and costs, the short-term coaching process could be a useful intervention for the organizations as the society change in a fast-paced, constant, and unpredictable way. Micro-coaching attempt to create an ambiance where the goal is specific and viable to achieve in a short-term. The main differences between a standard coaching process and micro-coaching resides in the definition of a specific and short-term feasible goal and in fewer number of sessions in micro-coaching (Peláez et al., 2020).

Build on the definitions of these terms, previous research suggested the integration of positive psychology and psychological coaching because both approaches focus on developing optimal functioning and utilizing individuals' strengths for improvement (Linley and Harrington, 2005; Green, 2014). Based on this approach, the concept of positive psychological coaching emerges as a technique that uses positive psychology principles to provide a "positive diagnosis" (Biswas-Diener, 2009). Positive psychology applied to coaching allows the coachee to be conscious of his personal resources, and provides the conditions for the development of skills and abilities beyond the usual or prescribed professional roles (Castiello D'Antonio, 2018). van Zyl et al. (2020) propose a definition of positive psychological coaching based on positive psychological evidence-based approaches that describes a collaborative relationship between coach and coachee focused on discovering, cultivating, and applying personal resources to enhance positive states and facilitate personal/professional growth. In general, coaching has always focused on strengths because of their explicit use as tools for personal development (Biswas-Diener, 2010). Burke (2018) suggests that the use of strengths in the PPMC, and particularly in strengths-based coaching, is a key element in finding solutions to help coachees achieve their goals. Additionally, the assessment of character strengths benefits the coaching process by creating awareness, increasing confidence, and developing personal resources to improve performance (Burke and Passmore, 2019). Positive psychological coaching is a powerful methodology because it promotes positive psychological interactions, helps employees to develop positive psychological resources, and increases productivity (Biswas-Diener, 2010).

Some interventions indicate that the use of personal resources for personal and professional success is an efficient organizational strategy to promote beneficial outcomes. For example, Meyers and van Woerkom (2017) observed that a brief strengths intervention increased employees' positive affect and PsyCap by identifying and developing strengths and their use in the work context.

In recent years, research in the field of psychological coaching has experienced significant growth at the level of organizational research and practice. Several meta-analyses and studies highlight the effectiveness of coaching (Theeboom et al., 2013; Lai and McDowall, 2014; Sonesh et al., 2015; Jones et al., 2016; Bozer and Jones, 2018). Currently, a growing number of professionals are using positive intervention strategies because they are linked to increased psychological resources, such as self-efficacy (Proctor et al., 2011) and the achievement of personal and organizational goals (Linley et al., 2010).

Furthermore, although there is empirical evidence about the influence of executive coaching on work-related outcomes, such as leadership skills (MacKie, 2014), findings on the effects of coaching on non-executive workers are still limited (Grant, 2013a). However, recent research has focused on applying the strengths-based coaching methodology to non-executive positions, analyzing the effectiveness of strength-based coaching in promoting well-being (i.e., work engagement) and job performance (Peláez et al., 2020). Nevertheless, more studies with controlled and longitudinal designs are needed to broaden and build on the effects of PPMC on work-related outcomes, such as PsyCap, and the role of self-efficacy in achieving goals during the process, considering the key role of these variables in a coaching process. In order to respond to these requests, this study aims to contribute to the research on the impact of a PPMC program on PsyCap and the relationship between self-efficacy and goal attainment in the coaching process.

Positive Psychological Micro-Coaching and Psychological Capital

Luthans et al. (2007b) define PsyCap as

An individual's positive psychological state of development, characterized by: (1) having confidence (self-efficacy) to take on and put in the necessary effort to succeed at challenging tasks; (2) making a positive attribution (optimism) about succeeding now and in the future; (3) persevering toward goals and, when necessary, redirecting paths to goals (hope) in order to succeed; and (4) when beset by problems and adversity, sustaining and bouncing back and even beyond (resiliency) to attain success. (p. 3)

This approach is based on the Conservation of Resources (COR) theory (Hobfoll, 2002), which posits that individuals seek to obtain, retain, and protect personal resources in order to control and impact their environment effectively. PsyCap is described as a positive interpretation of events that stimulates flourishing and success based on effort and constancy. According to Youssef-Morgan and Luthans (2013), the mechanisms through which PsyCap works focus on: (1)

the intentionality and motivation for behavior; (2) positive cognitive assessments through which negative situations are reevaluated more positively; (3) positive emotions that facilitate the construction and restoration of weakened psychological resources, including the dimensions of PsyCap; and (4) social mechanisms that help in the development of personal resources. The concept extends to organizations and represents a competitive advantage because it is difficult to replicate. A study by Luthans et al. (2007b) shows that the four dimensions of PsyCap together are a better predictor of job performance and satisfaction than the four facets individually.

Improving PsyCap leads to greater organizational commitment, more favorable organizational citizenship behavior, less absenteeism, greater job satisfaction (Idris and Manganaro, 2017), and greater psychological well-being (Avey et al., 2011). Additionally, longitudinal studies show that PsyCap is a state-like construct, i.e., flexible and open to improvement (Avey et al., 2010; Peterson et al., 2011), and can be developed through short interventions (Luthans et al., 2006; Demerouti et al., 2011; Dello Russo and Stoykova, 2015; Ertosun et al., 2015). In order to carry out effective PsyCap interventions, it is important to take into account the organizational climate context because it seeks to promote positive thinking patterns. This transformation requires an organizational climate that promotes empowerment, support, and recognition (Luthans and Youssef-Morgan, 2017). PsyCap becomes relevant in the organizational context because high levels of its four dimensions make it possible to face adversities in organizational dynamics. Previous literature suggests that coaching offers the necessary conditions to cultivate this psychological resource (Petersen, 2015).

Whereas, research has focused on the impact of coaching on each of the dimensions separately, such as resilience (Grant, 2013a; Sherlock-Storey et al., 2013; Sarkar and Fletcher, 2016), hope (Green et al., 2006; Madden et al., 2011), and self-efficacy (Evers et al., 2006; Baron and Morin, 2009; McDowall and Butterworth, 2014), no workplace coaching studies have focused on the four dimensions of the PsyCap construct as a whole and their relationship with coaching (Hsu et al., 2019). Additionally, scientific evidence on the impact of PPMC on PsyCap is still missing, which is a new challenge and a novelty of this study. In addition, due to the lack of longitudinal studies that evaluate the maintenance of the results obtained in the coaching process over time (Grant and O'Connor, 2018), it is necessary to evaluate and verify the durability of the positive effects produced on PsyCap.

Hypothesis 1: Participants will increase their levels of PsyCap in Post time (after the intervention) for the Experimental group (EX) compared to Pre time (before the intervention), and compared to a Waiting List-control group (WL). Additionally, participants will report higher scores on PsyCap in Post time and 4 months after finishing the intervention (4-month follow-up; FUP) compared to Pre time (before the intervention), and considering the whole intervention group.

Goal-Related Self-Efficacy and Goal Attainment in PPMC

Goals, as defined by Locke and Latham (2002, p. 705) are “the object or aim of an action, for example, to attain a specific standard of proficiency, usually within a specified time limit.” In other words, is the conscious intentionality that an individual does in order to achieve to desired results. Goal setting is the mechanism whereby the person reaches these goals. According to goal setting theory, difficult and specific goals lead to higher levels of performance as direct both attention and action (Locke and Latham, 2006). If the development of successful goals is perceived, individual's confidence in their own capabilities enhances their ability to progress. Combined with self-efficacy, goal achievement leads individuals to set new, demanding goals (Schunk, 1990). This theory seems to fit properly in coaching literature because of the future-focused nature of goals and coaching, the key role of goal attainment in coaching, and the useful framework for coaching models provided by the goal setting theory, such as Specific, Measurable, Achievable, Realistic, Time-bound (SMART) (Clutterbuck and Spence, 2016).

By definition, coaching is a technique for learning and achieving goals by designing an action plan (Grant, 2013b). Goal attainment is an important indicator of the success of the process, according to the theory of coaching. The research finds coaching to be an effective method to achieve goals because it increases motivation, positive affect, and self-efficacy, and it facilitates goal progression (Grant and O'Connor, 2010; Grant, 2012). Specifically, strengths-based solutions reinforce individuals' resilience skills and abilities and their use in achieving goals and making significant positive changes (Grant, 2011a). This perspective argues that coaches should spend most of the time posing inquiries that elicit the coachees' thoughts about the best way to achieve their goals, rather than asking “why” questions that explore causality. By defining the different types of goals and their relevance in the clients' transformation process, coaches can encourage their customers to gain insight and improve habits that enhance their job performance and, more importantly, their personal well-being and sense of self (Grant, 2019).

Bandura (1997) defined perceived self-efficacy as “beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments” (p. 3). Research suggests that people with higher levels of self-efficacy have stronger beliefs in their task-related capacities and their ability to set more ambitious goals and pursue them than people with lower levels of self-efficacy (Bandura, 1986). Coachee self-efficacy has been found to be a key antecedent of coaching outcomes, such as perceived coaching effectiveness (de Haan et al., 2013) and performance (Bozer et al., 2013). Considering the important role of behavioral and cognitive mechanisms in coaching, such as feedback, planning, and goal setting, and their connection to self-efficacy (Bandura, 1986), coachee self-efficacy is viewed as a central psychological factor in the process. Self-efficacy can be considered a generalized construct or a domain-specific variable to predict behavior and outcomes (Maddux, 2016). According to Bandura (1997) the more specific is self-efficacy, the greater prediction of successful behavior. We contend that

the goal attainability construct can be better understood by taking into consideration the effects of goal-related self-efficacy in successfully fulfilling the tasks involved in the coaching process in order to reach goals. Evers et al. (2006) demonstrated that self-efficacy in setting goals has a positive impact on the client's perceptions of coaching's effectiveness. Given the relationship between these two concepts, specific self-efficacy for achieving goals will lead to greater progress in goal attainment.

Past research has proposed that workplace coaching has a positive impact on positive aspects, such as goal attainment (Grant, 2014), self-efficacy (Baron and Morin, 2009), and well-being (Theeboom et al., 2013). However, research on the effectiveness of a strengths-based micro-coaching intervention and its impact on these variables is still in its infancy (Peláez et al., 2020), and there is still a need for evidence-based research that considers specific self-efficacy as a predictor of goal attainment in PPMC. Moreover, there is a request in the scientific literature to relate goal-related self-efficacy and coaching outcomes (i.e., goal attainment; Bozer and Jones, 2018). In order to address this gap, we formulate the following hypothesis:

Hypothesis 2: Goal-related self-efficacy will predict goal attainment in the PPMC process.

MATERIALS AND METHODS

Sample

The sample for this study was drawn from a multinational automotive industry company located in Spain, with 7,561 employees. Seventy-six employees who hold technical and engineering positions with non-supervisory or non-executive functions received an invitation to participate in a short-term strengths-based micro-coaching program. Finally, a total of 60 participants (79%) were involved in this research project: 35 participants divided into six groups that took part simultaneously and made up the experimental condition (EX group), and 25 participants divided into three groups that made up the waiting-list condition (WL group) as untreated comparisons in the study. Participants' mean age was 36 years ($SD = 7.5$), and 70% were male. Furthermore, 82% of participants had a tenured contract, and the average length of time working in the company was 8.6 years ($SD = 8.5$). Participation was completely voluntary, and there was no extra financial incentive for their participation. All participants gave their written informed consent to release their personal data for scientific research purposes.

A degree of attrition was expected due to the longitudinal design of this study and the company's casuistry. Due to unforeseen work-related and personal events, four employees did not complete the intervention program. Therefore, a total of 56 (93%) participants completed the program and responded to a post-intervention questionnaire, and 52 (87%) responded to the FUP questionnaire. For managerial reasons, the WL groups initiated the intervention shortly after the EX groups finished the coaching sessions (after the T2

evaluation), instead of waiting until the completion of the FUP questionnaires.

Program Description and Procedure

The intervention was called the "Strengths-based micro-coaching program," and it was designed for different purposes: (1) to present and provide feedback on the results of self-assessments of participants' positive psychological resources (i.e., hope, optimism, resilience, and self-efficacy), well-being variables (i.e., work engagement), and healthy organizational outcomes (i.e., performance); and (2) to facilitate goal attainment by establishing an action plan based on the use of personal strengths.

In a previous study (Peláez et al., 2020), the authors explored the impact of this particular intervention program on work engagement and job performance. Thus, these two outcome variables were not included in the present study. This previous intervention program was extended over the course of 6 weeks and divided into a 2-hour group session and three individual coaching sessions. The intervention was delivered by four professional psychologists external to the organization with specific coaching and positive psychology expertise. They also participated in two group supervision sessions (one at the beginning and the second one in the middle of the process) with an experienced professional in this subject. All four coaches had to follow a guideline (i.e., protocol) in order to obtain uniform, and comparable information regarding the main issues on the coaching process. Moreover, each coach had to register the relevant points of the session based on the protocol. This procedure ensured that the results were based on the same approach.

The present study is related to the Peláez et al. (2020) study and has the same design and sample. We attempt to analyze the effectiveness of a PPMC program in increasing work-related variables (i.e., PsyCap), study the relationship between goal-related self-efficacy and goal attainment, and provide further evidence reinforcing its value and validity.

To manage this intervention, researchers were assisted by the manager of the plant in order to identify employees' need to respond to high levels of job demands and reach higher performance goals. During the first phase of this project, employees were informed about the characteristics of the study, the evaluation procedure, the purpose of the intervention, and the confidentiality of their responses, according to the European data regulation standards. Furthermore, the research adhered to ethical principles and standards approved by the Research Ethics Committee of the University. Participants were not randomly allocated to either the EX group or the WL group because their assignment depended on their availability, the preferences of the organization, and coaches' schedule. The participants could choose between the two groups through registering in a template sheet.

The study used a within-subjects (pre-post-FUP) and between-subjects (EX-WL) design. Participants were assessed at Time 1 (T1; before the intervention), Time 2 (T2; immediately after the intervention for the EX group, and before the intervention for the WL group), Post times (after the intervention for the whole intervention group, once the WL group has

finished the intervention) and follow-up times (FUP; 4 months after finishing the intervention for the whole intervention group). The self-reported questionnaires were administrated online by sending an email with a direct link to each participant at all four assessment times. Next, participants in the experimental group started the 2-hour group session, followed by three micro-coaching sessions. **Figure 1** represents the outline research of the study.

The coaching sessions were grounded in Grant's RE-GROW model (Review, Evaluate, Goal, Reality, Options, and Wrap up) (2011b) and the strengths-based approach (Linley and Harrington, 2006). Hence, the focus of the intervention was to set a specific goal for personal and professional growth, analyze the current-future status of the goal, brainstorm ways to achieve individual goals, establish an action plan, initiate action and implement the best options, supervise performance, evaluate progress between coaching sessions, and adjust actions if necessary (based on evaluation of progress). Following this approach, a self-regulatory cycle takes place that links outcomes from the previous session to the current session as the guiding thread in this micro-coaching process. Participants were guided by the coach through the different steps during the entire program. In addition, this model is expanded in the study with a previous step of a self-assessment report and analysis (see **Figure 2**).

During the group workshop session (i.e., the first session), participants received a short theoretical presentation on positive psychology, positive psychological coaching, and the variables assessed in the study. Next, the participants received an individual report and feedback on their self-assessment, providing a starting point and enhancing awareness of their personal resources, well-being, and performance. Following the structure, each coachee established a specific goal to focus on, and a working guide was offered that included a workbook, information, and instructions for coaching activities and a bibliography.

The program continued with 2 weekly 90-min individual micro-coaching sessions that mainly consisted of reporting the levels of goal-related self-efficacy, defining the goal and the action plan for achieving it. Throughout the intervention, the participants used their character strengths to reach the established goal. Specifically, in the "R" of the GROW model, the current status and personal strengths available to reach the

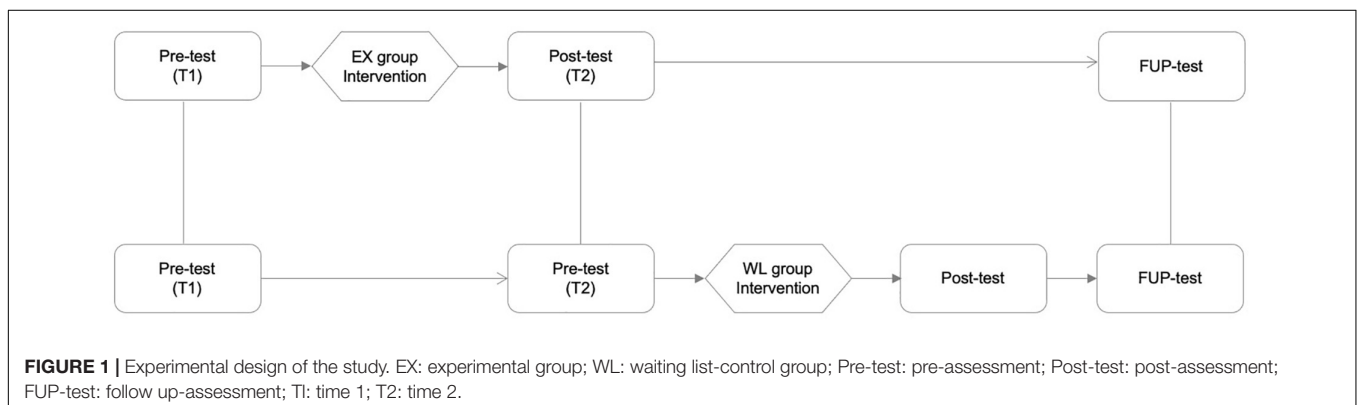
desired status (goal) were identified, followed by a reflection on participants' abilities, improvement areas, and external opportunities. Afterward, the individuals developed and initiated an action plan. Between sessions, participants worked on developing the plan. In each session, the coach helped the coachee to evaluate and adjust the goal or actions in order to obtain better results.

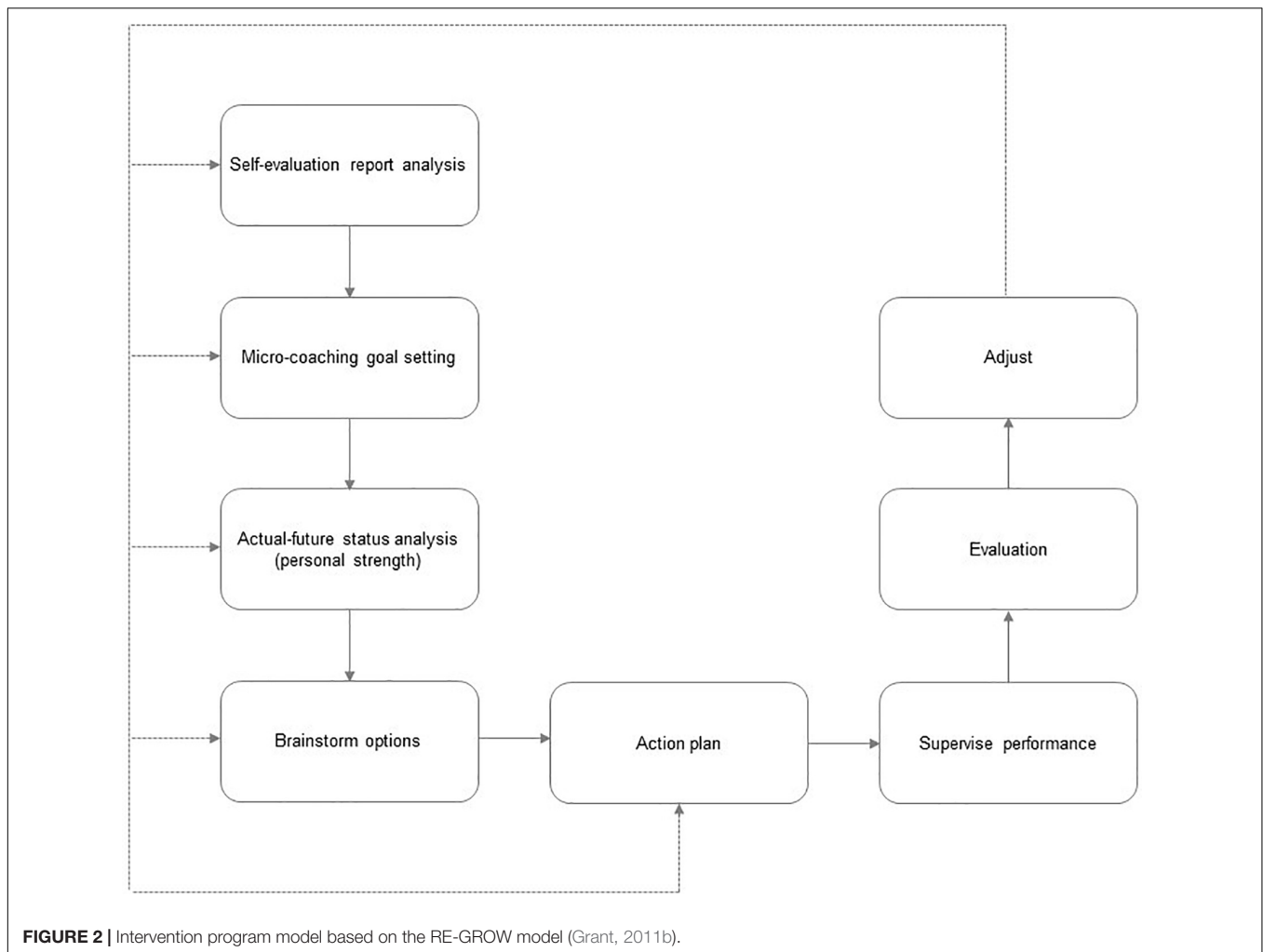
Finally, 2 weeks after finishing the two 90-min sessions, the participants attended a 60-min final follow-up session to monitor the action plan, celebrate the positive results and the accomplishment of the goal, and provide feedback on the program. To ensure transference of training back to their daily work, throughout this session, the "Best Possible Self" technique, developed by King (2001), was performed as a closing task, accompanied by visualization techniques based on their signature strengths. Participants were asked to picture themselves in the best possible future situation taking into account three specific areas (personal, professional, and social). Peters et al. (2010) found that this exercise was useful for improving personal and psychological well-being. In this intervention, this exercise was adapted to the individual coachee micro-coaching process and specific strengths used in the PPMC, encouraging participants to write down and then visualize the journey to achieve the goal using their personal resources. **Table 1** summarizes the PPMC intervention program.

Measures

Psychological Capital

Psychological capital was measured with the adapted version (Azanza et al., 2014) of the Psychological Capital Questionnaire (PCQ; Luthans et al., 2007a). The questionnaire consists of 12 items distributed in four factors: (1) self-efficacy (3 items; example item: "I feel confident in representing my work area in meetings with management."); (2) hope (4 items; example item: "I can think of many ways to reach my current work goals."); (3) optimism (2 items; example item: "I always look on the bright side of things regarding my job."); and (4) resilience (3 items; example item: "I can get through difficult times at work because I've experienced difficulty before."). The PCQ items were rated on a six-point Likert scale ranging from 1 ("strongly disagree") to 6 ("strongly agree"). Based on the reliability test, PCQ obtained





a coefficient of 0.809 for T1, 0.88 for T2, and 0.83 for T3 for the alpha Cronbach value, which means that this questionnaire can measure psychological capital consistently.

Goal-Related Self-Efficacy

Following Bandura's (2006) guide for constructing self-efficacy scales, participants were asked during the first session to rate the degree of confidence to successfully achieve their goals, using a 10-point rating scale ranging from 0 ("cannot do"); through intermediate degrees of assurance, 5 ("moderately certain can do"); to complete assurance, 10 ("highly certain can do"). Although single-item measures are often avoided in research due to concerns about their psychometric properties, the challenge of applying research in practical contexts, such as the workplace has led to an examination of their suitability when circumstances require very brief scales that restrict the duration of the measurement design (Bowling, 2005). In this regard, previous research has demonstrated that a single-item self-reported measure of self-efficacy can be as effective as a multiple-item scale (Hoepfner et al., 2011; Williams and Smith, 2016). This advantage is important because a shorter survey is more likely to be answered by the participants (Nagy, 2002).

Goal Attainment

Participants established one goal that was related to the coaching program's purpose and satisfied their specific needs. This variable was measured in the final session of the PPMC program to examine the coachees' performance on the selected goal. As mentioned above, the use of a single-item scale in organizational research may be useful for capturing information if there are practical constraints (e. g., respondent load, reducing survey length) (Fisher et al., 2016). Based on this approach, goal attainment was assessed by asking the participants to rate their degree of success in attaining the goal through a percentage scale (example item: "What percentage of your goal have you achieved at this moment?") from 0% (no attainment) to 100% (total attainment). Goal attainment scores were calculated by transforming percentages to scales from 1 to 10. This variable was measured in the 60-min final follow-up session.

Data Analyses

Descriptive data analyses were calculated to test the relationships between the study variables using the SPSS 25.0 statistical program. In order to examine the effects of the intervention

TABLE 1 | Positive Psychological Micro-Coaching sessions framework.

Session	Main purpose	Activities/tasks	Homework
1	Connecting and sharing. Pre-assessment results: feedback and reflection. Goal setting. Workbook delivery.	Welcome: coaches' presentation and objectives, structure and internal rules of the program. Ice-breaker: participants' self-presentation through symbols. Positive Psychology inputs. Presentation of the variables assessed and delivery of the results. Goal setting using SMART + technique: role-playing in pair.	Brief survey to think about the gap between current and desired situation (i.e., How do you define success in your life at this moment? When are you at your best? What are your personal strengths?)
2	Process development following the GROW model: GOAL setting (SMART+), examine the REALITY, explore OPTIONS, and establish the WILL	Review session 1: potential areas uncovered (SMART + goal). Reality: identifying and reflecting about personal strengths and weaknesses (symbol identification, strengths map, SOWT analysis). Options: brainstorming, and analysis of advantages and disadvantages. Action plan: detailed description regarding the what, why, when, how, and who questions.	"Time line" exercise: steps to follow for the action plan. Start the action plan.
3	Follow-up the action plan:	Review session 2: contents and doubts. Activity: "Time line" adapted to the action plan. Reflection about the achievements so far and future actions. Activity: (written and visualized) "The Best Possible Self" exercise. Process overview	Practice and follow the plan.
4	Closing, review, and reflection	Review session 3: topics, action plan, and doubts. Coachees' feedback: on the process, and coaches' performance.	

SMART, Specific, Measurable, Achievable, Realistic, Time-bound; +, Positive; SWOT, Strengths, Weaknesses, Opportunities, Threats.

program, analysis of variance (ANOVA) with a 2×2 repeated measures design was conducted to analyze differences between-subjects factor (group: EX and WL) and within-subjects factor (time: T1; T2). While T1 refers to the first pre-intervention test for both EX and WL, T2 refers to the post-intervention test for EX and to the second pre-intervention test for WL, just before this second group started the intervention.

In addition, *t*-tests for related samples were performed to test for differences between Pre and Post times and Pre and FUP times considering the whole intervention group (EX and WL group), once the WL group had finished the intervention.

Moreover, following Cohen (1988), eta squared in the repeated-measures ANOVA and Cohen's *d* as a measure of the effect size on *t*-tests for related samples were estimated (small effect = 0.01–0.03; moderate or intermediate effect = 0.03–0.05; large effect = 0.05). A significance level of 0.05 was established for all tests.

Finally, simple linear regression analyses were used to evaluate the specific link between the research variables (goal-related self-efficacy) at Pre time and the outcome variables (goal attainment) at Post time.

RESULTS

First, 2×2 repeated measures (ANOVA) analysis was carried out, and results showed a statistically significant difference between the EX and WL groups on the dependent variable PsyCap [$F(1.55) = 9.65, p < 0.05, \eta_p^2 = 0.152$], demonstrating a large effect size. This result indicates that participants in the EX group had statistically higher levels of PsyCap at T2 (immediately after the intervention for EX, and before the intervention for WL) compared to T1 (Pre intervention time for both groups) and to

WL. **Figure 3** shows the interaction plots of the effects of the intervention program on PsyCap.

Next, paired-sample *t*-tests for the whole intervention group were performed to compare Pre and Post and Pre and FUP times (see **Table 2**). Results showed significantly higher levels of PsyCap at Post [$t(53) = -5.22, p < 0.001, d = 1.42$], and FUP [$t(46) = -5.65, p < 0.001, d = 1.66$] compared to Pre time, revealing large effect sizes. These findings suggest that the intervention had a positive impact on the development of the participants' PsyCap, and that these effects remained high across time.

Finally, in order to examine the relationship between goal-related self-efficacy and goal attainment, different analyses were performed. The average value of goal-related self-efficacy was 8.4 ($SD = 1.3$) with a minimum score reported of 5 and a maximum of 10 suggesting that the participants perceived medium-high levels of self-efficacy at the beginning of the process. For goal attainment the mean was 7.5 ($SD = 4.9$), the minimum 3 and the maximum 10 indicating that on average participants have reached 75% level of the established goal. Second, regression analyses were conducted to determine to what degree the independent variable (goal-related self-efficacy) contributes to the dependent variable (goal attainment). Results revealed that goal-related self-efficacy ($R^2 = 0.084, \beta = 0.29, p < 0.05$) was a significant predictor of goal attainment in the short-term PPMC program; see **Table 3**.

DISCUSSION

The main aim of this study was to investigate the impact of a PPMC program on non-executive workers' PsyCap and the connection between goal-related self-efficacy and goal attainment

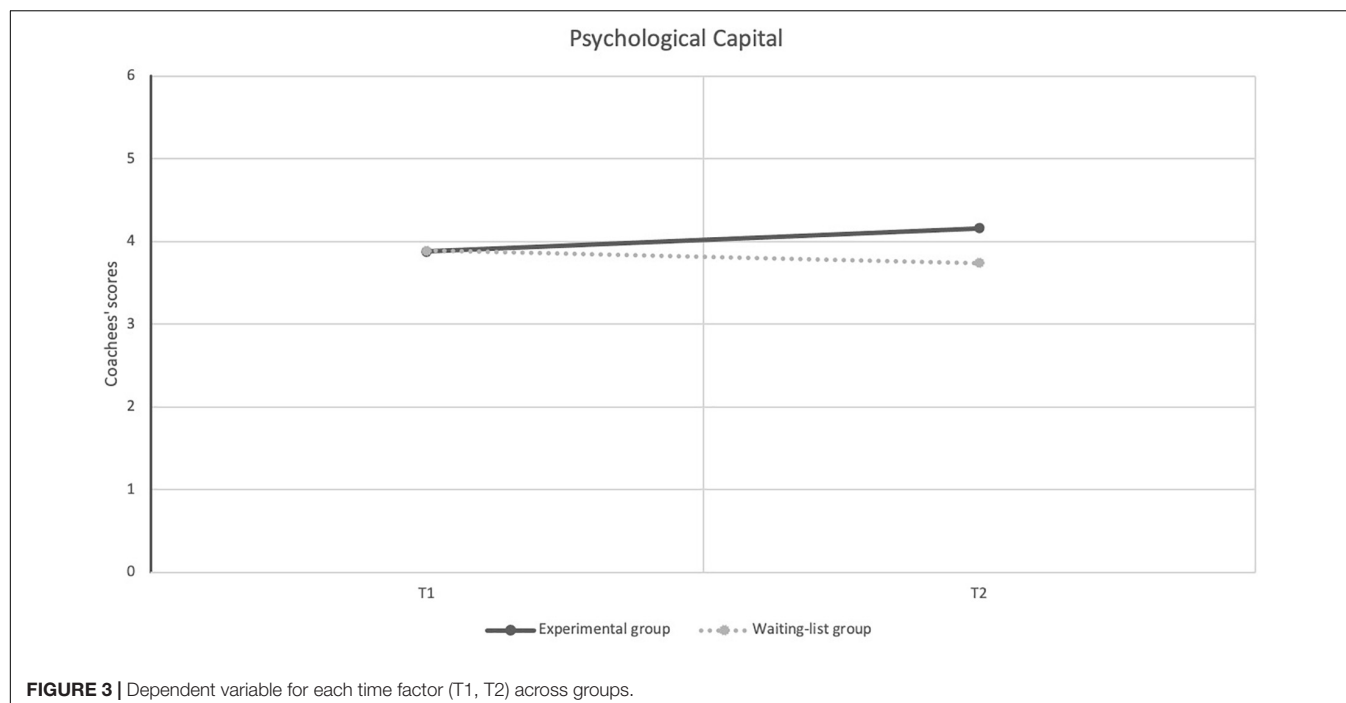


TABLE 2 | Means and *t*-test on PsyCap for the whole group.

		<i>M</i>	<i>SD</i>	<i>t</i> -value	<i>df</i>	<i>p</i> -value
Pair 1	Pre	3.82	0.437	-5.22	53	0.000
	Post	4.12				
Pair 2	Pre	3.82	0.44	-5.65	46	0.000
	FUP	4.19				

Pair 1, difference between Pre and Post time points for PsyCap; Pair 2, difference between Pre and FUP time points for PsyCap; *M*, mean; *SD*, Standard Deviation; *df*, degrees of freedom; *p*, significance level; Pre, pre-intervention time; Post, post-intervention time; FUP, follow-up time.

TABLE 3 | Regression analyses results for work-related self-efficacy as predictor of goal attainment.

Predictor	Adjusted <i>R</i> ²	<i>B</i>	<i>SD</i>	β	<i>t</i>	<i>p</i>
Goal-related self-efficacy	0.084	0.53	0.25	0.29	2.15	0.037

Dependent variable: goal attainment.

in the PPMC. Overall, the results agreed with this main objective of the study and confirmed the proposed hypotheses. Participants demonstrated significant increases in PsyCap after finishing the PPMC intervention and over time. Moreover, the results highlight the predictive role of goal-related self-efficacy in goal attainment in the coaching process. Therefore, results are consistent with previous research indicating that Positive Psychological Micro-Coaching (short-term and strengths-based) can be an effective and valuable intervention to enhance work-related outcomes and well-being, even when the number of coaching sessions is small (Theeboom et al., 2013). Finally, this study addresses a gap in the literature related to the few empirical control trial studies with a longitudinal design (Grant and O'Connor, 2018), in addition to investigating the relationship between goal-related self-efficacy and coaching outcomes (i.e., goal attainment) (Bozer and Jones, 2018).

The first hypothesis was supported in the current study. The results suggest that the intervention significantly increases PsyCap levels immediately after the intervention for the EX group when compared with the WL group. Findings also indicate a significant increase in PsyCap after the intervention and 4 months after finishing it, compared to the baseline levels, considering the whole intervention group (once WL has finished the intervention). The state-like nature of PsyCap (Youssef-Morgan and Luthans, 2015) makes it suitable for interventions focused on personal growth (i.e., PPMC), and its working mechanisms (i.e., positive evaluation of the scenarios and opportunities to success based on effort and persistence; Youssef-Morgan and Luthans, 2013) confirm the positive and direct effect of PPMC. Based on the assumption that the coaching process pursues the capacity for growth of personal resources, these results are congruent with previous studies

confirming that coaching provides the perfect environment for the development of PsyCap (Petersen, 2015). The effect of the non-executive PPMC program on PsyCap has not been previously investigated, and so these findings provide new scientific evidence in this regard.

The second hypothesis was also confirmed. The results revealed that goal-related self-efficacy is a significant predictor of goal attainment in the PPMC program; that is, participants' goal-related self-efficacy enhanced positive outcomes (i.e., goal attainment) at the end of the intervention. Despite not having a baseline measurement for goal attainment (participants were asked only in the last coaching session about the level of achievement of the goal they established in the first session), an improvement in goal attainment was reported as stated by the participants during the last coaching session, and considering the high level of percentage achieved. Based on the RE-GROW model, interventions focused on achieving a specific goal and self-efficacy were shown to be a crucial precedent for coaching performance (de Haan et al., 2013). Because the coaching process aimed to help the coachee to set his/her own personal goals, it may have contributed to greater commitment to the goal and increased motivation to achieve it, followed by positive outcomes that are likely to strengthen feelings of self-efficacy (Bandura, 1997). As expected in this study, and in line with previous research (Evers et al., 2006), considering the essence of specific self-efficacy for achieving goals, the effect on goal attainment was positive and high. This finding addresses the gap in the literature and the request to relate goal-related self-efficacy to coaching outcomes (Bozer and Jones, 2018) and reinforce the importance of enhancing personal resources (i.e., self-efficacy) (Demerouti et al., 2011).

Moreover, results from this research contribute to the literature on coaching psychology by demonstrating that micro-coaching can be a useful positive intervention to improve optimal organizational functioning. Therefore, the study results are consistent with previous research showing that even if the number of coaching sessions is small, coaching can be successful (Theeboom et al., 2013; Peláez et al., 2020). The reason short-term coaching led to successful outcomes could be that the intervention focuses on developing specific skills and goals in a relatively brief period of time. Additionally, the findings strengthen the literature on empirical control trial studies with a longitudinal design, considering the effect of PPMC on work-related outcomes (i.e., PsyCap), long-term effects of coaching, and the role of self-efficacy in goal attainment.

Implications for Practice

Some practical implications emerge from the study results. First, this study provides further evidence of the positive impact that PPMC has on employees' personal resources and work outcomes, and it may contribute to the competitive advantage of an organization. In other words, investing in and developing employees' personal resources is usually promoted in healthy organizations, understood as those that care about the psychosocial health of their workers (Salanova et al., 2012, 2019). This study has shown that relatively few coaching sessions can be effective, which could be an important element to consider

given the challenges faced by organizations in turbulent and changing environments. People are working under time pressure and have to use their time effectively; under the paradigm of urgent vs. important, coaching may not be a priority task. In this regard, short coaching sessions are beneficial in terms of motivation, flexibility, costs, and parsimony, due to their focus on specific goals. In PPMC, not only positive resources are developed and reinforced, but also the coachee receive support in the development and use of techniques to handle challenging circumstances and cope with difficulties (Skinner and Zimmer-Gembeck, 2007). The complicated interactions between positive aspects of human functioning and negative experiences alter the way people think, feel and behave (Lomas and Ivrtzan, 2016), and therefore should be taken into account in the coaching process.

Therefore, coaching provides opportunities not only to develop abilities and internalize them in everyday life (Evers et al., 2006), but also to increase the effectiveness of coachees' functioning and work performance even when the environment is challenging. Workplace coaching needs to be agile, flexible, and easily integrated into the organization (Grant, 2016). Thus, workplace coaching, specifically PPMC, can serve as an important tool that can facilitate significant positive organizational change to address the problems that contemporary companies are experiencing. It is a short-term interaction designed to obtain long-term benefits.

Limitations and Future Directions

Finally, some limitations of this study must be recognized. First, participants were not assigned randomly to either the EX or the WL group because the allocation depended on the participants' availability and the organization's priorities. Nevertheless, the findings of the *t*-test analysis between the groups did not show any significant difference in the outcome variable (PsyCap) at T1 (before the intervention).

Second, the sample was small and very specific; therefore, the result cannot be generalized. Therefore, future investigations should examine the effect of this intervention in other sectors or companies and extend the sample in order to contrast the results. Thus, replications are welcome in order to discover the benefits of the intervention based on its positive effects in other sectors, companies, or countries, and give greater validity to our findings.

Third, due to the organizational context, the comparison of the EX and WL groups at FUP was not possible because the WL group started the intervention shortly after the EX group finished it. Nonetheless, we found valuable results by comparing the whole intervention group across time (before, after, and FUP), calculating paired-sample *t*-tests. Future studies should consider adjusting the research design in order to compare the two conditions at this evaluation time. Additionally, we highlight the importance of a FUP evaluation to ensure the maintenance of the results over time and the use of objective or multisource ratings of outcome variables and the results.

Fourth, the self-efficacy and goal attainment measurements based on single-item scales are sensitive to bias and error. Additionally, the changes of self-efficacy and goal attainment were not possible to analyze since they were measured only once.

Even so, our results were positive and congruent with previous research. However, the use of the Goal Attainment Scaling and the Self-efficacy Scale (Chen et al., 2001) should be considered in future studies for more accuracy, as well as evaluating the variables in different times in order to examine changes.

Fifth, our study is also limited by the use of self-reported data and thus it was not possible for the investigators to objectively determine the veracity of such data. Self-reported performance might boost social desirability (Caputo, 2017). Furthermore, as participation was voluntary, the competence and motivation of participants could have influenced our results. However, findings are consistent with the theory, and we attempted to minimize the impact of these biases in our study by collecting data over time (i.e., before, after and follow-up times). It could be valuable to include a wider range of objective measurements to examine the impact of this intervention. Also, it would be valuable to consider, not only the positive aspects of well-being, but also the evaluation of negative experiences and emotional states to gain a complete and realistic picture of well-being (Lomas and Ivtzan, 2016). Additionally, it could be interesting to assess in future studies the benefit and impact of PPMC on performance variables, such as behavioral persistence and performance flexibility (Theeboom et al., 2016).

Finally, even though positive and significant effects of PPMC were found on PsyCap and in the connection between goal-related self-efficacy and goal attainment, future research should consider focusing on specific factors in the effectiveness of coaching (e.g., performance, SMART goals, working alliance, commitment to the process) and on the analysis of the links between self-efficacy, goal attainment and changes on the outcome variable (PsyCap). Our study has shown that short-term coaching can be successful. However, a comparison of short-term and long-term interventions in future research would be very useful.

CONCLUSION

To sum up, this study provides relevant information for both researchers and professionals. From a theoretical perspective, the results offer evidence about the effects of a Positive Psychological Micro-Coaching intervention on psychological capital and the predictability of goal-related self-efficacy on goal attainment during the coaching process. The present study presents original data indicating that short-term sessions are indeed effective in enhancing personal resources (i.e., PsyCap) and that on average participants reported medium-high percentage of attainment of their established goals. It also demonstrates that workplace

coaching can increase PsyCap in non-executive workers, using a longitudinal controlled design. Although the effects of the intervention cannot be generalized, and comparisons of EX-WL at FUP were not possible, the encouraging results suggest that future studies should include stronger designs (i.e., multiple measurement points, and randomization). From an applied perspective, this research represents a significant development from an operational point of view because it provides professionals with an innovative and replicable intervention that can be adapted and implemented across a wide range of organizations. The findings highlight the strategic value of providing personal growth opportunities that can help employees to develop their skills to handle challenging circumstances and cope with difficulties, and therefore, contribute to successful organizational outcomes.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University Research Ethics Committee Universitat Jaume I. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MP coordinated the entire intervention process, performed the data collection, and contributed to the wording of article. MS contributed during the intervention program and revised the manuscript. AC and MP developed the study design, conducted the analyses, and interpretation of the results. AC wrote the manuscript. All the authors listed have made a substantial intellectual contribution to the research and conceived the idea for the study.

FUNDING

This work was supported by the Universitat Jaume I (Grant No. #B/2017/81) and the Spanish Ministry of Economy and Competitiveness (Grant No. #PSI2015-64933-R).

REFERENCES

- Avey, J. B., Luthans, F., Smith, R. M., and Palmer, N. F. (2010). Impact of positive psychological capital on employee well-being over time. *J. Occup. Health Psychol.* 15, 17–28. doi: 10.1037/a0016998
- Avey, J. B., Reichard, R. J., Luthans, F., and Mhatre, K. H. (2011). Meta-analysis of the impact of positive psychological capital on employee attitudes, behaviors, and performance. *Hum. Resour. Dev. Q.* 22, 127–152. doi: 10.1002/hrdq.20070
- Azanza, G., Dominguez, A. J., Moriano, J. A., and Molero, F. J. (2014). Capital psicológico positivo, validación del cuestionario PCQ en España. *Anal. Psicol.* 30, 294–301. doi: 10.6018/analesps.30.1.153631
- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Upper Saddle River, NJ: Prentice-Hall, Inc.
- Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. Dallas, TX: Freeman.

- Bandura, A. (2006). "Guide for constructing self-efficacy scales," in *Self-efficacy Beliefs Adolescents*, Vol. 5, eds F. Pajares and T. Urdan (Greenwich, CT: Information Age Publishing), 307–337.
- Baron, L., and Morin, L. (2009). The impact of executive coaching on self-efficacy related to management soft-skills. *Leadership Organ. Dev. J.* 31, 18–38. doi: 10.1108/01437731011010362
- Bickerich, K., Michel, A., and O'Shea, D. (2018). Executive coaching during organisational change: a qualitative study of executives and coaches perspectives. *Coach. Intl. J. Theory Res. Pract.* 11, 117–143. doi: 10.1080/17521882.2017.1407806
- Biswas-Diener, R. (2009). Personal coaching as a positive intervention. *J. Clin. Psychol.* 65, 544–553. doi: 10.1002/jclp.20589
- Biswas-Diener, R. (2010). *Practicing Positive Psychology Coaching: Assessment, Activities and Strategies for Success*. Hoboken, NJ: John Wiley & Sons, Inc. doi: 10.1002/9781118269633
- Bodein, Y., Rose, B., and Caillaud, E. (2013). A roadmap for parametric CAD efficiency in the automotive industry. *Comp. Aided Design* 45, 1198–1214. doi: 10.1016/j.cad.2013.05.006
- Bowling, A. (2005). Just one question: if one question works. Why ask several? *J. Epidemiol. Commun. Health* 59, 342–345. doi: 10.1136/jech.2004.021204
- Bozer, G., and Jones, R. J. (2018). Understanding the factors that determine workplace coaching effectiveness: a systematic literature review. *Eur. J. Work Organ. Psychol.* 27, 342–361. doi: 10.1080/1359432X.2018.1446946
- Bozer, G., Sarros, J. C., and Santora, J. C. (2013). The role of coachee characteristics in executive coaching for effective sustainability. *J. Manag. Dev.* 32, 277–294. doi: 10.1108/02621711311318319
- Burke, J. (2018). Conceptual framework for a positive psychology coaching practice. *Coach. Psychol.* 14, 16–25.
- Burke, J., and Passmore, J. (2019). "Strengths based coaching—a positive psychology intervention," in *Theoretical Approaches to Multi-Cultural Positive Psychological Interventions*, ed. I. Rothmann (Berlin: Springer, Cham), 463–475. doi: 10.1007/978-3-030-20583-6_21
- Caputo, A. (2017). Social desirability bias in self-reported well-being measures: evidence from an online survey. *Universitas Psychol.* 16, 245–255. doi: 10.11144/javeriana.upsy16-2.sdsww
- Castiello D'Antonio, A. (2018). Coaching psychology and positive psychology in work and organizational psychology. *Psychol. Manage. J.* 21, 130–150. doi: 10.1037/mgr0000070
- Chen, G., Gully, S. M., and Eden, D. (2001). Validation of a new general self-efficacy scale. *Organ. Res. Methods* 4, 62–83. doi: 10.1177/109442810141004
- Clutterbuck, D., and Spence, G. B. (2016). "Working with goals in coaching," in *The SAGE Handbook of Coaching*, eds T. Bachkikova, G. Spence, and D. Drake (London: Sage), 218–237.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*, 2nd Edn. Hillsdale, NJ: Lawrence Earlbaum Associates.
- de Haan, E., Duckworth, A., Birch, D., and Jones, C. (2013). Executive coaching outcome research: the predictive value of common factors such as relationship, personality match and self-efficacy. *Consult. Psychol. J. Practice Res.* 65, 40–57. doi: 10.1037/a0031635
- de Haan, E., Grant, A. M., Burger, Y., and Eriksson, P. O. (2016). A large-scale study of executive and workplace coaching: the relative contributions of relationship, personality match, and self-efficacy. *Consult. Psychol. J. Practice Res.* 68:189. doi: 10.1037/cpb0000058
- Dello Russo, S., and Stoykova, P. (2015). Psychological capital intervention (PCI): a replication and extension. *Hum. Resour. Dev. Q.* 26, 329–347. doi: 10.1002/hrdq.21212
- Demerouti, E., van Eeuwijk, E., Snelder, M., and Wild, U. (2011). Assessing the effects of a "personal effectiveness" training on psychological capital, assertiveness and self-awareness using self-other agreement. *Career Dev. Intl.* 16, 60–81. doi: 10.1108/13620431111107810
- Emsza, B., Eliyana, A., and Istyarni, W. (2016). The relationship between self efficacy and readiness for change: the mediator roles of employee empowerment. *Mediterr. J. Soc. Sci.* 7, 201–206. doi: 10.5901/mjss.2016.v7n3s1p201
- Ertosun, ÖG., Erdil, O., Deniz, N., and Alpkın, L. (2015). Positive psychological capital development: a field study by the Solomon four group design. *Intl. Business Res.* 8, 102–111. doi: 10.5539/ibr.v8n10p102
- Evers, W. J. G., Brouwers, A., and Tomic, W. (2006). A quasi-experimental study on management coaching effectiveness. *Consult. Psychol. J. Practice Res.* 58, 174–182. doi: 10.1037/1065-9293.58.3.174
- Fisher, G. G., Matthews, R. A., and Gibbons, A. M. (2016). Developing and investigating the use of single-item measures in organizational research. *J. Occup. Health Psychol.* 21, 3–23. doi: 10.1037/a0039139
- Gallwey, W. T. (2014). *The Inner Game of Tennis: The Ultimate Guide to the Mental Side of Peak Performance*. New Delhi: Pan Macmillan.
- Grant, A. (2017). "Coaching as evidence-based practice: the view through a multiple-perspective model of coaching research," in *The SAGE Handbook of Coaching*, eds T. Bachkikova, G. Spence, and D. Drake (Thousand Oaks, CA: SAGE Publications Ltd), 62–83.
- Grant, A., and Greene, J. (2004). *Coach Yourself: Make Real Changes in Your Life*, 2nd Edn. London: Pearson Education UK.
- Grant, A. M. (2011a). The solution-focused inventory: a tripartite taxonomy for teaching, measuring, and conceptualizing solution-focused approaches to coaching. *Coach. Psychol.* 7, 98–106.
- Grant, A. M. (2011b). Is it time to REGROW the GROW model? Issues related to teaching coaching session structures. *Coach. Psychol.* 7, 118–126.
- Grant, A. M. (2012). Making positive change: a randomized study comparing solution-focused vs. problem-focused coaching questions. *J. Syst. Therapies* 31, 21–35. doi: 10.1521/jsyt.2012.31.2.21
- Grant, A. M. (2013a). "The efficacy of coaching," in *The Wiley-Blackwell Handbook of the Psychology of Coaching and Mentoring*, eds J. Passmore, D. Peterson, and T. Freire (Hoboken, NJ: John Wiley & Sons), 15–39. doi: 10.1002/9781118326459.ch2
- Grant, A. M. (2013b). "New perspectives On goal setting in coaching practice: an integrated model of goal-focused coaching," in *Beyond Goals: Effective Strategies for Coaching and Mentoring*, eds D. Clutterbuck, D. Megginson, and S. David (Aldershot: Gower Publishing), 55–84.
- Grant, A. M. (2014). The efficacy of executive coaching in times of organisational change. *J. Change Manag.* 14, 258–280. doi: 10.1080/14697017.2013.805159
- Grant, A. M. (2016). The third 'generation' of workplace coaching: creating a culture of quality conversations. *Coaching* 10, 37–53. doi: 10.1080/17521882.2016.1266005
- Grant, A. M. (2019). "Goals and coaching: an integrated evidence-based model of goal-focused coaching and coaching psychology," in *Handbook of Coaching Psychology: A Guide for Practitioners*, eds S. Palmer and A. Whybrow (Abingdon: Routledge), 34–50. doi: 10.4324/9781315820217-5
- Grant, A. M., Curtayne, L., and Burton, G. (2009). Executive coaching enhances goal attainment, resilience and workplace well-being: a randomised controlled study. *J. Positive Psychol.* 4, 396–407. doi: 10.1080/17439760902992456
- Grant, A. M., Green, L. S., and Rynsaardt, J. (2010). Developmental coaching for high school teachers: executive coaching goes to school. *Consult. Psychol. J. Practice Res.* 62, 151–168. doi: 10.1037/a0019212
- Grant, A. M., and O'Connor, S. A. (2010). The differential effects of solution-focused and problem-focused coaching questions: a pilot study with implications for practice. *Industrial Commercial Train.* 42, 102–111. doi: 10.1108/00197851011026090
- Grant, A. M., and O'Connor, S. A. (2018). Broadening and building solution-focused coaching: feeling good is not enough. *Coaching* 11, 165–185. doi: 10.1080/17521882.2018.1489868
- Green, L. S. (2014). "Positive education: an Australian perspective," in *Handbook of Positive Psychology in Schools*, eds M. J. Furlong, R. Gilman, and E. S. Huebner (Milton Park: Taylor & Francis), 401–415.
- Green, L. S., Oades, L. G., and Grant, A. M. (2006). Cognitive-behavioral, solution-focused life coaching: enhancing goal striving, well-being, and hope. *J. Positive Psychol.* 1, 142–149. doi: 10.1080/17439760600619849
- Green, S., and Palmer, S. (2018). "Positive psychology coaching: science into practice," in *Positive Psychology Coaching in Practice*, eds S. Green and S. Palmer (Abingdon: Routledge), 1–20. doi: 10.4324/9781315716169-1
- Green, S., and Spence, G. B. (2014). "Evidence-based coaching as a positive psychological intervention," in *The Wiley Blackwell Handbook of Positive Psychological Interventions*, eds A. C. Parks and S. Schueller (Hoboken, NJ: John Wiley & Sons), 273–285. doi: 10.1002/9781118315927.ch15
- Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Rev. Gen. Psychol.* 6, 307–324. doi: 10.1037/1089-2680.6.4.307

- Hoepfner, B. B., Kelly, J. F., Urbanoski, K. A., and Slaymaker, V. (2011). Comparative utility of a single-item versus multiple-item measure of self-efficacy in predicting relapse among young adults. *J. Substance Abuse Treat.* 41, 305–312. doi: 10.1016/j.jsat.2011.04.005
- Hsu, Y., Chun-yang, P., Pi-hui, T., and Ching-wei, T. (2019). Managerial Coaching, Job performance, and team commitment: the mediating effect of psychological capital. *Adv. Manag. Appl. Econ.* 9, 101–125.
- Idris, A. M., and Manganaro, M. (2017). Relationships between psychological capital, job satisfaction, and organizational commitment in the Saudi oil and petrochemical industries. *J. Hum. Behav. Soc. Environ.* 27, 251–269. doi: 10.1080/10911359.2017.1279098
- Ivanov, D., Das, A., and Choi, T. M. (2018). New flexibility drivers for manufacturing, supply chain and service operations. *Intl. J. Production Res.* 59, 3359–3368. doi: 10.1080/00207543.2018.1457813
- Jones, R. J., Woods, S. A., and Guillaume, Y. R. (2016). The effectiveness of workplace coaching: a meta-analysis of learning and performance outcomes from coaching. *J. Occupational Organ. Psychol.* 89, 249–277. doi: 10.1111/joop.12119
- King, L. A. (2001). The health benefits of writing about life goals. *Person. Soc. Psychol. Bull.* 27, 798–807. doi: 10.1177/0146167201277003
- Kombarakaran, F. A., Yang, J. A., Baker, M. N., and Fernandes, P. B. (2008). Executive coaching: it works! *Consult. Psychol. J. Practice Res.* 60, 78–90. doi: 10.1037/1065-9293.60.1.78
- Lai, Y., and McDowall, A. (2014). A systematic review of (SR) coaching psychology: focusing on the attributes of effective coaching psychologists. *Intl. Coach. Psychol. Rev.* 9, 118–134.
- Linley, P. A. (2008). *Average to a+: Realising Strengths in Yourself and Others*. Coventry: CAPP Press.
- Linley, P. A., and Harrington, S. (2005). Positive psychology and coaching psychology: perspectives on integration. *Coach. Psychol.* 1, 13–14.
- Linley, P. A., and Harrington, S. (2006). Strengths coaching: a potential-guided approach to coaching psychology. *Intl. Coach. Psychol. Rev.* 1, 37–46.
- Linley, P. A., Nielsen, K. M., Gillett, R., and Biswas-Diener, R. (2010). Using signature strengths in pursuit of goals: effects on goal progress, need satisfaction, and well-being, and implications for coaching psychologists. *Intl. Coach. Psychol. Rev.* 5, 6–15.
- Locke, E. A., and Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: a 35-year odyssey. *Am. Psychol.* 57:705. doi: 10.1037/0003-066X.57.9.705
- Locke, E. A., and Latham, G. P. (2006). New directions in goal-setting theory. *Curr. Direct. Psychol. Sci.* 15, 265–268. doi: 10.1111/j.1467-8721.2006.00449.x
- Lomas, T., and Ivztan, I. (2016). Second wave positive psychology: exploring the positive-negative dialectics of wellbeing. *J. Happiness Stud.* 17, 1753–1768. doi: 10.1007/s10902-015-9668-y
- Luthans, F., Avey, J. B., Avolio, B. J., Norman, S. M., and Combs, G. M. (2006). Psychological capital development: toward a micro-intervention. *J. Organ. Behav.* 27, 387–393. doi: 10.1002/job.373
- Luthans, F., Avolio, B. J., Avey, J. B., and Norman, S. M. (2007a). Positive psychological capital: measurement and relationship with performance and satisfaction. *Personnel Psychol.* 60, 541–572. doi: 10.1111/j.1744-6570.2007.00083.x
- Luthans, F., Youssef, C. M., and Avolio, B. J. (2007b). *Psychological Capital: Developing the Human Competitive Edge*. Oxford: Oxford University Press.
- Luthans, F., and Youssef-Morgan, C. M. (2017). Psychological capital: an evidence-based positive approach. *Annu. Rev. Organ. Psychol. Organ. Behav.* 4, 339–366. doi: 10.1146/annurev-orgpsych-032516-113324
- Lyubomirsky, S., and Layous, K. (2013). How do simple positive activities increase well-being? *Curr. Dir. Psychol. Sci.* 22, 57–62. doi: 10.1177/0963721412469809
- MacKie, D. (2014). The effectiveness of strength-based executive coaching in enhancing full range leadership development: a controlled study. *Consulting Psychol. J. Practice Res.* 66, 118–137. doi: 10.1037/cpb0000005
- Madden, W., Green, S., and Grant, A. M. (2011). A pilot study evaluating strengths-based coaching for primary school students: enhancing engagement and hope. *Intl. Coach. Psychol. Rev.* 6, 71–83.
- Maddux, J. E. (2016). “Self-efficacy,” in *Interpersonal and Intrapersonal Expectancies*, eds S. Trusz and P. Bel (Abingdon: Routledge), 41–46. doi: 10.4324/9781315652535-5
- Madsen, S. R., Miller, D., and John, C. R. (2005). Readiness for organizational change: do organizational commitment and social relationships in the workplace make a difference? *Hum. Resour. Dev. Q.* 16, 213–234. doi: 10.1002/hrdq.1134
- McDowall, A., and Butterworth, L. (2014). How does a brief strengths-based group coaching intervention work? *Coaching* 7, 152–163. doi: 10.1080/17521882.2014.953560
- Mendes, L., and Machado, J. (2015). Employees’ skills, manufacturing flexibility and performance: a structural equation modelling applied to the automotive industry. *Intl. J. Production Res.* 53, 4087–4101. doi: 10.1080/00207543.2014.993772
- Meyers, M. C., and van Woerkom, M. (2017). Effects of a strengths intervention on general and work-related well-being: the mediating role of positive affect. *J. Happiness Stud.* 18, 671–689. doi: 10.1007/s10902-016-9745-x
- Miglianico, M., Dubreuil, P., Miquelon, P., Bakker, A. B., and Martin-Krumm, C. (2020). Strength use in the workplace: a literature review. *J. Happiness Stud.* 21, 737–764. doi: 10.1007/s10902-019-00095-w
- Minzlaff, K. A. (2019). Organisational coaching: integrating motivational interviewing and mindfulness with cognitive behavioural coaching. *Coach. Intl. J. Theory Res. Practice* 12, 15–28. doi: 10.1080/17521882.2018.1478437
- Moen, F., and Allgood, E. (2009). Coaching and the effect on self-efficacy. *Organ. Dev. J.* 27, 69–81.
- Nagy, M. S. (2002). Using a single-item approach to measure facet job satisfaction. *J. Occupational Organ. Psychol.* 75, 77–86. doi: 10.1348/096317902167658
- Palmer, S., and Whybrow, A. (2005). The proposal to establish a special group in coaching psychology. *Coach. Psychol.* 1, 5–12.
- Parks, A. C., and Biswas-Diener, R. (2013). “Positive interventions: past, present, and future,” in *Mindfulness, Acceptance, and Positive Psychology: The Seven Foundations of Wellbeing*, eds T. Kashdan and J. Ciarrochi (Oakland, CA: Context Press), 140–165.
- Passmore, J., and Oades, L. G. (2014). Positive psychology coaching: a model for coaching practice. *Coach. Psychol.* 10, 68–70.
- Peláez, M. J., Coe, C., and Salanova, M. (2020). Facilitating work engagement and performance through strengths-based micro-coaching: a controlled trial study. *J. Happiness Stud.* 21, 1265–1284. doi: 10.1007/s10902-019-00127-5
- Peters, L. M., Flink, I. K., Boersma, K., and Linton, S. J. (2010). Manipulating optimism: can imagining a best possible self be used to increase positive future expectancies? *J. Positive Psychol.* 5, 204–211. doi: 10.1080/17439761003790963
- Petersen, K. (2015). *Authentic Leadership and Unit Outcomes: Additive and Interactive Contributions of Climate and Psychological Capital*. Doctoral dissertation, University of Bellevue, Bellevue, WA.
- Peterson, S. J., Luthans, F., Avolio, B. J., Walumbwa, F. O., and Zhang, Z. (2011). Psychological capital and employee performance: a latent growth modeling approach. *Personnel Psychol.* 64, 427–450. doi: 10.1111/j.1744-6570.2011.01215.x
- Proctor, C., Maltby, J., and Linley, P. A. (2011). Strengths use as a predictor of well-being and health-related quality of life. *J. Happiness Stud.* 12, 153–169. doi: 10.1007/s10902-009-9181-2
- Salanova, M., Llorens, S., Cifre, E., and Martínez, I. M. (2012). We need a hero! Toward a validation of the healthy and resilient organization (HERO) model. *Group Organ. Manag.* 37, 785–822. doi: 10.1177/1059601112470405
- Salanova, M., Llorens, S., and Martínez, I. (2019). “Psicología Positiva aplicada a las organizaciones,” in *Organizaciones Saludables. Una Mirada Desde La Psicología Positiva*, 1st Edn, eds M. Salanova, S. Llorens, and I. M. Martínez (Navarra: Aranzadi), 41.
- Sarkar, M., and Fletcher, D. (2016). “Developing resilience through coaching,” in *The Psychology of Sports Coaching: Research and Practice*, eds R. Thelwell, C. Harwood, and I. Greenlees (Abingdon: Routledge), 235–248.
- Schunk, D. H. (1990). Goal setting and self-efficacy during self-regulated learning. *Educ. Psychol.* 25, 71–86. doi: 10.1207/s15326985ep2501_6
- Sherlock-Storey, M., Moss, M., and Timson, S. (2013). Brief coaching for resilience during organisational change—an exploratory study. *Coach. Psychol.* 9, 19–26.
- Skinner, E. A., and Zimmer-Gembeck, M. J. (2007). The development of coping. *Annu. Rev. Psychol.* 58, 119–144. doi: 10.1146/annurev.psych.58.110405.085705

- Smither, J. W. (2011). Can psychotherapy research serve as a guide for research about executive coaching? An agenda for the next decade. *J. Business Psychol.* 26, 135–145. doi: 10.1007/s10869-011-9216-7
- Sonesh, S. C., Coultas, C. W., Lacerenza, C. N., Marlow, S. L., Benishek, L. E., and Salas, E. (2015). The power of coaching: a meta-analytic investigation. *Coach. Intl. J. Theory Res. Practice* 8, 73–95. doi: 10.1080/17521882.2015.1071418
- Spence, G. B., and Grant, A. M. (2007). Professional and peer life coaching and the enhancement of goal striving and well-being: an exploratory study. *J. Positive Psychol.* 2, 185–194. doi: 10.1080/17439760701228896
- Theeboom, T., Beersma, B., and Van Vianen, A. E. (2013). Does coaching work? A meta-analysis on the effects of coaching on individual level outcomes in an organizational context. *J. Positive Psychol.* 9, 1–18. doi: 10.1080/17439760.2013.837499
- Theeboom, T., Beersma, B., and Van Vianen, A. E. M. (2016). The differential effects of solution-focused and problem-focused coaching questions on the affect, attentional control and cognitive flexibility of undergraduate students experiencing study-related stress. *J. Positive Psychol.* 11, 460–469. doi: 10.1080/17439760.2015.1117126
- Van Wingerden, J., Derks, D., and Bakker, A. B. (2017). The impact of personal resources and job crafting interventions on work engagement and performance. *Hum. Resour. Manag.* 56, 51–67. doi: 10.1002/hrm.21758
- van Zyl, L. E., Roll, L. C., Stander, M. W., and Richter, S. (2020). Positive psychological coaching definitions and models: a systematic literature review. *Front. Psychol.* 11:793. doi: 10.3389/fpsyg.2020.00793
- Walsh, L. C., Boehm, J. K., and Lyubomirsky, S. (2018). Does happiness promote career success? Revisiting the evidence. *J. Career Assessment* 26, 199–219. doi: 10.1177/1069072717751441
- Williams, G., and Smith, A. P. (2016). Using single-item measures to examine the relationships between work, personality, and well-being in the workplace. *Psychology* 7, 753–767. doi: 10.4236/psych.2016.76078
- Wong, P. T. (2020). Second wave positive psychology's (PP 2.0) contribution to counselling psychology. *Counsel. Psychol. Q.* 32, 275–284. doi: 10.1080/09515070.2019.1671320
- Wong, P. T. P. (2016). Existential positive psychology. *Intl. J. Existential Psychol. Psychother.* 6:7.
- Youssef-Morgan, C. M., and Luthans, F. (2013). “Developing psychological capital in organizations: cognitive, affective and conative contributions of happiness,” in *Oxford Handbook of Happiness*, eds S. David, I. Boniwell, and A. C. Ayers (Oxford: Oxford University Press). doi: 10.1093/oxfordhb/9780199557257.013.0055
- Youssef-Morgan, C. M., and Luthans, F. (2015). Psychological capital and well-being. *Stress Health* 31, 180–188. doi: 10.1002/smi.2623

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Corbu, Peláez Zuberbühler and Salanova. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Corrigendum: Positive Psychology Micro-Coaching Intervention: Effects on Psychological Capital and Goal-Related Self-Efficacy

Alina Corbu*, María Josefina Peláez Zuberbühler and Marisa Salanova

WANT Research Team, Department of Social Psychology, Universitat Jaume I, Castellón de la Plana, Spain

Keywords: positive psychology coaching, goal-related self-efficacy, psychological capital, goal attainment, short-term coaching, control trial, strengths-based intervention

OPEN ACCESS

Approved by:
Frontiers Editorial Office,
Frontiers Media SA, Switzerland

***Correspondence:**
Alina Corbu
corbu@uji.es

Specialty section:
This article was submitted to
Health Psychology,
a section of the journal
Frontiers in Psychology

Received: 18 February 2021

Accepted: 19 February 2021

Published: 17 March 2021

A Corrigendum on

Positive Psychology Micro-Coaching Intervention: Effects on Psychological Capital and Goal-Related Self-Efficacy

by Corbu, A., Peláez Zuberbühler, M. J., and Salanova, M. (2021). *Front. Psychol.* 12:566293. doi: 10.3389/fpsyg.2021.566293

In the original article, the reference for Castiello D'Antonio (2018) was incorrectly written as Castiello, D., and Antonio, A. (2018). Coaching psychology and positive psychology in work and organizational psychology. *Psychol. Manage. J.* 21, 130–150. doi: 10.1037/mgr0000070

It should be Castiello D'Antonio, A. (2018). Coaching psychology and positive psychology in work and organizational psychology. *Psychol. Manage. J.* 21, 130–150. doi: 10.1037/mgr0000070

The authors apologize for this error and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

REFERENCES

Castiello D'Antonio, A. (2018). Coaching psychology and positive psychology in work and organizational psychology. *Psychol. Manage. J.* 21, 130–150. doi: 10.1037/mgr0000070

Copyright © 2021 Corbu, Peláez Zuberbühler and Salanova. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Citation:
Corbu A, Peláez Zuberbühler MJ and
Salanova M (2021) Corrigendum:
Positive Psychology Micro-Coaching
Intervention: Effects on Psychological
Capital and Goal-Related Self-Efficacy.
Front. Psychol. 12:669283.
doi: 10.3389/fpsyg.2021.669283



Improving Care for Deinstitutionalized People With Mental Disorders: Experiences of the Use of Knowledge Translation Tools

Izabela Fulone¹, Jorge Otavio Maia Barreto², Silvio Barberato-Filho¹,
Cristiane de Cássia Bergamaschi¹, Marcus Tolentino Silva¹ and Luciane Cruz Lopes^{1*}

¹ Pharmaceutical Sciences Graduate Course, University of Sorocaba, Sorocaba, Brazil, ² Fiocruz School of Government, Fiocruz Brasília, Oswaldo Cruz Foundation, Brasília, Brazil

OPEN ACCESS

Edited by:

Wenjie Duan,
East China University of Science and
Technology, China

Reviewed by:

Daniela Oliveira De Melo,
Federal University of São Paulo, Brazil
Raluca Sfetcu,
Spiru Haret University, Romania

*Correspondence:

Luciane Cruz Lopes
luciane.lopes@prof.uniso.br;
luslopesbr@gmail.com

Specialty section:

This article was submitted to
Public Mental Health,
a section of the journal
Frontiers in Psychiatry

Received: 22 June 2020

Accepted: 29 March 2021

Published: 26 April 2021

Citation:

Fulone I, Barreto JOM,
Barberato-Filho S, Bergamaschi CdC,
Silva MT and Lopes LC (2021)
Improving Care for Deinstitutionalized
People With Mental Disorders:
Experiences of the Use of Knowledge
Translation Tools.
Front. Psychiatry 12:575108.
doi: 10.3389/fpsy.2021.575108

Background: The deinstitutionalization process is complex, long-term and many countries fail to achieve progress and consolidation. Informing decision-makers about appropriate strategies and changes in mental health policies can be a key factor for it. This study aimed to develop an evidence brief to summarize the best available evidence to improve care for deinstitutionalized patients with severe mental disorders in the community.

Methods: We used the SUPPORT (Supporting Policy Relevant Reviews and Trials) tools to elaborate the evidence brief and to organize a policy dialogue with 24 stakeholders. A systematic search was performed in 10 electronic databases and the methodological quality of systematic reviews (SRs) was assessed by AMSTAR 2.

Results: Fifteen SRs were included (comprising 378 studies and 69,736 participants), of varying methodological quality (3 high-quality SRs, 2 moderate-quality SRs, 7 low-quality SRs, 3 critically low SRs). Six strategies were identified: (i). Psychoeducation; (ii). Anti-stigma programs, (iii). Intensive case management; (iv). Community mental health teams; (v). Assisted living; and (vi). Interventions for acute psychiatric episodes. They were associated with improvements on a global status, satisfaction with the service, reduction on relapse, and hospitalization. Challenges to implementation of any of them included: stigma, the shortage of specialized human resources, limited political and budgetary support.

Conclusions: These strategies could guide future actions and policymaking to improve mental health outcomes.

Keywords: evidence-informed policy, knowledge translation, deinstitutionalization, mental health, community mental health services

BACKGROUND

Deinstitutionalization is the procedure of shifting the care and support from long-stay psychiatric hospitals to community mental health services for patients diagnosed with severe mental disorders (1). This procedure works in two ways. The first concentrates on reducing the population size of mental institutions. The second emphasizes reforming psychiatric care and developing special

services to reduce dependence, isolation and other behaviors that make it difficult for patients to adjust to life outside of care (2).

Deinstitutionalization emerged in the post-World War II period in the 1950s in the US and the UK due to several factors, such as poor and inhumane living conditions, human rights violations, harmful treatment practices, the introduction of more effective psychotropic drugs and the high cost of mental hospitals (3). Although many countries have advanced and reached positive levels in this process, such as USA, England, Italy, Germany and UK, others are still starting the process and are facing many problems (4). Many challenges remain in low- and middle-income countries, Eastern Europe, and Eastern and Southeastern Asian countries (5, 6).

This complex process entails ensuring access to and developing special alternative community services for the care of the physical and mental health of the mentally ill, non-institutionalized population, with the aim to improve quality of life, ensure citizenship and promote social inclusion (2, 7).

Many countries fail because they close institutions without careful planning and without implementing community (8). Failures to establish basic infrastructure, to diversity and to integrate the mental health services are the most common (9). This fact can have serious effects such as homelessness, marginalization, and “reinstitutionalization” or “transinstitutionalization” into prisons or asylums as well as worsening psychiatric conditions and crowding emergency department (10).

Informing decision makers about positive strategies and appropriate changes in mental health policies could be a key factor for mental healthcare development (10, 11). Considering Brazil, as a case scenario, this study aimed to identify effective

strategies to improve care for deinstitutionalized patients with mental disorders in the community, through the use of knowledge translation tools.

METHOD

The SUPPORT Policy relevant Reviews and Trials (SUPPORT) tools (12, 13) were used to guide the process as methods to obtain evidence to inform health policymaking and to develop an evidence brief and to organize the policy dialogue, **Figure 1**.

Eligibility Criteria of the Studies

Inclusion Criteria

Participants

Patients 18 years of age and older suffering from severe and persistent non-affective mental disorders (schizophrenia and schizophreniform, schizoaffective or schizotypal disorders or multiple diagnoses) who were or not institutionalized in psychiatric hospitals.

Interventions

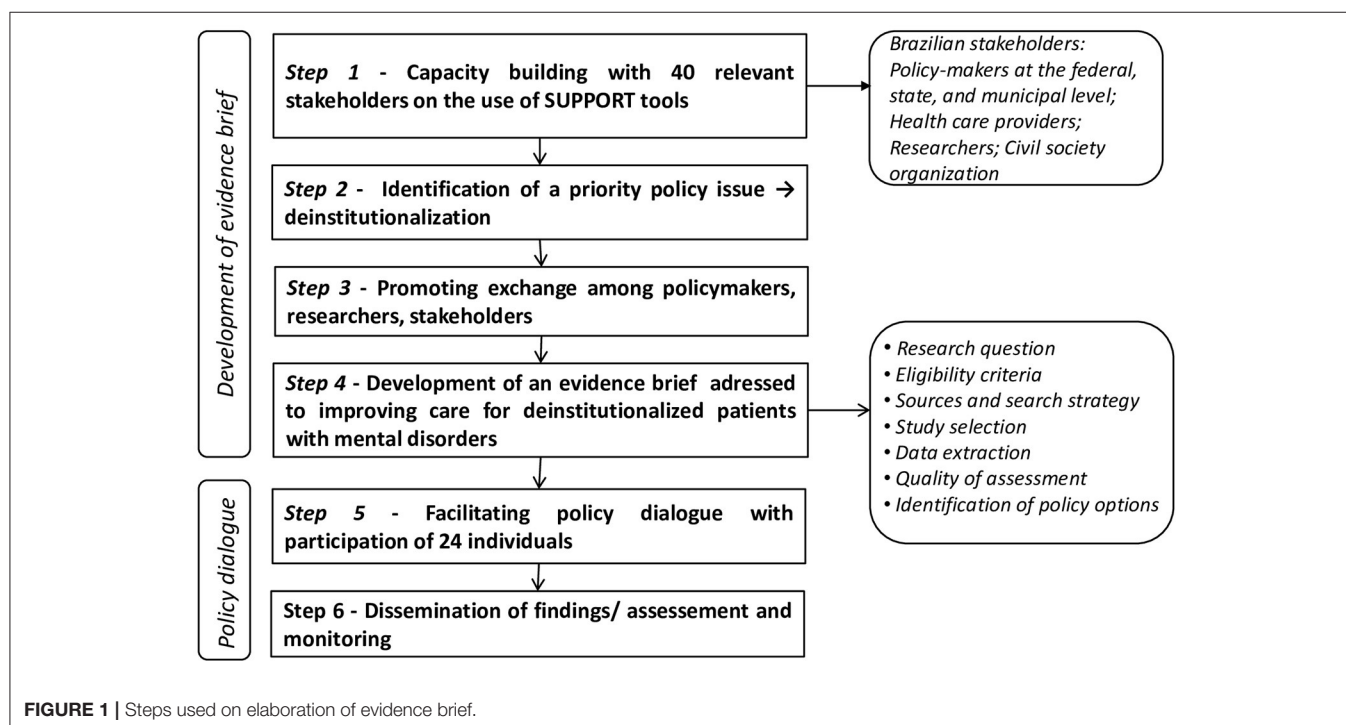
Strategies for outpatient follow-up and care in the community.

Comparator

Comparison with usual/standard care, other strategies for outpatient follow-up and care in the community or nothing.

Outcome

Compliance with medication, relapse, satisfaction with the service, internalized stigma reduction, reduction in stigmatizing attitudes, hospitalization, contacts with mental health services, improve of the global and mental state, social rehabilitation



status, quality of life, death by suicide, stability, equity, harms and costs.

Timing

Any duration of follow-up.

Studies Design

Systematic reviews (SR), overview of SRs and economic assessment studies. We selected these study designs because they are at the top of the hierarchy of evidence pyramid.

Exclusion Criteria

We excluded articles that evaluated only the clinical outcomes related to psychiatric patients without providing information regarding management strategies, actions and/or methodologies for the process of monitoring deinstitutionalized patients, as well as outdated SRs whose topics have been addressed in updated SRs. Studies that reported results only for patients with mild mental disorders or with dementia or intellectual disorders or substance abuse or for people with mental disorders who were already living on the street (homeless) were excluded.

Sources of Information and Search Strategy

The electronic search of eligible studies was performed in the following databases until 13 January 2020: Virtual Health Library, Cochrane Library, PubMed, Health Evidence, Rx for Change, Cumulative Index to Nursing and Allied Health Literature, Excerpta Medica Database, American Psychological Association, Epistemonikos, Latin American & Caribbean Health Sciences Literature.

We also screened the reference lists of secondary studies and manually searched for references in journals and databases. We did not apply any limits on language or date of publication. The search strategy in Medline (Ovid) is presented in **Supplementary Data Sheet 1**. We adapted it to each database.

Study Selection Process and Data Extraction

Two review authors (IF, CB) independently screened the titles and abstracts for inclusion. Then, the full texts of potentially relevant references were retrieved, and two review authors (IF, CB) independently assessed the full-text articles for inclusion and extracted all relevant data. Any disagreements were resolved by a third review author (LCL). Data extracted included the following: author, year, type and number of primary studies included, year range of the primary studies, setting of included studies, total number of subjects, type of intervention and of comparator, type of outcome measure and main outcomes.

We also checked barriers and facilitators general for implement strategies for outpatient follow-up and care in the community and their inequities. To verify inequities for implement health policies, we used the PROGRESS (place of residence, race/ethnicity/culture/language, occupation, gender/sex, religion, education, socioeconomic status, and social capital) framework to ensure considerations for health equity (14).

Quality Assessment of Systematic Reviews

The quality of the SRs was assessed using the updated “A Measurement tool for Assessing the Methodological Quality of Systematic Reviews” (AMSTAR 2) (15).

AMSTAR 2 considers seven critical domains (items 2, 4, 7, 9, 11, 13, and 15) to rate the overall confidence in the findings of each SR.

Organization of Policy Dialogue

We used SUPPORT tools to guide the organization of the policy dialogue and to discuss the evidence brief and validate it with relevant stakeholders involved in the problem. From meetings with policy-makers researchers and stakeholders, key informants were identified and invited to participate of the policy dialogue. Twenty-four individuals participated of policy dialogue (5 of them were policymakers, 11 health care providers, 6 researches, 1 from civil society organization and 1 representant from public defense). The process, outcomes and lessons learnt during this dialogue were showed in details in elsewhere (16).

A preliminary version of the evidence brief was pre-circulated among participants and the strategies and key implementation considerations were discussed exhaustibly during the policy dialogue. After, the evidence brief was aligned and updated according to the deliberations and outputs produced.

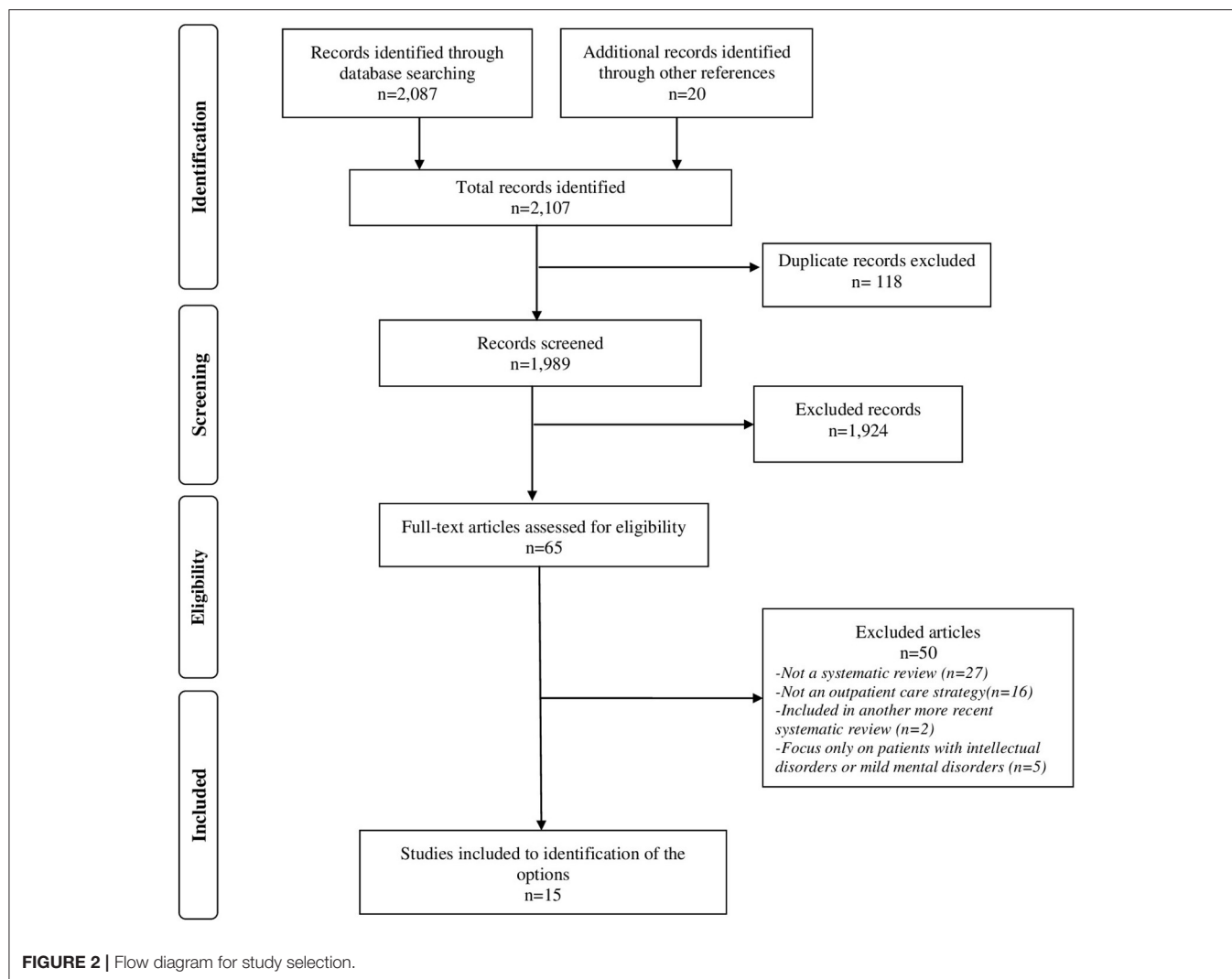
RESULTS

Overall, 2,107 references were retrieved. Sixty-five studies were selected and examined in detail; fifteen SRs met the scope of this evidence brief and were selected to develop the policy strategies (see detailed results reported in **Supplementary Table 1**), while fifty studies were excluded (see **Supplementary Table 2**). A flow diagram illustrates the inclusion process, **Figure 2**.

From the 15 SRs, we identified six strategies to improve care for deinstitutionalized patients: (i). psychoeducation; (ii). anti-stigma programmes; (iii). intensive case management; (iv). community mental health teams; (v). assisted living; and (vi). interventions for acute psychiatric episodes. The main characteristics of the included reviews are summarized in **Table 1**.

As already noted in the **Table 1**, three (20.0%) SRs were considered high in quality, two (13.3%) moderate, seven (46.6%) low, and three (20.0%) critically low. Weaknesses were found in items 3, 4, 7, and 10. Thirteen (86.6%) of the included SRs failed to provide justification for their selection of study designs (item 3). A comprehensive literature search strategy was revealed in seven (46.6%) of the SRs, but the remaining studies failed to do so because they did not show a justification for language restrictions or did not search for gray literature (item 4, critical domain). Eight (53.3%) of them did not provide a list of excluded studies that were read in full-text form or report reasons for their exclusion (item 7, critical domain). Twelve (80.0%) of them did not report on the sources of funding for the studies included (item 10), **Figure 3**. AMSTAR results are provided in **Supplementary Table 3**.

No potential harm or cost-effectiveness was pointed out in the SRs included. There are few cost data, and no conclusions



regarding cost-effectiveness can be drawn. The findings of each strategy showed in the SRs are summarized as follow.

Strategy 1: Psychoeducation

Four SRs (17–20) addressed the effectiveness of psycho-educational programmes as a means of improving care for severely mentally ill people.

Psychoeducation involves any group or individual programme with a combination of motivational, educational and behavioral techniques focused on knowledge and understanding of the disease, symptoms, treatment, prognosis and rehabilitation, and it should be directed to the patient, caregivers and family members (19).

When this intervention is addressed to patients, it promotes greater adherence to treatment in the short, medium and long term, lower relapse rates in medium and long term and greater satisfaction with the service (19, 20).

Nevertheless, psychoeducation with families ($n = 18$ studies) showed more effective in reducing relapse/rehospitalization (follow-up 7–12 months) than psychoeducation without families.

The effect size for knowledge was small and was no significant effect on symptoms change, functioning and medication adherence. At longer follow-up (>12 months), the results on relapse/rehospitalization also failed (18).

Aside from that, educational interventions offered to caregivers or families in comparison to all other treatments, standard care or other types of active treatments have shown benefits over relapse in the first 12 months, but this effect was not sustainable between 1–2 years. The single-family interventions demonstrated greater effectiveness over group family treatments to prevent readmissions in the long term (1–2 years) and to reduce the burden (17). The both SRs (17, 18) suggest the additional effort to integrating families and to offering psychoeducational interventions for longer periods.

Strategy 2: Anti-stigma Programs

Four SRs were addressed the reduction of stigma (21–24). This option came after discussions about the Psychoeducation strategy with stakeholders. As some studies showed specific results, directing psychoeducation to reduce stigma, the participants

TABLE 1 | Characteristics of the included systematic reviews.

Author, Year	Number of studies included	Year range of the studies	Total number of subjects	Main outcomes	Quality of assessment (AMSTAR 2)
Strategy 1: psychoeducation					
Pilling, 2002**	18	1978–1997	1,467	- Relapse - Readmission - Death (suicide) - Burden, expressed emotion - Medication compliance	critically low
Lincoln, 2007**	18	1982–2005	1,534	- Relapse/rehospitalization - Symptoms - Knowledge - Functional outcome - Medication adherence	low
Xia, 2011**	44	1988–2009	5,142	- Compliance with medication and Follow- up - Relapse - Satisfaction with the service	moderate
Zhao, 2015*	20	1988–2009	2,337	- Compliance with medication and follow- up - Relapse	high
Strategy 2: anti-stigma programs					
Tsang, 2016**	14	2007–2015	1,131	- Reduction in internalized stigma	critically low
Wood, 2016**	12	2002–2016	714	- Improvement in internalized stigma	low
Xu, 2017**	17	2011–2015	2,373	- Effects on perceived/ experienced/anticipated stigma - Effects on self-prejudice - Effects on stigma coping	critically low
Morgan, 2018**	62	2001–2017	9,002	- Reductions in stigmatizing attitudes - Desire for social distance	low
Strategy 3: intensive case management					
Burns, 2007**	29	1988–2005	1,996	- Days of hospitalization	low
Dieterich, 2017**	40	1985–2005	7,524	- Hospitalization - Improve of global state - Reducing death by suicide - Social functioning (on unemployment)	high
Strategy 4: community mental health teams					
Malone, 2017**	3	1992–1998	587	- Death (suicide /suspicious circumstances) - Hospitalization - Satisfaction with the service - Social functioning	moderate
Strategy 5: assisted living					
Leff, 2009*	44	1983–2006	13,436	- Housing stability - Reduction in psychiatric symptoms - Reduction in hospitalization - Reduction in alcohol abuse or drug abuse - Increased employment - Increased satisfaction	low
McPherson, 2018*	28 [£]	1990–2017	6,516 [#]	- Housing stability - Hospitalization - Symptoms of mental illness - Social functioning	low
Strategy 6: interventions for acute psychiatric episodes					
Murphy, 2015**	8	1964–2010	1,144	- Hospitalization - Improve mental state and global state - Satisfaction with the care - Quality of life - Burden family	high
Wheeler, 2015*	21 ^{&}	1993–2011	14,833 ^{##}	- Hospital admissions - Characteristic of service	low

*Systematic review without meta-analysis; **Systematic review with meta-analysis; [£]Studies included in deinstitutionalization subgroup; [&]Studies included in the quantitative analysis;

[#]One study did not declare total n; ^{##}Seven studies did not declare total n.

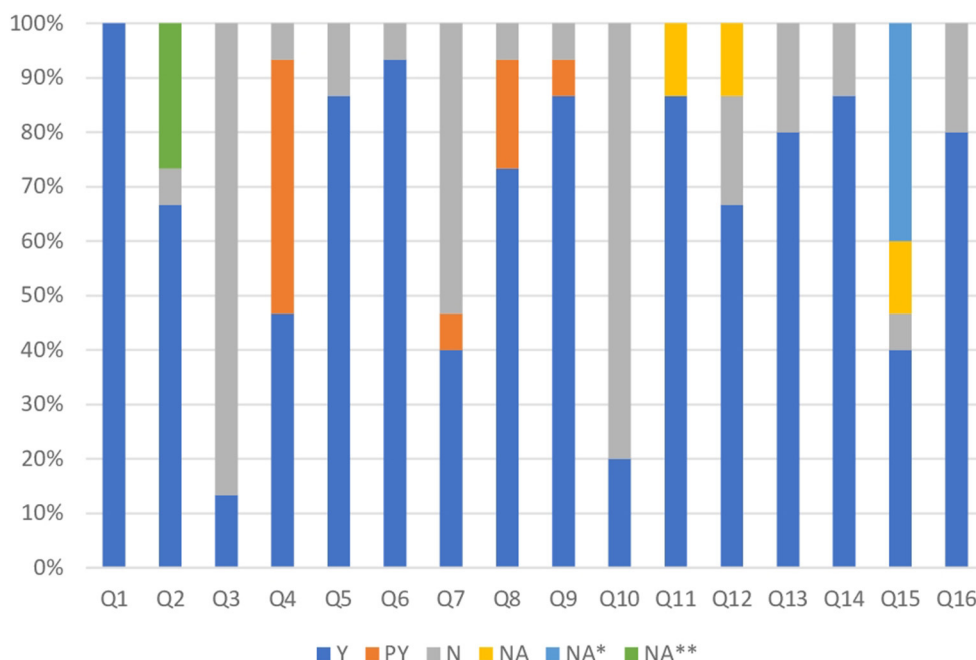


FIGURE 3 | Comparison of quality assessment of included reviews using AMSTAR 2 criteria. Y, yes; PY, partial yes; N, no; NA, not applicable; NA*, not applicable because there were 10 or fewer studies per outcome; NA**, the systematic review protocol records base PROSPERO was available virtually in February 2011.

suggested separating psychoeducation strategies that focused directly on reducing stigma and those related to the education of family members or patients to learn about the disease

Many interventions have been developed to reduce the negative impact, the discrimination and misconceptions around the public stigma and of internalized stigma toward people with severe and persistent mental disorders (24). The main approaches include psychoeducation, combined or not with other components, such as cognitive behavioral therapy, social skills training or group discussion elements (21–23).

Some SRs (21, 23) showed that psychoeducation was effective to reduce the internalized stigma and the self-prejudice. On the other hand, a SR ($n = 12$ studies) involving psychoeducation and/or other of psychosocial interventions (cognitive behavior therapy, social skills training, photovoice) did not found significant changes in internalized stigma at the end of the therapy or at follow up to 4 months (22).

To reduce the public stigma toward people with severe mental illness, education interventions, mixed or not with contact interventions, showed immediate positive effects. At the end of the treatment, stigmatizing attitudes and desire for social distance were reduced, but at follow up 6 months, the benefits were not sustainable (24).

Strategy 3: Intensive Case Management

Two SRs (25, 26) highlighted the effectiveness of the practice of intensive case management. This strategy is characterized by an integrated model of health care delivery and follow-up that aims to provide systematic, flexible and coordinated mental health

services according to the health and social care needs of people with severe mental illness (26).

This intervention model decreased the number of days of hospitalization, increased the retention in care, improved global state and promoted greater patient satisfaction (26). Nevertheless, other studies have shown a reduction in the hospitalization rate only for patients at high risk of hospital admission, who tend to use more of these services than patients who already have low hospitalization rates (25).

Strategy 4: Community Mental Health Teams

One SR (27) addressed the effectiveness of community mental health teams. A community mental health team is a multidisciplinary team composed of specialists in mental health, who should lead and be responsible for providing expert assessment, treatment and care to the population of a given area in the community (27). These team is different of other services including crisis intervention (24 h service) or assertive community treatment (restricted caseloads).

It can be a way of integrating mental health into primary care. In addition, having greater contact with patients and families makes it possible to detect and intervene earlier in some serious symptoms or other diagnoses (28). Community mental health team follow-up promotes greater patient satisfaction with the service, lower hospital admission rate than standard care (without community mental health teams) and improvement of social functioning including police contacts. Although the

evidence is still insufficient, follow-up performed by such teams tends to reduce the number of suicides (27).

Strategy 5: Assisted Living

Two SRs (29, 30) addressed the benefits of community housing models for deinstitutionalized persons with severe mental illness. Post-deinstitutionalization, assisted living emerged due to the housing needs for former patients of large psychiatric hospitals who had been resettled in the community. Housing models vary in terms of their physical structure, staffing arrangements, levels of support, recovery focus, discharge and move-on policies (30).

Patients living in residential care and treatment model housing have shown greater stability, reduction in hospitalization and in psychiatric symptoms (29).

Strategy 6: Interventions for Acute Psychiatric Episodes

Two SRs (31, 32) addressed the effectiveness of models for interventions for acute psychiatric episodes. Interventions in acute psychiatric episodes should provide rapid assessment and intensive treatment for a brief period through a multidisciplinary team specialized in crisis situations either in a community setting or in the patient's own home. Such interventions represent a viable alternative that is less stigmatized than standard hospitalization (31).

Despite the results on hospitalization, improvement in mental and global status, and quality of life remains inconclusive, crisis interventions promote greater satisfaction with treatment and less burden on family compared to standard care received in a hospital (31). In other SR ($n = 21$ studies), it was not feasible to summarize the data due to the variety of design of included studies, but suggest to reduce hospitalizations and highlight some key components that should be available: 24-h service provision, including psychiatrists, high-quality staff training and integration with other local mental health services (32).

Implementation Barriers and Inequities

The planning and implementation in mental health policies should consider the characteristics of the option itself, the outer setting (social, political and economic context), the inner setting (structural characteristics, relationships) and the characteristics of the individuals involved (knowledge, skills) (33). Some of these factors can represent barriers that are likely to be encountered at the political, professional, patient and societal levels. Some common barriers in mental health are showed in **Supplementary Table 4**.

Stigma, discrimination, cultural beliefs and negative societal responses to people with mental illness are recognized as one of the largest barriers in the mental health area (34), remaining strong in society, in patients and among health professionals. It is necessary to raise public awareness and promote education campaigns (35).

Although the staff composition of health professionals varies by setting, population needs, the type of health system and the availability of financial resources, the shortage of appropriate human resources for mental health, particularly in low-middle-income countries, is recognized as a global concern (36, 37).

Establishing effective training programmes, clear documentation practices and supervision about quality of services are strategies recommended (36, 38).

Low political priority, insufficiency resource, knowledge-action gap in policy implementation and lack of partnership formation with other sectors are important obstacles that needs to be overcome (33, 37, 39).

Cooperation from all levels of government to implement and review mental health policy, configuration of proactive partnerships and the adoption of scientific implementation frameworks are facilitators to improve the care practice (11, 33, 37).

Half the strategies implemented delivered effective outcomes in the replicate sites due contextual differences, inequalities and the unpredictable behavior of the system (39). Some groups or places may be potentially disadvantaged or under different conditions, which obscures the effectiveness of an option.

People with low socioeconomic conditions, with physical disability or frailty, and who lives in rural area were considered to be potentially disadvantaged. Poor rural people have few or no local treatment options and their access in the city is expensive. They are also less likely to achieve long term follow-up (9). Strategies to overcome these inequities include integration to primary care, subsidy for treatment and facility transportation in emergency cases (35). WHO recommends the integration and strength of primary healthcare to mental health services in order to decrease the global gap in mental health (40).

Main Contributions Obtained in the Policy Dialogue

- Psychoeducation was the strategy that received the most endorsement from all participants of the policy dialogue;
- Anti-stigma programs were added as one of the post-dialogue suggestions;
- Intensive case management and assisted living were recognized as one the main axes of deinstitutionalization, but there is the need to improve their structure and organization;
- Despite not have in Brazil, community mental health teams were considered promising strategy.
- Interventions for acute psychiatric episodes were realigned post-dialogue and were the most discussed. The prominent discussion emerged around ensuring a brief and intensive treatment, and defending the end of hospitalization for long periods.
- The deliberations related to the implementation barriers focused mainly on the stigma, lack of funding and political will. Participants emphasized that the stigma of being labeled as a deinstitutionalized patient needs to change and can no longer be considered as an unpredictable, dangerous individual, unable to live in the community. Perhaps, overcoming stigma is the biggest challenge.

DISCUSSION

The available evidence from 15 SRs covered six different types of strategies that can lead to meaningful improvements in care for

deinstitutionalized people with mental disorders and their health outcomes. They can complement each other, but not necessarily have to be employed together. The outcomes, estimates of effects, and the quality of SRs varied. The paucity of studies and conflicting evidence has been observed in some strategies. The deliberations obtained in the policy dialogue contributed to align the strategies, to improve the evidence brief and validate it.

There was extensive evidence for the positive effects of the psychoeducation (strategy 1), but the true benefits and cost-effectiveness in the short and long-term still are uncertain (19, 20), as well as whether it is better to apply group delivery rather than individually, or only with patients or with the family (17, 18). Similarly, the wide variety of combined strategies in the anti-stigma programs (strategy 2) also showed conflicting results and it was unfeasible to determine whether there is any recommendation on which strategy or duration is most effective (21–24).

The lack of fidelity to maintain and apply key components in the structure and organization aspect of an original model as Intensive case management (strategy 3) could explain the variation in some outcomes (e.g., hospitalization) between studies and the level of effectiveness (25, 26). Not all studies measured fidelity adequately to the original strategy.

Despite the number of primary studies existing in some strategies such as Assisted living (strategy 5) and Interventions for acute psychiatric episodes (strategy 6), the wide variety of instruments used to measure clinical and non-clinical results, the heterogeneity of the retrieved studies designs and the definitional inconsistency makes it impossible to combine some data, which reduces the power of conclusion and the degree of evidence confidence. Two SRs were unable to summarize the data due to the heterogeneity of the recovered study designs (30, 32). The lack of consistency in the definition of active components or terminology used in the published literature about assisted living models (strategy 5) has limited the evidence on which model is most effective and safe (30).

Whilst we found more studies within of some strategies, there was the strategy 3, Community mental health teams, with only a single SR, which included three trials (27). Some evidence is scarce and much more robust studies are needed.

We were unable to investigate the potential for harms associated with these strategies that might influence benefits, because any SR reported adverse events. Cost-effectiveness and consequences of implementing any of these strategies as a routine service was not assessed. Much more studies should be undertaken in this area to explore the costs, to measure the health economic outcomes and the harms of the strategies, in order to make them more attractive for managers and policymakers.

Considerations about the implementation barriers of any of the strategies are complex should be interpreted with caution. Barriers and facilities have dynamic nature, change over time and may be more or less affected according the extern context (41).

There is a real need to support evidence-based policy making. Combining research evidence with views, experiences and tacit knowledge from relevant stakeholders is a promising strategy. Policy dialogue strengthened interactions with policy makers, stakeholders and research and raised awareness of

the importance of applying evidence to policies. Positive lessons have occurred in other countries (42, 43) and need to be disseminated worldwide, especially in low- and middle-income countries.

STRENGTHS AND LIMITATIONS

This study evaluated a wide range of interventions and summarized in a single document the best evidence available to improve the care of patients with deinstitutionalized mental disorders in the community, including some implementation barriers, facilitators, and equity considerations. This policy brief is not restricted to only one audience, can reach mental health professionals, researchers, and policymakers and likely easier to be understood. It is also one of the few studies that reported experiences of use of knowledge translation tools combining development of an evidence brief and organization of policy dialogue in a middle-income country and addressed the issue of deinstitutionalization.

The majority of the SRs focused on high-income countries (United States of America, the United Kingdom, Canada), which revealed a gap in low-income countries. Considering Brazil as a case scenario, we could verify that although it has implemented several of these strategies, we did not find any SR including assessment of them in the Brazilian setting.

Some strategies were based on studies with low quality of evidence, limiting confidence in their findings. Some outcomes are under-researched such as cost, cost-benefit, harms, implementation barriers and equity.

Further studies should be conducted in low-middle-income countries because several factors are very different and, in some cases, deficient. There is a need to know the challenges they may face and whether the results are generalizable for these contexts.

More rigorous methods are needed to improve the validity of SRs, to provide high-quality evidence, and to increase the applicability of the findings by decision-makers. In addition, much more effects need to be explored and well-reported. Emphasis should be given to underreported outcomes, which involve patient outcomes and the advance of public health, harms, costs and inequities.

CONCLUSIONS

This evidence brief showed six strategies based on the best evidence available and considering the strengths and weaknesses of each to improve care for deinstitutionalized people with severe mental disorders. The intention is not to advocate specific strategies or to for close discussion but to inform and to promote deliberations among policymakers and stakeholders with regard to the preferred strategies and their planning of implementation according to needs, financial resources, feasibility, the local reality and engagement among key actors. Thus, far, there is no consensus regarding which key components and implementation strategies

are essential for successful mental health care service in the community.

DATA AVAILABILITY STATEMENT

The data generated and analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTIONS

LL conceptualized the study. IF, JB, and LL designed the study. IF, LL, SB-F, CB, and MS participated in the study search strategy process. IF and CB participated in the study selection process and extraction of data. IF and LL assessed the quality of studies

and drafted the manuscript. All authors contributed to and have approved the final manuscript.

FUNDING

This work was supported by FAPESP grants 2017/20668-7, EVIPNet-Brazil/Ministry of Health SCON2017-02502, and Dom Aguirre Foundation.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsy.2021.575108/full#supplementary-material>

REFERENCES

1. Fakhoury W, Priebe S. Deinstitutionalization and reinstitutionalization: major changes in the provision of mental healthcare. *Psychiatry*. (2007) 6:313–6. doi: 10.1016/j.mpps.2007.05.008
2. Lamb HR, Bachrach LL. Some perspectives on deinstitutionalization. *Psychiatr Serv*. (2001) 52:1039–45. doi: 10.1176/appi.ps.52.8.1039
3. Taylor Salisbury T, Killaspy H, King M. An international comparison of the deinstitutionalisation of mental health care: development and findings of the Mental Health Services Deinstitutionalisation Measure (MENDit). *BMC Psychiatry*. (2016) 16:54. doi: 10.1186/s12888-016-0762-4
4. Taylor Salisbury T, Killaspy H, King M. The relationship between deinstitutionalization and quality of care in longer-term psychiatric and social care facilities in Europe: a cross-sectional study. *Eur Psychiatry*. (2017) 42:95–102. doi: 10.1016/j.eurpsy.2016.11.011
5. Kunitoh N. From hospital to the community: the influence of deinstitutionalization on discharged long-stay psychiatric patients. *Psychiatry Clin Neurosci*. (2013) 67:384–96. doi: 10.1111/pcn.12071
6. Krupchanka D, Winkler P. State of mental healthcare systems in Eastern Europe: do we really understand what is going on? *BJPsych Int*. (2016) 13:96–9. doi: 10.1192/s2056474000001446
7. Razzouk D. Accommodation and Health Costs of Deinstitutionalized People with Mental Illness Living in Residential Services in Brazil. *Pharmacoecon Open*. (2019) 3:31–42. doi: 10.1007/s41669-018-0078-z
8. WHO (2007). World Health Organization. The optimal mix of services. Available online at: https://www.who.int/mental_health/policy/services/2_Optimal%20Mix%20of%20Services_Infosheet.pdf (accessed 15, 2019).
9. Akiyama T, Chandra N, Chen CN, Ganesan M, Koyama A, Kua EE, et al. Asian models of excellence in psychiatric care and rehabilitation. *Int Rev Psychiatry*. (2008) 20:445–51. doi: 10.1080/09540260802397537
10. Winkler P, Barrett B, Mccrone P, Csemy L, Janouskova M, Hoschl C. Deinstitutionalised patients, homelessness and imprisonment: systematic review. *Br J Psychiatry*. (2016) 208:421–8. doi: 10.1192/bjp.bp.114.161943
11. Bhugra D, Pathare S, Joshi R, Kalra G, Torales J, Ventriglio A. A review of mental health policies from Commonwealth countries. *Int J Soc Psychiatry*. (2018) 64:3–8. doi: 10.1177/0020764017745108
12. Lavis JN, Permaand G, Oxman AD, Lewin S, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP) 13: preparing and using policy briefs to support evidence-informed policymaking. *Health Res Policy Syst*. (2009) 7(Suppl 1):S13. doi: 10.1186/1478-4505-7-s1-S13
13. Lavis JN, Boyko JA, Oxman AD, Lewin S, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP) 14: organising and using policy dialogues to support evidence-informed policymaking. *Health Res Policy Syst*. (2009) 7(Suppl 1):S14. doi: 10.1186/1478-4505-7-s1-S14
14. O'Neill J, Tabish H, Welch V, Petticrew M, Pottie K, Clarke M, et al. Applying an equity lens to interventions: using PROGRESS ensures consideration of socially stratifying factors to illuminate inequities in health. *J Clin Epidemiol*. (2014) 67:56–64. doi: 10.1016/j.jclinepi.2013.08.005
15. Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ*. (2017) 358:j4008. doi: 10.1136/bmj.j4008
16. Fulone I, Barreto JOM, Barberato-Filho S, De Carvalho MH, Lopes LC. Knowledge translation for improving the care of deinstitutionalized people with severe mental illness in health policy. *Front Pharmacol*. (2019) 10:1470. doi: 10.3389/fphar.2019.01470
17. Pilling S, Bebbington P, Kuipers E, Garety P, Geddes J, Orbach G, et al. Psychological treatments in schizophrenia: I. Meta-analysis of family intervention and cognitive behaviour therapy. *Psychol Med*. (2002) 32:763–82. doi: 10.1017/s0033291702005895
18. Lincoln TM, Wilhelm K, Nestoriuc Y. Effectiveness of psychoeducation for relapse, symptoms, knowledge, adherence and functioning in psychotic disorders: a meta-analysis. *Schizophr Res*. (2007) 96:232–45. doi: 10.1016/j.schres.2007.07.022
19. Xia J, Merinder LB, Belgamwar MR. Psychoeducation for schizophrenia. *Cochrane Database Syst Rev*. (2011) 6:CD002831. doi: 10.1002/14651858.CD002831.pub2
20. Zhao S, Sampson S, Xia J, Jayaram MB. Psychoeducation (brief) for people with serious mental illness. *Cochrane Database Syst Rev*. (2015) 4:CD010823. doi: 10.1002/14651858.CD010823.pub2
21. Tsang HW, Ching SC, Tang KH, Lam HT, Law PY, Wan CN. Therapeutic intervention for internalized stigma of severe mental illness: a systematic review and meta-analysis. *Schizophr Res*. (2016) 173:45–53. doi: 10.1016/j.schres.2016.02.013
22. Wood L, Byrne R, Varese F, Morrison AP. Psychosocial interventions for internalised stigma in people with a schizophrenia-spectrum diagnosis: a systematic narrative synthesis and meta-analysis. *Schizophr Res*. (2016) 176:291–303. doi: 10.1016/j.schres.2016.05.001
23. Xu Z, Huang F, Kusters M, Rusch N. Challenging mental health related stigma in China: systematic review and meta-analysis. II Interventions among people with mental illness. *Psychiatry Res*. (2017) 255:457–64. doi: 10.1016/j.psychres.2017.05.002
24. Morgan AJ, Reavley NJ, Ross A, Too LS, Jorm AF. Interventions to reduce stigma towards people with severe mental illness: systematic review and meta-analysis. *J Psychiatr Res*. (2018) 103:120–33. doi: 10.1016/j.jpsychires.2018.05.017
25. Burns T, Catty J, Dash M, Roberts C, Lockwood A, Marshall M. Use of intensive case management to reduce time in hospital in people with severe mental illness: systematic review and meta-regression. *BMJ*. (2007) 335:336. doi: 10.1136/bmj.39251.599.259.55

26. Dieterich M, Irving CB, Park B, Marshall M. Intensive case management for severe mental illness. *Cochrane Database Syst Rev.* (2017) 1:CD007906. doi: 10.1002/14651858.CD007906.pub3
27. Malone D, Newron-Howes G, Simmonds S, Marriot S, Tyrer P. Community mental health teams (CMHTs) for people with severe mental illnesses and disordered personality. *Cochrane Database Syst Rev.* (2007) 3:CD000270. doi: 10.1002/14651858.CD000270.pub2
28. Simmonds S, Coid J, Joseph P, Marriott S, Tyrer P. Community mental health team management in severe mental illness: a systematic review. *Br J Psychiatry.* (2001) 178:497–502; discussion 503–495. doi: 10.1192/bjp.178.6.497
29. Leff HS, Chow CM, Pepin R, Conley J, Allen IE, Seaman CA. Does one size fit all? What we can and can't learn from a meta-analysis of housing models for persons with mental illness. *Psychiatr Serv.* (2009) 60:473–82. doi: 10.1176/appi.ps.60.4.473
30. Mcpherson P, Krotofil J, Killaspy H. Mental health supported accommodation services: a systematic review of mental health and psychosocial outcomes. *BMC Psychiatry.* (2018) 18:128. doi: 10.1186/s12888-018-1725-8
31. Murphy SM, Irving CB, Adams CE, Waqar M. Crisis intervention for people with severe mental illnesses. *Cochrane Database Syst Rev.* (2015) 12:CD001087. doi: 10.1002/14651858.CD001087.pub5
32. Wheeler C, Lloyd-Evans B, Churchard A, Fitzgerald C, Fullarton K, Mosse L, et al. Implementation of the Crisis Resolution Team model in adult mental health settings: a systematic review. *BMC Psychiatry.* (2015) 15:74. doi: 10.1186/s12888-015-0441-x
33. Chinman M, Woodward EN, Curran GM, Hausmann LRM. Harnessing Implementation Science to Increase the Impact of Health Equity Research. *Med Care.* (2017) 55(Suppl 9 Suppl 2):S16–23. doi: 10.1097/MLR.0000000000000769
34. WHO (2001). *World Health Organization. World Health Report 2001. Mental health: New Understanding, New Hope.* Geneva: World Health Organization (2001).
35. Hailemariam M, Fekadu A, Selamu M, Medhin G, Prince M, Hanlon C. Equitable access to integrated primary mental healthcare for people with severe mental disorders in Ethiopia: a formative study. *Int J Equity Health.* (2016) 15:121. doi: 10.1186/s12939-016-0410-0
36. Kakuma R, Minas H, Van Ginneken N, Dal Poz MR, Desiraju K, Morris JE, et al. Human resources for mental health care: current situation and strategies for action. *Lancet.* (2011) 378:1654–63. doi: 10.1016/S0140-6736(11)61093-3
37. Shen GC, Eaton J, Snowden LR. Mainstreaming mental health care in 42 countries. *Health Syst Reform.* (2017) 3:313–24. doi: 10.1080/23288604.2017.1356424
38. Woody CA, Baxter AJ, Harris MG, Siskind DJ, Whiteford HA. Identifying characteristics and practices of multidisciplinary team reviews for patients with severe mental illness: a systematic review. *Australas Psychiatry.* (2018) 26:267–75. doi: 10.1177/1039856217751783
39. Shidhaye R. Implementation Science for closing the treatment gap for mental disorders by translating evidence base into practice: experiences from the PRIME project. *Australas Psychiatry.* (2015) 23:35–7. doi: 10.1177/1039856215609771
40. Ayano G. Significance of mental health legislation for successful primary care for mental health and community mental health services: a review. *Afr J Prim Health Care Fam Med.* (2018) 10:e1–e4. doi: 10.4102/phcfm.v10i1.1429
41. Lau R, Stevenson F, Ong BN, Dziedzic K, Treweek S, Eldridge S, et al. Achieving change in primary care—causes of the evidence to practice gap: systematic reviews of reviews. *Implement Sci.* (2016) 11:40. doi: 10.1186/s13012-016-0396-4
42. Mulvale G, Chodos H, Bartram M, Mackinnon MP, Abud M. Engaging civil society through deliberative dialogue to create the first Mental Health Strategy for Canada: changing directions, changing lives. *Soc Sci Med.* (2014) 123:262–8. doi: 10.1016/j.socscimed.2014.07.029
43. Yehia F, El Jardali F. Applying knowledge translation tools to inform policy: the case of mental health in Lebanon. *Health Res Policy Syst.* (2015) 13:29. doi: 10.1186/s12961-015-0018-7

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Fulone, Barreto, Barberato-Filho, Bergamaschi, Silva and Lopes. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Fidelity Assessment Checklist Development for Community Nursing Research in Early Childhood

Lubna Anis^{1*}, Karen M. Benzies², Carol Ewashen³, Martha J. Hart^{1,4} and Nicole Letourneau^{1,4}

¹ Department of Pediatrics, Faculty of Nursing, Owerko Centre, Alberta Children's Hospital Research Institute, University of Calgary, Calgary, AB, Canada, ² Department of Pediatrics, Faculty of Nursing, University of Calgary, Calgary, AB, Canada, ³ Faculty of Nursing, University of Calgary, Calgary, AB, Canada, ⁴ Department of Community Health Sciences, Faculty of Nursing, Owerko Centre, Alberta Children's Hospital Research Institute, University of Calgary, Calgary, AB, Canada

OPEN ACCESS

Edited by:

Wanzhen Chen,
East China University of Science and
Technology, China

Reviewed by:

Carl Dunst,
Orelana Hawks Puckett Institute,
United States
Dawn Frambes,
Calvin University, United States

*Correspondence:

Lubna Anis
lanis@ucalgary.ca

Specialty section:

This article was submitted to
Public Mental Health,
a section of the journal
Frontiers in Public Health

Received: 23 November 2020

Accepted: 08 April 2021

Published: 14 May 2021

Citation:

Anis L, Benzies KM, Ewashen C,
Hart MJ and Letourneau N (2021)
Fidelity Assessment Checklist
Development for Community Nursing
Research in Early Childhood.
Front. Public Health 9:582950.
doi: 10.3389/fpubh.2021.582950

Nurses play an important role in promoting positive childhood development via early interventions intended to support parenting. Despite recognizing the need to deliver vital parenting programs, monitoring fidelity has largely been ignored. Fidelity refers to the degree to which healthcare programs follow a well-defined set of criteria specifically designed for a particular program model. With increasing demands for early intervention programs to be delivered by non-specialists, rigorous yet pragmatic strategies for maintaining fidelity are needed. This paper describes the step-by-step development and evaluation of a program fidelity measure, using the Attachment and Child Health (ATTACHTM) parenting program as an exemplar. The overall quality index for program delivery varied between “very good” to “excellent,” with a mean of 4.3/5. Development of checklists like the ATTACHTM fidelity assessment checklist enables the systematic evaluation of program delivery and identification of therapeutic components that enable targeted efforts at improvement. In future, research should examine links between program fidelity and targeted outcomes to ascertain if increased fidelity scores yield more favorable effects of parenting programs.

Keywords: parenting, intervention, program, fidelity tools, checklist, measure, early childhood, ATTACH

INTRODUCTION

Parents influence children's affective and cognitive development, with lifelong impacts (1, 2). Nurses play an important role in intervening early to support parenting and promote healthy child development (3, 4). Despite recognizing the need to deliver vital parenting programs, monitoring fidelity has been historically ignored (5, 6). Fidelity refers to the extent to which a healthcare program follows an explicit set of criteria specifically designed for its particular program model (7–9). However, defining and operationalizing program fidelity for parenting programs is difficult due to their interactive and dynamic nature (10, 11). Attempts by program developers to assure adherence to their programs include the creation of training and protocol manuals, but these alone may not be sufficient to ensure fidelity of implementation (8, 12). With increased demands for early intervention to be widely delivered by non-specialists, rigorous yet pragmatic strategies for maintaining program fidelity are needed.

In the United States and Canada, the development and implementation of parenting programs to bolster healthy development of children has increased during the last 20 years (13). There is a growing awareness of the significance of developing and applying fidelity measures to evaluate the implementation of such programs (12, 14, 15). However, practical guidelines and exemplars are lacking. This paper describes how to develop and conduct an evaluation of a

program fidelity checklist, including the step-by-step developmental process our research team used for the Attachment and Child Health (ATTACH™) parenting program. ATTACH™ is a psycho-educational parenting program that fosters parental reflective function (RF), the ability of parents to envision mental states in themselves and their children to promote healthy child development (16, 17). Compared to routine care, ATTACH™ has been shown to be effective in randomized controlled trials and quasi-experimental studies (16, 17); however, program fidelity assessment was needed to contextualize results and assure ongoing internal validity in support of wider implementation. Thus, the purpose of our paper is to demonstrate the step-by-step process for development of a fidelity checklist, specifically for ATTACH™, and to provide preliminary data on its utility.

Background

The practice of assessing fidelity in community-based interventions was adopted from trials of pharmacotherapy (drug) trials, in which strict adherence to protocol is a critical requirement (18, 19). In contrast to drug trials, systematic evaluation of program fidelity of psycho-educational programs, such as parenting programs, is more difficult due to the dynamic and often highly individualized interactions between facilitator and parent (20, 21). It is also more challenging to ascertain the therapeutic elements of parenting programs (22) as they tend to be tailored to parents' individual needs and preferences. However, tailoring a program does not mean that the facilitator may extemporize during the program administration; rather, program elements that are standardized vs. customized must be clearly defined and monitored (22, 23). Stated simply, facilitators need to be assessed on whether they delivered the program by using judgment and discretion appropriately.

Evaluation of program fidelity answers the following question: Did facilitators deliver the program as intended? (24). Strategies such as reviewing audio- or video-taped intervention sessions or direct observations to detect any diversions in program delivery have been recommended (25, 26). While helpful, these strategies offer insufficient guidance for rigorous evaluation of fidelity. The National Institutes of Health (NIH) Behaviour Change Consortium identified five elements to promote program fidelity (i.e., design, training, delivery, receipt, and enactment) (18, 27, 28); however, simply including the five steps does not ensure fidelity (14, 28, 29). The five steps offer little specific direction to the: (1) processes of conducting fidelity assessment, (2) determining which types of assessments are appropriate for a given program, or (3) how to define degree of adherence to and any deviations from program protocols (24, 30).

Assessing program fidelity includes consideration of content and process (20, 30–32). Content fidelity (or adherence) refers to the degree to which each main element is implemented as intended and if there are unplanned elements delivered (30, 31). Process fidelity (or competence) refers to the degree to which effective communication skills are used in response to facilitator and participant needs and situations, and essentially how well each intervention element is delivered (20, 21, 24, 30, 32–34). While adherence refers to the quantity of recommended

behaviors, process refers to skillfulness in implementation of intervention (12, 35).

The cost and time required to develop a fidelity measure, training raters to code the intervention sessions, and establishing inter-rater reliability between the coders, contribute to the lack of reports of the systematic assessment of program fidelity. Although nurses may benefit from using extant program evaluation measures, instruments created for one program may not be promptly adaptable to others (36) as evaluation of program fidelity must be tailored to the program being tested (12). Additionally, nursing interventions are increasingly being delivered by other health professionals (37, 38); therefore, it is crucial to describe a step-by-step developmental process for a fidelity checklist that can be effectively used by many professionals.

How fidelity is measured and how checklists are developed matters a great deal in terms of assessing adherence to any kind of practice (39–41). Psycho-educational parenting programs like ATTACH™ require a great deal of mutual interaction (between the facilitator and the participant), which contributes to the skillful delivery of program elements; it may also pose difficulty in training facilitators and examining the quality of program delivery (42, 43). A checklist to assess program fidelity may facilitate a systematic evaluation of program delivery as well as facilitators' training and help with interpretation of intervention effects.

MATERIALS AND METHODS

To develop and test the fidelity checklist for ATTACH™, we evaluated existing measures for monitoring fidelity of parenting programs. We determined their applicability to the ATTACH™ program and identified challenges that needed to be resolved for our fidelity checklist. Then we created the ATTACH™ fidelity checklist by tailoring standard recommendations (18, 24, 30, 32, 34, 44–47) to ATTACH™'s guiding theory and program structure.

The Attach™ Program

Details of the ATTACH™ program and the guiding theory are published elsewhere (16, 17). Briefly, ATTACH™ is a 1-h, 10–12 session, face-to-face intervention with dyadic (mother and infant) and triadic (mother, infant, and co-parent) elements. ATTACH™ is designed to help parents bolster a skill called parental Reflective Function (RF), the capacity of parents to think about mental states (thoughts, feelings, and intentions) in themselves and their children, and to consider how their mental states might affect their children to regulate behavior (16, 17). Parental RF is distinguishable from many related terms including mindful parenting (48–50), mindblindedness (51), empathy (52), insightfulness (53), and mind mindedness (54). ATTACH™ can be delivered by nurses or other health professionals with an undergraduate degree in health sciences, social work, psychology, sociology, or some post-secondary education that relates to child welfare. During weekly ATTACH™ sessions, that involve review of parent-child play sessions, and discussions of real-life and hypothetical or made-up stressful social situations, the

facilitator helps the parents learn new RF skills, accomplished through leading by example, asking questions and practicing RF skills. The ATTACH™ studies were approved by an appropriate institutional review board.

Review of Extant Parenting Program Fidelity Measures

To examine utility for the evaluation of ATTACH™, twelve fidelity measures were reviewed to determine if and how content, process, adherence and competence fidelity were assessed (Table 1). All measures included “adherence” to program content elements as a part of the measures. Additionally, fidelity checklist developers of the Leadership Observation Tool (45), Common Sense Parenting Trial (60), Getting Ready Project (61), Family Check-Up (44, 47) and EARLY ALLIANCE prevention trial (24) included competence to process elements or as a part of their checklists to capture process skills of facilitators. Furthermore, “participants’ responsiveness” was also taken into consideration in the Chicago Parent Program fidelity tool (14), and the Fidelity of Implementation Rating System (FIRS) (57, 58, 65) to ensure the program was received and understood by the participants. Finally, an overall score was assigned to rate the “overall quality index of program delivery” by using a specific criterion in the Chicago Parenting Program checklist (14).

One of the major challenges or limitations with the extant fidelity measures was the vague boundary between fidelity to content elements (or adherence) and fidelity to process elements (or competence), expected to be consistent with the theoretical model of the program (24, 45). Most of the program fidelity measures we reviewed were focused on monitoring a skill set or approach, a process element to measure content fidelity (24, 56, 62–64). Because the contents and the conceptual model of the ATTACH™ were closely related to the theoretical underpinnings of parental RF, in addition to the adherence, we needed to directly evaluate the use of the principles of parental RF deemed essential to the program. For example, exploration of “parental RF” representations was expected to be consistent with the theoretical model of ATTACH™ in each element of intervention.

Another challenge was the inattention to identifying unplanned program elements, an element of process fidelity (56). To describe the relationships between intervention delivery and outcomes accurately, it was essential to assess not only what and how many program elements were implemented but also whether and how many unplanned elements were delivered (57, 58, 65). This knowledge would improve training, monitoring and specific retraining for facilitators’ adherence to the program protocol.

Adequate pacing, which allows the facilitators to deliver each step of intervention in a certain duration of time without rushing or dragging, is another important aspect of process fidelity (66). However, evaluation of facilitators’ pacing has never been included in the fidelity measures of parenting measures that we reviewed. Although one fidelity tool (55) required calculating facilitator’s and participant’s talk time, talk time did not include facilitators’ pacing through the program steps, which was necessary for our purposes. Also, cut-offs/criterion ratings

for satisfactory levels of adherence are not frequently used in the parenting intervention fidelity literature. Although Caron et al. (67) described certification levels for the ABC fidelity measure, the decisions on the cut-offs appeared to be arbitrary. To overcome these challenges, we focused on broader fidelity measure literature from psycho-educational interventions of non-parenting programs for guidance e.g., Song et al. (66), Miller et al. (68), Miller et al. (69) and Miller et al. (70).

ATTACH™ Fidelity Assessment Checklist

In developing the ATTACH™ Fidelity Assessment Checklist, we extracted elements from the extant measures that best met fidelity requirements for our ATTACH™ fidelity checklist. We created a dictionary of operational definitions of the program elements or checklist items that is available on request. This includes, but is not limited to the definitions of: thoughts and feelings: liked, disliked, and interesting moments; the hypothetical and real life situations; and rushing, connecting, disconnecting, dragging, resistant, going along, and pacing. For example, during the video feedback component of the intervention, the facilitator invites the parent to choose a part of the free play interaction they like or found interesting to ascertain what the parent is *thinking* (e.g., mother thinks her child is smart as child shakes the rattle) and *feeling* (e.g., mother describes pride) and what the parent thinks their baby is thinking (e.g., child wants to shake the rattle) and feeling (e.g., child is happy) in those moments.

Adherence to Program Content Elements

To explicitly define and evaluate delivery of theoretical components of the ATTACH™, we determined the program elements based on the guiding principle and prescribed steps of the program. The five steps included in the dyadic sessions and the four steps included in the triadic sessions had a total of 30 and 26 elements, respectively, as shown in Table 2. Each content element included several prescribed questions as shown in Tables 3, 4. To evaluate adherence to program content elements, each program component was coded as *Yes* (attempted = implemented as intended) or *No* (not attempted = never asked or failed to perform). Additionally, to evaluate the overall adherence to program content elements, the occurrences of *Yes* or *No* elements were simply summed. These numbers were then divided by the total number of elements (31) and multiplied by 100 to compute percentages; a higher score in the *Yes* category reflected higher program content fidelity. An intervention is typically regarded as implemented with high fidelity when there is >80–90% adherence to content (45, 62, 66, 71). Therefore, to be considered satisfactory, content fidelity was expected to be 90% or higher for *Yes* category, or 10–20% or lower for *No* category. Each element was expected to be treated as equal in importance at this stage of creation of the checklist.

Adherence to Process Elements or Competence

For the ATTACH™ fidelity checklist, we adapted the concepts of individual process skills largely from the Leadership Observation Tool (LOT) (45), the Common Sense Parenting Trial (60), the Getting Ready Project (61), and the EARLY ALLIANCE prevention trial (24). According to the ATTACH™ protocol, the

TABLE 1 | Review of extant fidelity tools for parenting intervention.

	Fidelity tools	Description of tool/intervention	Fidelity elements
1.	The Parent Programme Implementation Checklist (55)	A simple, brief and generic observational tool for assessment of implementation fidelity of group-based parent programmes.	Checklist focusing on Adherence, Exposure or length of session, Quality of program delivery, Participant responsiveness, and Program differentiation.
2.	Implementation fidelity tool for a school-based parenting program for low-income families (14)	Chicago Parent Program (CPP): a 12-session, video and group-based parenting skills training program that improves parenting skills and confidence and reduce behavior problems in young children 2–5 years old.	Content fidelity for intervention design, training interventionist; Delivery; Receipt; Enactment.
3.	Quality assurance/fidelity checks for Triple P - Positive Parenting Program (56)	Triple P - Positive Parenting Program: a parenting intervention to enhance the knowledge, skills, and confidence of parents, and reduce the behavioral and emotional problems in children and adolescents.	Session Checklists; Accreditation of practitioners.
4.	Fidelity of Implementation Rating System (FIR) (57–59)	Evaluation of 5 dimensions of competent adherence to Oregon model of Parent Management Training (i.e., knowledge, structure, teaching skill, clinical skill, and overall effectiveness).	Adherence to the intervention's core content components; Competent execution using accomplished clinical and teaching practices.
5.	Implementation assessment of Common Sense Parenting trial (60)	Common Sense Parenting: a parenting program to improve the transition to high school.	Intervention training protocol; Session checklist focusing on Adherence; Exposure or length of session; Quality of program delivery; Participant satisfaction.
6.	Treatment Fidelity in Evidence-Based Parent Training Programs for Externalizing Disorders in Children and Adolescents (29)	Evidence-Based Parent Training Programs for Externalizing Disorders in Children and Adolescents.	Aspects of intervention design, intervention delivery, training providers, and assessment of participant receipt of intervention and enactment of treatment skills.
7.	Fidelity measurement of a relationship-based school readiness intervention: (61)	Getting Ready project: an integrated, multi-systemic intervention that promotes school readiness through parent engagement for children from birth to age five.	Adherence, quality of intervention delivery, differentiation between groups, and participant responsiveness.
8.	Leader Observation Tool (LOT): A process skills treatment fidelity measure for the Incredible Years parenting programme (45)	Incredible Years Parenting Program: a group-based parenting program to improve parenting behavior and reduce child behavior problems.	Process fidelity including listening, empathy, physical encouragement, positive behavior.
9.	Intervention fidelity tool for the EARLY ALLIANCE prevention trial (24)	EARLY ALLIANCE, a prevention trial currently testing the effectiveness of family, peer, and school interventions to promote competence and reduce risk for conduct disorder, substance abuse, and school failure.	Content fidelity and process fidelity (including listening, respect, gestures, tone, instructions, questioning, preparedness on a 4-point Likert scale).
10.	Family Check-Up: (44, 47)	Family Check-Up (FCU): a brief, personalized parenting intervention designed to improve youth adjustment by motivating use of effective parenting skills.	Adherence to the FCU model and the quality of the delivery (assessed on a 9-point scale (needs work: 1–3, competent work: 4–6, excellent work: 7–9).
11.	Attachment and Biobehavioral Catch-up intervention (62)	Attachment and Biobehavioral Catch-up (ABC): a 10-session, home visiting parenting intervention developed to address the regulatory and attachment problems of children experiencing early adversity, including neglect.	Process fidelity measure.
12.	Parent-Child Interaction Therapy (63, 64)	Parent-Child Interaction Therapy (PCIT): a short-term treatment that enhances the parent–child relationship and utilizes <i>in vivo</i> coaching to promote parent skills.	Process fidelity measure.

facilitator was expected to maintain a positive communication behavior (for example, repeat or restate, paraphrase, and asking probing questions) by making notes for each component of the program, while using higher level of RF skills. For fidelity purposes, the occurrences of attempted communication behaviors were then counted followed by computing percentages.

To be considered adequate, process fidelity or competence was expected to be 70–90% or higher, and 10–30% or lower for skipped opportunities, as suggested by literature (45, 62, 66). It deemed important to take both attempted communication behaviors and skipped opportunities into consideration when rating competence or adherence to process elements for accuracy

TABLE 2 | ATTACH™ program content outline for dyadic and triadic sessions.

ATTACH sessions	Content by session
Dyadic sessions	Step #1: Introduction to RF and What to Expect During the ATTACH Intervention (2 elements) Step #2: 3–5 min Free Play and Video Feedback (Parent: 1 like, 1 dislike – Facilitator: 1 interesting = intrusive) (16 elements) Step #3: Hypothetical Situation: Introduced by Facilitator (4 elements) Step #4: Real Life Situation: Introduced by Parent (4 elements) Step #5: Debriefing (4 elements) Total = 30 elements**
Triadic sessions	Step #1: Introduction to RF for the Co-parent (2 elements) Step #2: 5–6 min Free Play and Video Feedback (Parent: 1 like, 1 dislike – Co-Parent: 1 like, 1 dislike – Facilitator: 2 interesting = 1 parent, 1 co-parent – intrusive for both) (16 elements) Step #3: Hypothetical Situation: Introduced by Facilitator (4 elements) Step #4: Debriefing (4 elements) Total = 26 elements**

** Content elements are described in detail in **Tables 3, 4**.

purposes (45, 62, 66). A skipped opportunity is defined as the facilitator's missed opportunities to repeat/restate, paraphrase, or ask timely probing questions, e.g., asking about child's thoughts and feelings.

Pacing of the Program Delivery

For ATTACH™ to be paced adequately, the facilitator was expected to deliver each of the five steps in dyadic sessions, and four steps in triadic sessions in 45–60 min. We analyzed video-recorded sessions from pilot studies to determine recommended durations for the steps (17). For example, the duration of Step 2 may vary based on the time required to establish rapport with the participant; we expected this step to last at least 10 min to investigate all perspectives of the parent's representations of RF and should not last more than 20 min so that the remaining steps are completed without rushing. A 3-point rating scale from 1 (too short) to 3 (too long) was employed to rate the actual duration of the session as compared to the recommended duration range (55, 60, 66). Overall adherence to pacing was calculated by using a mean score of the ratings.

Participants' Responsiveness

Although the participants' responsiveness to the program is an aspect distinct from facilitators' adherence or competence, participants' acceptance of a program may impact fidelity (61). For example, if the participant is hesitant to further discuss reflective questions, this may hinder achieving the goals of the program. Others considered participants' responsiveness to be a potent mediator of the relationship between program or practice fidelity and participant outcomes (72, 73). For our checklist, we created items for this assessment as a determinant of fidelity, based on the concepts used in the Chicago Parent Program fidelity tool (14), and FIRS (57, 58, 65) to assess the degree to which ATTACH™ was received and understood by the participant. We used a Likert scale ranging from 1 (resistant) to 3 (going along) to rate participants' responsiveness (68).

Overall Quality Index of Program Delivery

The overall quality index included an overall assessment of the program delivery after getting a sense of the entire session by reviewing to the video-recorded session for adherence intervention content elements, competence, pacing and participants' responsiveness (14, 66, 68). This overall quality index was used to rate the quality of program delivery employing a predetermined criterion. The criterion was focused on facilitators' adherence to the program content elements and competence in delivering the program elements, without putting too much emphasis on frequencies of specific behaviors (14, 66, 70).

As described by (69, 70), typically this quality index evaluation included the extent to which the facilitator balanced their use of positive communication skills with their discretion in delivering the program on a 5-point Likert scale ranging from 1 (poor) to 5 (excellent). Each rating was defined e.g., overall quality index was expected to be rated 5 when the facilitator strictly adhered to the program components, by utilizing higher levels of clarification skills (e.g., repeating, reframing), making gentle and timely transitions, using probing questions ranging from fact to emotion probing, and missing few opportunities. Facilitators' overall quality index was expected to be rated 1 when they hardly used clarification skills (e.g., repeating, paraphrasing, reframing) probing questions, opportunities were often missed to explore further or promote RF, and the entire session felt like a question-answer session.

Decisions About Percentages and Ratings

The decisions about the percentages and ratings were adopted from fidelity assessments of psycho-educational interventions of both parenting and non-parenting programs (24, 30, 44, 45, 55, 66, 71). The percentages (used in the overall adherence to intervention content and process elements) and ratings (used in the pacing, dyad responsiveness, and over quality index of intervention delivery) were assessed in the ATTACH™ fidelity checklist. In deciding the number of points to be included in our rating scale (e.g., binary or Likert-type scale), we needed to carefully consider whether the rating scale would allow for raters to demonstrate their ability to differentiate among the set

TABLE 3 | ATTACH™ fidelity checklist for dyadic sessions.

Location: _____
 Parent's name: _____ Child's name: _____
 Child's age: _____
 Session date and time: _____ Facilitator: _____

A. Adherence to intervention content elements

1. Introductions:

(a) Facilitator describes the purpose of the intervention session and what kinds of questions will be asked and discussed (when applicable):

☐ Yes ☐ No

(b) Facilitator asks about the past week:

☐ Yes ☐ No

2. 3-min free play and video feedback:

3- min video completed: ☐ Yes ☐ No

Video Feedback:

Like (Session 1,2,3,4)/ Connecting (Session 5,6,8 and 10):

☐ Yes ☐ No

- Parent's thoughts: ☐ Yes ☐ No

- Parent's feelings: ☐ Yes ☐ No

- Child thoughts: ☐ Yes ☐ No

- Child's feelings: ☐ Yes ☐ No

Dislike (Session 1,2,3,4)/ Disconnecting (Session 5,6,8 and 10):

☐ Yes ☐ No

- Parent's thoughts: ☐ Yes ☐ No

- Parent's feelings: ☐ Yes ☐ No

- Child thoughts: ☐ Yes ☐ No

- Child's feelings: ☐ Yes ☐ No

1 Interesting moment (Session 1,2,3,4)/ 2 Interesting moments Session 5,6,8 and 10:

☐ Yes ☐ No

- Parent's thoughts: ☐ Yes ☐ No

- Parent's feelings: ☐ Yes ☐ No

- Child thoughts: ☐ Yes ☐ No

- Child's feelings: ☐ Yes ☐ No

3. Reflective exercises:

Facilitator introduces the hypothetical situation to parent and ask her/ him to reflect on it. Facilitator asks everyone's thoughts & feelings x 2 to explore two distinct states using same hypothetical situation.

Hypothetical Situation: ☐ Yes ☐ No

First round (thoughts and feelings): ☐ Yes ☐ No

Second round (thoughts and feelings): ☐ Yes ☐ No

4. Real life situation:

Parent introduces a real-life stressful parenting situation to facilitator and reflects on it. Facilitator asks everyone's thoughts & feelings x 2, first in actual life situation and then in conjectural real-life situation.

Real Life Situation: ☐ Yes ☐ No

First actual real-life Situation: ☐ Yes ☐ No

Second conjectural real-life situation: ☐ Yes ☐ No

5. Debriefing and additional support:

Facilitator asks the parent how they thought the session went and discuss any issues that come up.

(a) Session debrief: ☐ Yes ☐ No

(b) Social support provided: ☐ Yes ☐ No ☐ N/A

(Yes or N/A responses are counted as 1)

(c) Next appointment booked? ☐ Yes ☐ No

(d) Walked the parent out? ☐ Yes ☐ No

Total count of 'Yes' items: _____/30 items; _____%

Total count of "No" items: _____/30 items; _____%

To be considered satisfactory, content fidelity is expected to be 80-90% or higher for Yes category, or 10-20% or lower for No category.

B. Adherence to process elements or competence

Note: The facilitators are expected to take notes and repeat/ restate/ paraphrase/ and ask timely probing questions for the video feedback, the hypothetical situation, and the real-life situation components of the session = 24 items.

(Continued)

TABLE 3 | Continued

1. *Repeat/restate/paraphrase/timely probing questions: _____/24 items; _____%	
2. Skipped opportunities: _____/24 items; _____%	
<i>To be considered satisfactory, process fidelity is expected to be 70–90% or higher for repeating/restating/ paraphrasing/ using timely probing questions, and 10–30% or lower for skipped opportunities.</i>	
<i>*Repeat/restate (simply repeat to what the participant has said using some or all the same words)</i>	
<i>*Paraphrase (change or add to what the participant has said in a significant way to speculate his or her meaning, something that he or she has not yet said directly) where appropriate</i>	
<i>*Timely probing questions (when the participant was having a hard time to reflect)</i>	
3. Pacing: Skill to deliver each step of intervention in 45–60 min without rushing or dragging	<input type="checkbox"/> 1 – Too short (<20 min) <input type="checkbox"/> 2 – Adequate (45–60 min) <input type="checkbox"/> 3 – Too long (>60 min)
4. Participant's responsiveness	<input type="checkbox"/> 1
1 (resistant) to 3 (going along)	<input type="checkbox"/> 2
	<input type="checkbox"/> 3
Overall quality index of intervention delivery	
1. Content Fidelity =	
2. Process Fidelity:	
a) Repeat/restate/ paraphrase/ timely probing questions (ratio) =	
b) Skipped (ratio) =	
3. Pacing =	
4. Participant's responsiveness =	
5. Overall Quality Index on a Likert scale of 1 (poor) to 5 (excellent) =	
1 = Poor	
2 = Average	
3 = Good	
4 = Very good	
5 = Excellent	

of behavior and activities to be coded (74). We also considered and whether such a detailed rating is useful and purposeful in evaluating fidelity. Taking these aspects into consideration, we elected to use 3-point ratings on the Likert scale items for pacing and participant's responsiveness, and 5-point ratings on the Likert scale items for overall quality index of program delivery (66).

Application of the ATTACH™ Fidelity Assessment Checklist

The resultant fidelity checklist was implemented as part of testing of the ATTACH™ program (see Tables 3, 4). There were two facilitators, authors LA and MH, responsible for program delivery. The facilitators completed comprehensive competency-based training, relying on role playing and skill demonstration and employed training manuals. The facilitators delivered the ATTACH™ sessions, which were video-recorded, and completed ATTACH™ visit forms. The video sessions were assessed to examine fidelity of the ATTACH™ sessions.

Data Analysis

To select a representative sample, we selected video recordings from one dyadic and one triadic session for each of 18 participants who completed ATTACH™, by selecting alternate sessions from both dyadic and triadic sessions. Thus, we examined 36 videotaped sessions (from pilot studies #1 and

#2). Two trained raters independently coded session fidelity using the ATTACH™ fidelity checklist. We assessed inter-rater agreement between the coders by computing intraclass correlation coefficients [ICC; Type A (two-way mixed) using an absolute agreement definition; (55, 75)] using IBM SPSS Statistics version 26 software. Coders were also asked to comment on the utility of the checklist.

RESULTS

Table 5 shows an example of three ATTACH™ sessions assessed using the ATTACH™ fidelity assessment checklist. We selected the six sessions from three participants (both dyadic and triadic) to illustrate the full scope of assigned ratings and how the checklist may be used for monitoring fidelity and training. For example, for the first participant (No. 4), the overall quality index rating was 4.5 for both dyadic and triadic sessions. This rating was based on the 96–100% adherence on content and process fidelity, adequate pacing of program delivery, and high rating on participant's responsiveness for dyadic session. For the second participant (No. 11), an overall rating of 5 for dyadic session reflected completion of all elements of content fidelity (100%), process elements (100%) with no missed opportunities, completion of the session within time (adequate pacing), and high rating on participant's responsiveness for triadic session. For the third participant (No. 15), the overall rating was 4 for dyadic

TABLE 4 | ATTACH™ fidelity checklist for triadic sessions.

Location: _____
 Parent's name: _____ Child's name: _____
 Child's age: _____
 Co-parent's name: _____
 Session date and time: _____ Facilitator: _____

A. Adherence to intervention content elements

1. Introductions:

(a) Facilitator describes the purpose of the intervention session and what kinds of questions will be asked and discussed to the co-parent: ☐ Yes ☐ No

(b) Facilitator asks about the past week:
☐ Yes ☐ No

2. 5–6-min free play and video feedback:

5–6-min video completed: ☐ Yes ☐ No

Video feedback for parent:

Like: ☐ Yes ☐ No

- Parent's thoughts: ☐ Yes ☐ No

- Parent's feelings: ☐ Yes ☐ No

- Child's thoughts: ☐ Yes ☐ No

- Child's feelings: ☐ Yes ☐ No

Dislike: ☐ Yes ☐ No

- Parent's thoughts: ☐ Yes ☐ No

- Parent's feelings: ☐ Yes ☐ No

- Child's thoughts: ☐ Yes ☐ No

- Child's feelings: ☐ Yes ☐ No

Video feedback for co-parent:

Like: ☐ Yes ☐ No

- Co-parent's thoughts: ☐ Yes ☐ No

- Co-parent's feelings: ☐ Yes ☐ No

- Child's thoughts: ☐ Yes ☐ No

- Child's feelings: ☐ Yes ☐ No

Dislike: ☐ Yes ☐ No

- Parent's thoughts: ☐ Yes ☐ No

- Parent's feelings: ☐ Yes ☐ No

- Child thoughts: ☐ Yes ☐ No

- Child's feelings: ☐ Yes ☐ No

Video feedback for both the parent and co-parent:

Interesting: ☐ Yes ☐ No

- Parent's thoughts: ☐ Yes ☐ No

- Parent's feelings: ☐ Yes ☐ No

- Co-parent's thoughts: ☐ Yes ☐ No

- Co-parent's feelings: ☐ Yes ☐ No

- Child's thoughts as described by the parent:

☐ Yes ☐ No

- Child's feelings as described by the parent:

☐ Yes ☐ No

- Child thoughts as described by the co-parent:

☐ Yes ☐ No

- Child's feelings as described by the co-parent:

☐ Yes ☐ No

3. Reflective exercises:

Facilitator introduces the hypothetical situation to the parent and the co-parent and asks them to reflect on the situation.

Facilitator asks everyone's thoughts & feelings x 3 to explore three distinct states using same hypothetical situation.

Hypothetical Situation: ☐ Yes ☐ No

Parent-led first round (thoughts and feelings):

☐ Yes ☐ No

Co-parent led second round (thoughts and feelings): ☐ Yes ☐ No

Parent and co-parent collaborated third round (thoughts and feelings):

☐ Yes ☐ No

4. No real – life situation to avoid any potential conflict.

Additional comments: (e.g., nature of support received, unexpected events, notes about visit to follow up next time)

(Continued)

TABLE 4 | Continued

5. Debriefing and additional support:

Facilitator asks the parent and the co-parent how they thought the session went and together they discuss any issues that came up.

(a) Session debrief: ☐ Yes ☐ No

(b) Social support provided: ☐ Yes ☐ No ☐ N/A

(Yes or N/A responses are counted as 1)

(c) Next appointment booked? ☐ Yes ☐ No

(d) Walked the parent out? ☐ Yes ☐ No

Total count of 'Yes' items: _____/26 items; _____%

Total count of 'No' items: _____/26 items; _____%

To be considered satisfactory, content fidelity is expected to be 80-90% or higher for Yes category, or 10-20% or lower for No category.

B. Adherence to process elements or competence

Note: The facilitators are expected to take notes and repeat/ restate/ paraphrase/ and ask timely probing questions for the video feedback, and the hypothetical situation components of the session = 20 items.

Adherence to process elements

1. ***Repeat/restate/paraphrase/timely probing questions:** _____/20 items; _____%

2. **Skipped opportunities:** _____/20 items; _____%

To be considered satisfactory, process fidelity is expected to be 70-90% or higher for repeating/restating/ paraphrasing/ and using timely probing questions, and 10-30% or lower for skipped opportunities.

**Repeat/ restate (simply repeat to what the participant has said using some or all the same words)*

**Paraphrase (change or add to what the participant has said in a significant way to speculate his or her meaning, something that he or she has not yet said directly) where appropriate.*

**Timely probing questions (when the participant was having a hard time to reflect)*

Pacing: Skill to deliver each step of intervention in about an hour without rushing or dragging

- ☐ 1 – Too short (<20 min)
☐ 2 – Adequate (45–60 min)
☐ 3 – Too long (>60 min)

Participant's responsiveness

1 (resistant) to 3 (going along)

- ☐ 1
☐ 2
☐ 3

Overall quality index of intervention delivery

1. Content Fidelity =

2. Adherence to Process Elements:

a) Repeat/restate/ paraphrase/ timely probing questions (ratio) =

b) Skipped (ratio) =

3. Pacing =

4. Participant's responsiveness =

5. Overall Quality Index on a Likert scale of 1 (poor) to 5 (excellent) =

1 = Poor

2 = Average

3 = Good

4 = Very good

5 = Excellent

session, and adherence to content fidelity was 93% meaning that the facilitator skipped two items and took longer than the protocol required to complete the dyadic session.

Table 6 indicates the adherence and competence of the ATTACHTM facilitators. Under adherence to program content elements, the percentage for implemented as intended was 96% for both dyadic and triadic sessions. The percentages for elements implemented as not intended was low, as expected, between 2 and 3%. Under adherence to program process elements, the fidelity for repeat/paraphrase/probing was 99%, while skipped opportunities was 0 as expected. For pacing, the mean was

2.16 for dyadic and 2.3 for triadic sessions out of possible 3. For participant responsiveness the mean was 3 for both dyadic and triadic sessions out of possible 3. The overall quality index for program delivery varied between "very good" to "excellent," with a mean of 4.3/5. The coders who coded the videos provided positive feedback on the checklist describing that they found user friendly. There were minor changes to address clarifications requested by the coders. For example, our preliminary checklist only included what the parent like/disliked about the play session. However, coders noticed that in later sessions the facilitator changed from asking what the parent

TABLE 5 | Evaluation of 6 sessions from 3 participants using the ATTACH™ fidelity checklist.

	Intervention sessions					
	No. 4		No. 11		No. 15	
	Dyadic session	Triadic session	Dyadic session	Triadic session	Dyadic session	Triadic session
Adherence to intervention content elements						
Elements implemented as intended (Yes)	96%	96%	100%	96%	93%	100%
Elements not implemented as intended (No)	4%	4%	–	4%	7%	–
Adherence to process elements or competence						
Repeat/paraphrase/probing questions	96%	95%	100%	100%	100%	100%
Skipped opportunities	4%	5%	–	–	–	–
Pacing (rating) 1 = too short, 2 = adequate, 3 = too long	Mean = 2	Mean = 2	Mean = 2	Mean = 2	Mean = 3	Mean = 2
Participant's responsiveness (rating) 1 (resistant) to 3 (going along)	Mean = 3	Mean = 3	Mean = 3	Mean = 3	Mean = 3	Mean = 3
Overall quality index of intervention delivery (rating) 1 (poor) to 5 (excellent)	Mean = 4.5	Mean = 4.5	Mean = 5	Mean = 4.5	Mean = 4	Mean = 5

TABLE 6 | Facilitators' compliance assessment by using ATTACH™ fidelity checklist.

		<i>n</i>	%/Mean (SD)
Adherence to intervention content elements			
Elements implemented as intended (Yes)	Dyadic sessions	18	96%
	Triadic sessions	18	96%
Elements not implemented as intended (No)	Dyadic sessions	18	4%
	Triadic sessions	18	2%
Adherence to process elements or competence			
Repeat/paraphrase/probing questions	Dyadic sessions	18	99%
	Triadic sessions	18	99%
Skipped opportunities	Dyadic sessions	18	0.00
	Triadic sessions	18	0.00
Pacing (rating) 1 = too short, 2 = adequate, 3 = too long	Dyadic sessions	18	2.16 (0.38)
	Triadic sessions	18	2.30 (0.48)
Participant Response (rating) 1 (resistant) to 3 (going along)	Dyadic sessions	18	3.00 (0.00)
	Triadic sessions	18	3.00 (0.00)
Overall quality index (rating) 1 (poor) to 5 (excellent)	Dyadic sessions	18	4.30 (0.36)
	Triadic sessions	18	4.50 (0.23)

like/disliked about the play session to moments the parent felt they were connected/disconnected with their child. We revised our checklist accordingly. Evaluation of the sessions from the ATTACH™ from earlier to later participants showed that the facilitators improved over time, as demonstrated by the improved fidelity ratings. The ATTACH™ fidelity assessment checklist

could be used for training and assessing fidelity. The ICC for agreement between the two coders for the three elements of the fidelity checklist (adherence to the ATTACH™ content elements, process elements, and overall quality index) was good to excellent (ICC = 0.85–1.00), suggesting strong inter-rater agreement.

DISCUSSION

The ATTACH™ Fidelity Assessment checklist was developed to evaluate facilitators' adherence and competence in implementing an evidence-based, psycho-educational parenting program to high-risk families. We found that facilitators adhered to the program content and process fidelity close to 100%. They adequately paced or completed the sessions within 30–45 min without dragging or rushing and maintained excellent participant responsiveness. The overall quality index of program delivery ranged from 4 to 5 on a 5-point Likert scale (1 = poor, 5 = excellent). Coders for the ATTACH™ sessions helped to further refine the checklist by requesting minor changes.

Supported by previous research, we developed the ATTACH™ fidelity checklist to measure the elements of adherence to content and process, as well as participant responsiveness (44, 47, 55, 60, 62–64). Overall pacing of program delivery, used in our checklist, has never been included in previous parenting program fidelity checklists, to our knowledge. This item was adapted from fidelity measures of psycho-educational interventions (66). While overall fidelity of program delivery was only rated in a few parenting programs and mostly based on content validity (14, 55, 57), we created an overall quality index rating from psycho-educational intervention fidelity assessment based on both content and process elements (66, 70, 76–78). As ATTACH™ is a psycho-educational parenting program, we deemed it important to include both pacing and overall assessment items to ensure we capture the essence of program delivery.

As we reviewed in **Table 1**, most of the extant fidelity checklists of the parenting programs have limitations as they are developed to minimize or eliminate the possibility that a practitioner will miss or fail to perform one or more steps or actions. However, assessing adherence to process elements or competence by simple using “Yes” and “No” categories may not be the best answer to meet all needs, specifically in case of psycho-educational interventions such as ATTACH™ (44, 57, 66). We therefore also applied insights from other, non-parenting intervention fidelity measures (such as Song et al. and Miller et al.) to fully comprehend and assess process elements or competence. We also provided an overall quality index of the intervention delivery, as supported by other fidelity literature of parenting interventions and non-parenting interventions (14, 57, 66, 68).

The ATTACH™ fidelity checklist will be specifically important in evaluating the efficacy of the program on outcomes, exploring ways to improve the program, and learning how to overcome challenges and barriers to program implementation (8, 55). The checklist may also improve the efficiency of training facilitators and systematic evaluation of their adherence and competence (79). Assessing competence of facilitators in program delivery is crucial because a facilitator may implement all the content of the program, but in a non-prescribed manner that can result in low efficacy of the program (14). Any deviated delivery of a program element and not using positive communication behaviors can be discouraged and corrected by assessing the program sessions by using our fidelity checklist.

Although only two facilitators delivered the ATTACH™ sessions evaluated here, the approach of monitoring and assessment is applicable to multiple facilitators. While we developed the fidelity checklist for training and monitoring fidelity in research contexts, it has not been evaluated in a clinical setting. Although inter-rater reliability was high (80), only two highly trained coders were assessed. Inter-rater reliability with clinical raters and a larger sample of sessions is needed to confirm these results. A second limitation is the lack of variability in some of the scores (e.g., Participant Responsiveness) of fidelity. Although this indicates overall good adherence and competence in delivering the ATTACH™ intervention, which is a positive finding, lack of variability in fidelity items limit the ability to understand the distinct items that may influence outcomes (12). This should be discussed as a limitation and potential future direction for research. Further work may focus on greater variability in a sample of community-based facilitators, suggesting that it might be valuable to retain these measures until the measure can be validated in a community implementation setting.

Questions remain concerning whether variations in program implementation should be evaluated as part of program fidelity by taking participants’ responsiveness into account as moderators of the program effects on outcomes, or both. In future research, weights for different elements may be taken into consideration when critical and core elements have been identified; however, this could be difficult to implement in clinical settings. There are important cost considerations in using fidelity measures (81), as we found that evaluation of

an hour-long single session consumed up to 2.5 h for coding and 30 min for scoring by an experienced coder/rater. Other fidelity measures (e.g., 58, 60) did not involve rating a full intervention session, instead they rated a session segment that took as little as 5 min, as a solution to potential time and cost issues in the discussion. Given the creation and testing phase of ATTACH™, we did not know whether significant differences exist between the major program elements (video feedback and RF exercises). Thus, we treated all steps equally in importance and considered them to be delivered within a specific range of time set for the intervention within the protocol.

In future, an extension of this research would examine links between program fidelity and targeted outcomes (e.g., increased fidelity scores may yield more favorable effects or outcomes) to help ascertain if the benefits outweigh the costs (62, 82, 83). This further step would provide evidence for validity of the ATTACH™ fidelity checklist. Nonetheless, measuring fidelity is arguably even more important as interventions are implemented in community settings outside of research studies, with less control and oversight over fidelity, and decreases in fidelity are linked to reduced intervention outcomes [e.g., (84)].

CONCLUSION

The program content elements are unique to the ATTACH™ program; therefore, the process of developing and evaluating a fidelity checklist is specifically described for the ATTACH™ parenting program. However, the ATTACH™ fidelity checklist described in this paper, may inform and be adapted to fidelity evaluation tools for other parenting program. High fidelity scores in ATTACH™ sessions provided an evidence of validity for the measure. Establishing treatment differentiation between the ATTACH™ and other manualised interventions would provide another future direction or next step in validation of this measure (33). We have designed a reliable measure and shown how nurses may operationalize program adherence and competence to evaluate facilitators’ adherence and competence so that elements of the implementation of parenting programs are more evident. Our evaluation showed the ATTACH™ intervention fidelity was high. Development of checklists like the ATTACH™ fidelity assessment checklist enables the systematic evaluation of program delivery and identification of therapeutic components that enable targeted efforts at improvement.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Conjoint Health Research Ethics Board, University

of Calgary, Calgary, Canada. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LA: formulated the research question and oversaw all aspects of manuscript preparation from literature review, found all of the relevant articles for fidelity assessment checklist development, developed and refined the checklist with the help of KB and NL, conducted the data analysis, interpreted the results, and undertook writing and submission. KB: helped oversee the research question, literature review, development of checklist, interpretation of the results, and writing. CE: helped oversee the literature review and reviewed the relevant

articles, interpreted the results, and writing. MH: helped review the relevant articles, development and refinement of checklist, interpreted the results, and writing. NL: helped formulate the research question, oversaw the literature review and reviewed the relevant articles, helped in the development and refinement of fidelity checklist, interpretation of the results, and writing. All authors have read and approved the final manuscript.

FUNDING

We are truly thankful to the Harvard Frontiers of Innovation to support this work.

REFERENCES

- Knauer HA, Ozer EJ, Dow WH, Fernald LC. Parenting quality at two developmental periods in early childhood and their association with child development. *Early Child Res Q.* (2019) 47:396–404. doi: 10.1016/j.ecresq.2018.08.009
- Kopala-Sibley DC, Cyr M, Finsaas MC, Orawe J, Huang A, Tottenham N, et al. Early childhood parenting predicts late childhood brain functional connectivity during emotion perception and reward processing. *Child Dev.* (2020) 91:110–28. doi: 10.1111/cdev.13126
- Kemp L, Bruce T, Elcombe EL, Anderson T, Vimpani G, Price A, et al. Quality of delivery of “right@ home”: implementation evaluation of an Australian sustained nurse home visiting intervention to improve parenting and the home learning environment. *PLoS ONE.* (2019) 14:e0215371. doi: 10.1371/journal.pone.0215371
- Reticena KDO, Yabuchi, V. D. N. T., Gomes MFP, Siqueira LDE, Abreu, et al. C. P. D., Fraccolli LA. Role of nursing professionals for parenting development in early childhood: a systematic review of scope. *Rev Lat Am Enfermagem.* (2019) 27:e3213. doi: 10.1590/1518-8345.3031.3213
- Schoenwald SK, Garland AF. A review of treatment adherence measurement methods. *Psychol Assess.* (2013) 25:146–156. doi: 10.1037/a0029715
- Seay KD, Byers K, Feely M, Lanier P, Maguire-Jack K, McGill T. Scaling up: replicating promising interventions with fidelity. In: Daro D, Cohn Donnelly A, Huang L, Powell B, editors. *Advances in Child Abuse Prevention Knowledge: The Perspective of New Leadership.* New York, NY: Springer (2015). p. 179–201.
- Biel CH, Buzhardt J, Brown JA, Romano MK, Lorio CM, Windsor KS, et al. Language interventions taught to caregivers in homes and classrooms: a review of intervention and implementation fidelity. *Early Child Res Q.* (2019) 50:140–56. doi: 10.1016/j.ecresq.2018.12.002
- Bond GR, Drake RE. Assessing the fidelity of evidence-based practices: history and current status of a standardized measurement methodology. *Adm Policy Ment Health.* (2019) 47:874–84. doi: 10.1007/s10488-019-00991-6
- Dusenbury L, Brannigan R, Falco M, Hansen WB. A review of research on fidelity of implementation: implications for drug abuse prevention in school settings. *Health Educ Res.* (2003) 18:237–56. doi: 10.1093/her/18.2.237
- Goense PB, Boendermaker L, van Yperen. T. Measuring treatment integrity: use of and experience with measurements in child and youth care organizations. *J Behav Health Serv Res.* (2018) 45:469–88. doi: 10.1007/s11414-018-9600-4
- Lange AM, van der Rijken RE, Delsing MJ, Busschbach JJ, Scholte RH. Development of therapist adherence in relation to treatment outcomes of adolescents with behavioral problems. *J Clin Child Adolesc Psychol.* (2019) 48 (Suppl. 1):S337–46. doi: 10.1080/15374416.2018.1477049
- Breitenstein SM, Gross D, Garvey CA, Hill C, Fogg L, Resnick B. Implementation fidelity in community-based interventions. *Res Nurs Health.* (2010) 33:164–73. doi: 10.1002/nur.20373
- Shonkoff JP, Richmond J, Levitt P, Bunge SA, Cameron JL, Duncan GJ, et al. *From Best Practices to Breakthrough Impacts a Science-Based Approach to Building a More Promising Future for Young Children and Families.* Cambridge, MA: Harvard University, Center on the Developing Child (2016).
- Bettencourt AF, Gross D, Breitenstein S. Evaluating implementation fidelity of a school-based parenting program for low-income families. *J School Nurs.* (2018) 35:325–36. doi: 10.1177/1059840518786995
- Wilson KR, Havighurst SS, Harley AE. Tuning in to kids: an effectiveness trial of a parenting program targeting emotion socialization of preschoolers. *J Family Psychol.* (2012) 26:56–65. doi: 10.1037/a0026480
- Anis L, Letourneau NL, Benzie K, Ewashen C, Hart MJ. Effect of the attachment and child health parent training program on parent–child interaction quality and child development. *Can J Nurs Res.* (2020) 52:157–68. doi: 10.1177/0844562119899004
- Letourneau N, Anis L, Ntanda H, Novick J, Steele M, Steele H, et al. Attachment & child health (ATTACH) pilot trials: effect of parental reflective function intervention for families affected by toxic stress. *Infant Ment Health J.* (2020) 41:445–62. doi: 10.1002/imhj.21833
- Borrelli B. The assessment, monitoring, and enhancement of treatment fidelity in public health clinical trials. *J Public Health Dent.* (2011) 71:S52–63. doi: 10.1111/j.1752-7325.2011.00233.x
- McLeod BD, Southam-Gerow MA, Jensen-Doss A, Hogue A, Kendall PC, Weisz JR. Benchmarking treatment adherence and therapist competence in individual cognitive-behavioral treatment for youth anxiety disorders. *J Clin Child Adolesc Psychol.* (2019) 48 (Suppl. 1):S234–46. doi: 10.1080/15374416.2017.1381914
- Carroll KM, Nich C, Sifry RL, Nuro KE, Frankforter TL, Ball SA, et al. A general system for evaluating therapist adherence and competence in psychotherapy research in the addictions. *Drug Alcohol Depend.* (2000) 57:225–38. doi: 10.1016/S0376-8716(99)00049-6
- Santacroce SJ, Maccarelli LM, Grey M. Intervention fidelity. *Nurs Res.* (2004) 53:63–6. doi: 10.1097/00006199-200401000-00010
- Reed D, Titler MG, Dochterman JM, Shever LL, Kanak M, Picone DM. Measuring the dose of nursing intervention. *Int J Nurs Terminol Classifications.* (2007) 18:121–30. doi: 10.1111/j.1744-618X.2007.00067.x
- Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ.* (2014) 348:g1687. doi: 10.1136/bmj.g1687
- Dumas JE, Lynch AM, Laughlin JE, Smith EP, Prinz RJ. Promoting intervention fidelity: Conceptual issues, methods, and preliminary results from the EARLY ALLIANCE prevention trial. *Am J Prev Med.* (2001) 20:38–47. doi: 10.1016/S0749-3797(00)00272-5
- Resnick B, Bellg AJ, Borrelli B, De Francesco C, Breger R, Hecht J, et al. Examples of implementation and evaluation of treatment fidelity in the BCC studies: where we are and where we need to go. *Ann Behav Med.* (2005) 29:46. doi: 10.1207/s15324796abm2902s_8

26. Resnick B, Inguito P, Orwig D, Yahiro JY, Hawkes W, Werner M, et al. Treatment fidelity in behavior change research: a case example. *Nurs Res.* (2005) 54:139–143. doi: 10.1097/00006199-200503000-00010
27. Bellg AJ, Borrelli B, Resnick B, Hecht J, Minicucci DS, Ory M, et al. Enhancing treatment fidelity in health behavior change studies: best practices and recommendations from the NIH Behavior Change Consortium. *Health Psychol.* (2004) 23:443–51. doi: 10.1037/0278-6133.23.5.443
28. Radziewicz RM, Rose JH, Bowman KF, Berila RA, O'Toole EE, Given B. Establishing treatment fidelity in a coping and communication support telephone intervention for aging patients with advanced cancer and their family caregivers. *Cancer Nurs.* (2009) 32:193–202. doi: 10.1097/NCC.0b013e31819b5abe
29. Garbacz LL, Brown DM, Spee GA, Polo AJ, Budd KS. Establishing treatment fidelity in evidence-based parent training programs for externalizing disorders in children and adolescents. *Clin Child Fam Psychol Rev.* (2014) 17:230–47. doi: 10.1007/s10567-014-0166-2
30. Carroll C, Patterson M, Wood S, Booth A, Rick J, Balain S. A conceptual framework for implementation fidelity. *Implement Sci.* (2007) 2:40. doi: 10.1186/1748-5908-2-40
31. Dane AV, Schneider BH. Program integrity in primary and early secondary prevention: are implementation effects out of control? *Clin Psychol Rev.* (1998) 18:23–45. doi: 10.1016/S0272-7358(97)00043-3
32. Moncher FJ, Prinz RJ. Treatment fidelity in outcome studies. *Clin Psychol Rev.* (1991) 11:247–66. doi: 10.1016/0272-7358(91)90103-2
33. Perepletchikova F, Kazdin AE. Treatment integrity and therapeutic change: issues and research recommendations. *Clin Psychol Sci Pract.* (2005) 12:365–83. doi: 10.1093/clipsy.bpi045
34. Stein KF, Sargent JT, Rafaels N. Intervention research: establishing fidelity of the independent variable in nursing clinical trials. *Nurs Res.* (2007) 56:54–62. doi: 10.1097/00006199-200701000-00007
35. Feely M, Seay KD, Lanier P, Auslander W, Kohl PL. Measuring fidelity in research studies: a field guide to developing a comprehensive fidelity measurement system. *Child Adolesc Soc Work J.* (2018) 35:139–52. doi: 10.1007/s10560-017-0512-6
36. Faulkner MS. Intervention fidelity: ensuring application to practice for youth and families. *J Special Pediatr Nurs.* (2012) 17:33–40. doi: 10.1111/j.1744-6155.2011.00305.x
37. Chartier M, Enns JE, Nickel NC, Campbell R, Phillips-Beck W, Sarkar J, et al. The association of a paraprofessional home visiting intervention with lower child maltreatment rates in First Nation families in Canada: a population-based retrospective cohort study. *Child Youth Serv Rev.* (2020) 108:104675. doi: 10.1016/j.childyouth.2019.104675
38. Lorber ME, Olds DL, Donelan-McCall N. The impact of a preventive intervention on persistent, cross-situational early onset externalizing problems. *Prevent Sci.* (2019) 20:684–94. doi: 10.1007/s1121-018-0973-7
39. Gawande A. *The Checklist Manifesto: How to Get Things Right.* New York, NY: Metropolitan Books (2009).
40. Perry AG, Potter PA, Ostendorf W. *Skills Performance Checklists for Clinical Nursing Skills and Techniques.* 8th ed. Maryland Heights, MO: Elsevier Mosby (2014).
41. Wilson C. *Credible Checklists and Quality Questionnaires: A User-Centered Design Method.* Waltham, MA: Morgan Kaufman (2013).
42. Becqué, YN, Rietjens JA, van Driel AG, van der Heide A, Witkamp E. Nursing interventions to support family caregivers in end-of-life care at home: a systematic narrative review. *Int J Nurs Stud.* (2019) 97:28–39. doi: 10.1016/j.ijnurstu.2019.04.011
43. Eymard AS, Altmiller G. Teaching nursing students the importance of treatment fidelity in intervention research: students as interventionists. *J Nurs Educ.* (2016) 55:288–91. doi: 10.3928/01484834-20160414-09
44. Chiapa A, Smith JD, Kim H, Dishion TJ, Shaw DS, Wilson MN. The trajectory of fidelity in a multiyear trial of the family check-up predicts change in child problem behavior. *J Consult Clin Psychol.* (2015) 83:1006. doi: 10.1037/ccp0000034
45. Eames C, Daley D, Hutchings J, Hughes JC, Jones K, Martin P, et al. The leader observation tool: a process skills treatment fidelity measure for the incredible years parenting programme. *Child Care Health Dev.* (2008) 34:391–400. doi: 10.1111/j.1365-2214.2008.00828.x
46. Rixon L, Baron J, McGale N, Lorencatto F, Francis J, Davies A. Methods used to address fidelity of receipt in health intervention research: a citation analysis and systematic review. *BMC Health Serv Res.* (2016) 16:663. doi: 10.1186/s12913-016-1904-6
47. Smith JD, Dishion TJ, Shaw DS, Wilson MN. Indirect effects of fidelity to the family check-up on changes in parenting and early childhood problem behaviors. *J Consult Clin Psychol.* (2013) 81:962. doi: 10.1037/a0033950
48. Alexander K. Integrative review of the relationship between mindfulness-based parenting interventions and depression symptoms in parents. *J Obstetr Gynecol Neonatal Nurs.* (2018) 47:184–90. doi: 10.1016/j.jogn.2017.11.013
49. Friedmutter R. The effectiveness of mindful parenting interventions: a meta analysis. In: *Dissertation Abstracts International: Section B: The Sciences and Engineering.* New York, NY, (2016). p. 76.
50. Townshend K, Jordan Z, Stephenson M, Tsey K. The effectiveness of mindful parenting programs in promoting parents' and children's wellbeing: a systematic review. *JBI Database Syst Rev Implement Rep.* (2016) 14:139–80. doi: 10.11124/JBISIR-2016-2314
51. Lombardo MV, Baron-Cohen S. The role of the self in mindblindness in autism. *Conscious Cogn.* (2011) 20:130–40. doi: 10.1016/j.concog.2010.09.006
52. Elliott R, Bohart AC, Watson JC, Greenberg LS. Empathy. *Psychotherapy.* (2011) 48:43–9. doi: 10.1037/a0022187
53. Oppenheim D, Koren-Karie N, Dolev S, Yirmiya N. Maternal insightfulness and resolution of the diagnosis are associated with secure attachment in preschoolers with autism spectrum disorders. *Child Dev.* (2009) 80:519–27. doi: 10.1111/j.1467-8624.2009.01276.x
54. Meins E, Fernyhough C, Wainwright R, Das Gupta M, Fradley E, Tuckey M. Maternal mind-mindedness and attachment security as predictors of theory of mind understanding. *Child Dev.* (2002) 73:1715–26. doi: 10.1111/1467-8624.00501
55. Bywater T, Gridley N, Berry V, Blower S, Tobin K. The parent programme implementation checklist (PPIC): the development and testing of an objective measure of skills and fidelity for the delivery of parent programmes. *Child Care Pract.* (2019) 25:281–309. doi: 10.1080/13575279.2017.1414031
56. Proctor KB, Brestan-Knight E. Evaluating the use of assessment paradigms for preventive interventions: a review of the triple p—positive parenting program. *Child Youth Serv Rev.* (2016) 62:72–82. doi: 10.1016/j.childyouth.2016.01.018
57. Forgatch MS, Patterson GR, DeGarmo DS. Evaluating fidelity: predictive validity for a measure of competent adherence to the Oregon model of parent management training. *Behav Ther.* (2005) 36:3–13. doi: 10.1016/S0005-7894(05)80049-8
58. Forgatch MS, DeGarmo DS, Beldavs ZG. An efficacious theory-based intervention for stepfamilies. *Behav Ther.* (2005) 36:357–65. doi: 10.1016/S0005-7894(05)80117-0
59. Thijssen J, Albrecht G, Muris P, de Ruiter C. Treatment fidelity during therapist initial training is related to subsequent effectiveness of parent management training—Oregon model. *J Child Family Stud.* (2017) 26:1991–9. doi: 10.1007/s10826-017-0706-8
60. Oats RG, Cross WF, Mason WA, Casey-Goldstein M, Thompson RW, Hanson K, et al. Implementation assessment of widely used but understudied prevention programs: an illustration from the common sense parenting trial. *Eval Program Plann.* (2014) 44:89–97. doi: 10.1016/j.evalprogplan.2014.02.002
61. Knoche LL, Sheridan SM, Edwards CP, Osborn AQ. Implementation of a relationship-based school readiness intervention: a multidimensional approach to fidelity measurement for early childhood. *Early Child Res Q.* (2010) 25:299–313. doi: 10.1016/j.ecresq.2009.05.003
62. Caron E, Bernard K, Dozier M. In vivo feedback predicts parent behavior change in the attachment and biobehavioral catch-up intervention. *J Clin Child Adolesc Psychol.* (2018) 47 (Suppl. 1):S35–46. doi: 10.1080/15374416.2016.1141359
63. Barnett ML, Niec LN, Acevedo-Polakovich ID. Assessing the key to effective coaching in parent-child interaction therapy: the therapist-parent interaction coding system. *J Psychopathol Behav Assess.* (2014) 36:211–23. doi: 10.1007/s10862-013-9396-8
64. Barnett ML, Niec LN, Peer SO, Jent JF, Weinstein A, Gisbert P, et al. Successful therapist-parent coaching: how in vivo feedback relates to parent engagement in parent-child interaction therapy. *J Clin Child Adolesc Psychol.* (2017) 46:895–902. doi: 10.1080/15374416.2015.1063428

65. Forgatch MS, Patterson GR, Gewirtz AH. Looking forward: the promise of widespread implementation of parent training programs. *Perspect Psychol Sci.* (2013) 8:682–94. doi: 10.1177/1745691613503478
66. Song MK, Happ MB, Sandelowski M. Development of a tool to assess fidelity to a psycho-educational intervention. *J Adv Nurs.* (2010) 66:673–82. doi: 10.1111/j.1365-2648.2009.05216.x
67. Caron E, Weston-Lee P, Haggerty D, Dozier M. Community implementation outcomes of attachment and biobehavioral catch-up. *Child Abuse Negl.* (2016) 53:128–37. doi: 10.1016/j.chiabu.2015.11.010
68. Miller WR, Moyers TB, Ernst D, Amrhein P. *Manual for the Motivational Interviewing Skill Code*, Vol. 2007. Albuquerque, NM: University of New Mexico (2000).
69. Miller WR, Rollnick S. *Motivational Interviewing: Preparing People to Change*. New York, NY: The Guilford Press (2002).
70. Miller WR, Moyers TB, Arciniega L, Ernst D, Forcehimes A. Training, supervision and quality monitoring of the COMBINE Study behavioral interventions. *J Stud Alcohol Drugs.* (2005) 66(Suppl. 15):188–95. doi: 10.15288/jsas.2005.s15.188
71. Bragstad LK, Bronken BA, Sveen U, Hjelle EG, Kitzmüller G, Martinsen R, et al. Implementation fidelity in a complex intervention promoting psychosocial well-being following stroke: an explanatory sequential mixed methods study. *BMC Med Res Methodol.* (2019) 19:59. doi: 10.1186/s12874-019-0694-z
72. Hurley JJ. Social validity assessment in social competence interventions for preschool children: a review. *Topics Early Childhood Special Educ.* (2012) 32:164–174. doi: 10.1177/0271121412440186
73. Leko MM. The value of qualitative methods in social validity research. *Remed Special Educ.* (2014) 35:275–86. doi: 10.1177/0741932514524002
74. Beckstead JW. Content validity is naught. *Int J Nurs Stud.* (2009) 46:1274–83. doi: 10.1016/j.ijnurstu.2009.04.014
75. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropract Med.* (2016) 15:155–63. doi: 10.1016/j.jcm.2016.02.012
76. Miller WR, Moyers TB, Ernst D, Amrhein P. *Manual for the Motivational Interviewing Skill Code (MISC)*. Unpublished Manuscript. Albuquerque: Center on Alcoholism, Substance Abuse and Addictions, University of New Mexico (2003).
77. Miller WR, Rollnick S. *Motivational Interviewing: Helping People Change*. New York, NY: Guilford Press (2012).
78. Madson MB, Campbell TC. Measures of fidelity in motivational enhancement: a systematic review. *J Subst Abuse Treat.* (2006) 31:67–73. doi: 10.1016/j.jsat.2006.03.010
79. Orwin RG. Assessing program fidelity in substance abuse health services research. *Addiction.* (2000) 95:309–27. doi: 10.1080/09652140020004250
80. Streiner DL, Norman GR. *Health Measurement Scales: A Practical Guide to Their Development and Use*. New York, NY: Oxford University Press (2003).
81. Tappin DM, McKay C, McIntyre D, Gilmour WH, Cowan S, Crawford F, et al. A practical instrument to document the process of motivational interviewing. *Behav Cogn Psychother.* (2000) 28:17–32. doi: 10.1017/S1352465800000035
82. Al-Ubaydli O, List JA, Suskind D. *The Science of Using Science: Towards an Understanding of the Threats to Scaling Experiments*. Working Paper 25848. National Bureau of Economic Research (2019). Available online at: <http://www.nber.org/papers/w25848> (accessed October 20, 2020).
83. Fixsen DL, Naoom SF, Blase KA, Friedman RM, Wallace F. *Implementation Research: A Synthesis of the Literature*. University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network (FMHI Publication #231) (2005).
84. Hulleman CS, Cordray DS. Moving from the lab to the field: the role of fidelity and achieved relative intervention strength. *J Res Educ Effectiv.* (2009) 2:88–110. doi: 10.1080/19345740802539325

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Anis, Benzies, Ewashen, Hart and Letourneau. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Positive Psychological Coaching Tools and Techniques: A Systematic Review and Classification

Stefanie Richter¹, Llewellyn E. van Zyl^{2,3,4,5*}, Lara C. Roll^{3,6,7} and Marius W. Stander³

¹ Faculty of Psychology, Technische Universität Dresden, Dresden, Germany, ² Human Performance Management, Department of Industrial Engineering, University of Eindhoven, Eindhoven, Netherlands, ³ Optentia Research Focus Area, North-West University Vaal Triangle Campus, Vanderbijlpark, South Africa, ⁴ Department of Human Resource Management, University of Twente, Enschede, Netherlands, ⁵ Department of Social Psychology, Institut für Psychologie, Goethe University, Frankfurt am Main, Germany, ⁶ Department of Applied Psychology, Lingnan University, Tuen Mun, Hong Kong, ⁷ Department of Work, Organisational and Personnel Psychology, KU Leuven, Leuven, Belgium

OPEN ACCESS

Edited by:

Wenjie Duan,
East China University of Science and
Technology, China

Reviewed by:

Cristina Torrelles-Nadal,
Universitat de Lleida, Spain
Ting Ting Li,
Dalian Maritime University, China

*Correspondence:

Llewellyn E. van Zyl
llewellyn101@gmail.com

Specialty section:

This article was submitted to
Public Mental Health,
a section of the journal
Frontiers in Psychiatry

Received: 17 February 2021

Accepted: 11 June 2021

Published: 09 July 2021

Citation:

Richter S, van Zyl LE, Roll LC and
Stander MW (2021) Positive
Psychological Coaching Tools and
Techniques: A Systematic Review and
Classification.
Front. Psychiatry 12:667200.
doi: 10.3389/fpsy.2021.667200

Positive psychological coaching (PPC) has emerged as a popular “paradigm” for practitioners interested in the professional development of people. A recent review consolidated the literature on PPC and produced a 5-phase positive psychological coaching model aimed at facilitating professional growth. However, little is known about practically operationalizing each phase of the coaching process (i.e., how to facilitate each phase and which underlying tools and techniques could be employed to do so). As such, the purpose of this systematic review was to address this limitation by (a) determining which coaching tools and techniques are proposed within the coaching literature and (b) classifying the identified tools and techniques into the respective phases of PPC model. The investigation used a two-step approach by conducting a systematic literature review (to identify various PPC tools/techniques) followed by an iterative heuristic classification process (to assign these PPC tools/techniques to a known PPC model). The systematic literature review resulted in 24 peer-reviewed publications on positive psychological coaching, providing 117 different coaching tools that could be condensed into 18 overarching coaching techniques. The iterative classification process showed that most techniques and tools are useful in at least two phases. Interestingly, experts still vary in opinion on the timing and application of these specific techniques and tools within the positive psychological coaching process. This study provides researchers and practitioners with practical guidelines to facilitate a positive psychological coaching process.

Keywords: positive psychological coaching, positive psychological tools, positive psychological techniques, positive psychological interventions, strengths based coaching

INTRODUCTION

Positive psychological coaching (PPC) has emerged as a popular “paradigm” for practitioners interested in the professional development of people (1). This popularization was fuelled by the scientific advancements in positive psychology in the early 2000’s, and lauded as a new approach to optimize the potential of people through focusing on “what already works well,” rather than on “fixing what is wrong” (2, 3). This approach seemed to be favored by both practitioners and clients as it promotes growth, optimizes psychological strengths, and shifts the focus away from addressing

psychopathology or professional inefficiencies (4, 5). From this perspective, it positions personal growth and goal achievement as a function of the identification, awareness, and active utilization of one's signature strengths (6, 7). This, in turn, largely removes the stigma attached to the use of psychological services and lowers the threshold for utilization/participation (8). It is, therefore, not surprising that PPC has become a buzzword within the modern-day coaching practitioner's lexicon (9).

Despite its rapid adoption in practice, the formalization of positive psychological coaching as a scientific concept, a sub-discipline of positive psychology or a "paradigm" is still in its infancy (10). Even though the concept's origins can be traced back to a chapter by Kauffman and Scoular almost two decades ago (6), the scientific discourse on PPC is still largely centered around its conceptualization (10), the differentiation between other types of coaching approaches (1) or how it differs from counseling, mentoring, and therapy (11, 12). A study has shown that at least 24 different definitions of PPC exist in the scientific literature, with less than a 20% overlap in common elements between these definitions (10). From these definitions, a myriad of positive psychological coaching approaches or models have been developed ranging from authentic happiness coaching (13) and strengths-based coaching (8) to appreciative inquiry coaching (14) and quality of life coaching (15). Each coaching model provides a different means to distinguish itself from others, which further distracts from what fundamentally constitutes PPC and what tools or techniques are considered "positive."

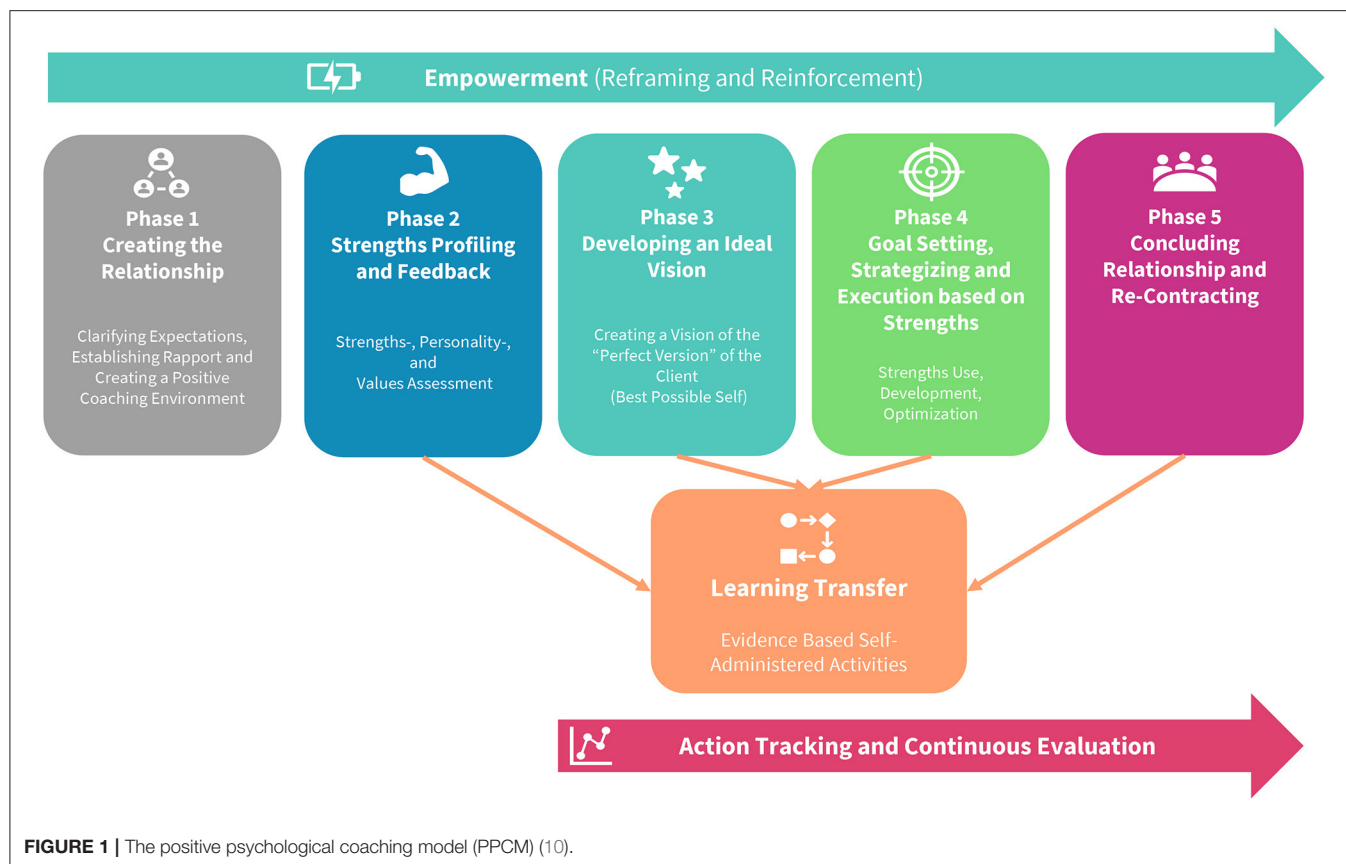
Some authors argue in favor of this inconsistency and state that "*definitions (and approaches) seldom stay static, unless the area has stagnated*" [(16), p. 3]; implying inconsistency and variety signifies growth or development in the discipline. Whereas, others argue these inconsistencies in fundamental components of a scientific concept signify an invalid concept or that it leads to a fragmentation in the scientific discourse on the subject matter (17). Some level of agreement in the fundamental principles of a scientific concept is therefore required to ensure that a discipline can develop and that it can lead to critical discrimination, an exploration of its function within the larger psychological system, and empirical verification (17, 18). For PPC to distinguish itself from other approaches to coaching and to develop as a science, there needs to be an objective, generally accepted, well-researched, organized body of knowledge supporting PPC's scientific identity (10, 19). The lack of a standardized approach may not only have negative implications for the discipline but may adversely affect the effectiveness of PPC interventions as they are not built on validated evidence-based theoretical frameworks (20).

A recent systematic literature review by Van Zyl et al. (10) aimed to consolidate the literature on PPC to develop an integrated definition and model thereof. They found that PPC can be defined as "*a short- to medium-term professional, collaborative relationship between a client and coach, aimed at the identification, utilization, optimisation and development of personal/psychological strengths and resources in order to enhance positive states, traits and behaviors. Utilizing Socratic goal setting and positive psychological evidence-based approaches facilitate personal/professional growth, optimal functioning, enhanced well-being, the actualization of people's potential and aid in coping*

with work-demands." [(10), p. 11]. From this definition and the common elements of other PPC models, the authors constructed a clear, demarcated coaching model comprised of five sequential coaching phases, supported by three continuous processes (c.f. **Figure 1**).

Van Zyl et al. (10) found that a PPC process follows a logical and sequential chronological order: First, a professional positive relationship between the client and coach is established. Here, the coach attempts to establish rapport and engages in various activities such as job shadowing to understand the nature of the client's work and how he/she fits into the organization's vision (*Creating the Relationship*). Second, the coach employs both strengths-focused psychometric assessments and other strengths-spotting techniques to identify the client's signature strengths. Here the aim is to provide the client with feedback on his/her strengths and to facilitate the development of a mindset of strengths use (*Strengths Profiling and Feedback*). Third, the client is facilitated to explicitly develop a clear picture of his/her perfect future self, where all dreams have been achieved and where he/she is living in an optimal range of positive functioning (*Developing Ideal Vision*). Fourth, the client identifies strategic goals centered around his/her strengths and develops action strategies that would bring him/her closer to the ideal vision (*Realistic Goal Setting, Strategizing And Execution Around Strengths*). Finally, the client is prepared for terminating the relationship and a discussion on re-contracting occurs. Here all parties reflect on the effectiveness of the coaching process and whether all goals were met. These phases are supported by three continuous processes that (a) aid in transferring the skills learned during the coaching process into the work environment (*Learning Transfer*), (b) continuous evaluation of the effectiveness of the coaching process through tracking both goal achievement and well-being (*Action Tracking and Continuous Evaluation*), and (c) empowering the client to achieve goals, reinforcing strengths, and helping to frame meaning (*Empowerment*).

Although Van Zyl et al. (10) addressed the need for a consolidated definition- and a process-orientated positive psychological coaching model, it is unclear how each phase of the model can be operationalised in practice. Operationalisation of a theoretical model occurs when it is clear (a) how each phase or component of the model is defined, (b) the sequential order of such is established, (c) how/why components in a model relate, and (d) what approaches, tools or techniques are required to activate each component (21). Once all four of these factors are theoretically confirmed, a model can be subjected to empirical validation. Van Zyl et al. (10) addressed the first three of these components but failed to describe the underlying tools or techniques required to facilitate each phase of the model. From this perspective, coaching tools are broadly defined as instruments or measures that have set procedural guidelines that have been validated for use within a given coaching context (22). This may include psychometric assessment measures or validated self-administered intentional activities. Coaching techniques, on the other hand, refer to a specific technique such as a skill, ability or competence, which a coach could employ during the coaching process (23). Within the PPC literature, very little evidence exists about the specific tools and techniques that are explicitly applicable or considered "positive." Further, no clear



differentiation between the tools or techniques are made and thus used interchangeably in PPC research (22). Additionally, it is also not clear from the literature which practical tools or techniques positive psychological coaches employ to support the growth of their clients.

Although, no broad classification framework for PPC tools/techniques exists, there are mentions of specific tools and techniques that positive psychological coaches could employ to facilitate the development of clients. Specific tools that are mentioned in the literature pertain to the use of strengths-based psychometric measures to identify the strengths of clients (e.g., the VIA signature strengths inventory; the Realise2; the Skills Finder 2.0), as well as various self-administered intentional activities (or "self-help tools") used to support the development of positive states/behaviors (e.g., the gratitude visit). Other techniques primarily relate to the use of behavioral strategies or psychological cues that facilitates the establishment of rapport [e.g., SOLER; (24)] or reframing techniques that aid clients to translate their narratives from victims to survivors (25). Despite such, no academic literatures exists that provide a comprehensive guide to, nor explanation of, the tools/techniques positive psychological coaches do or could employ during the coaching process (10, 26). This problem is further fuelled by the lack of clear coaching intervention protocols published alongside empirical coaching manuscripts (27). Therefore, it is unclear which tools/techniques are readily available for positive psychological coaches to use within the coaching process, nor

in which phase of the coaching process their use would be the most appropriate.

As such, the purpose of this paper was to identify which positive psychological coaching tools and techniques positive psychological coaching researchers employ and how such can be classified into the various phases of Van Zyl et al.'s PPCM (10). First, a systematic review was used to determine which coaching tools and techniques are suggested in the literature. Second, an iterative heuristic classification process was employed to classify each of the identified tools/techniques into the respective phases of the PPCM. This study aims to further the operationalisation of PPC as both a practice domain and scientific framework.

METHODS

Research Approach

The research approach consisted of a systematic literature review (to identify PPC tools/techniques), followed by a three-step, iterative heuristic classification process to classify the most commonly used coaching tools/techniques into the various phases of Van Zyl et al.'s PPCM (10).

A systematic literature review was deemed appropriate as it aims to synthesize an answer to a clearly defined research question. This is done through systematically identifying, selecting, and critically evaluating available research on a certain topic (28). In the present systematic review, the

“Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)” guidelines were followed (29). The PRISMA guidelines aim to enhance transparency, clarity, and credibility by providing a universally accepted evidence-based checklist of components, which are reported within the systematic literature review. The PRISMA checklist is provided in S2 Checklist. Following those guidelines, a clear extraction and classification taxonomy aligned to the purpose of this study was developed and systematically applied (28).

Once the tools and techniques were identified, an iterative heuristic classification process was followed to classify findings into the different phases of the coaching mode. The first step involved an independent classification by all four authors, the second consisted of independent classifications by six experts in the field of coaching psychology and in the third step all ratings were combined and discussed, resulting in the final classification based on specified criteria.

Search Strategy

Between April and June 2019, a comprehensive systematic literature search was conducted in the following bibliographic databases: ACM Digital Library, PsychInfo, Scopus, ScienceDirect, and Web of Science. A total of nine primary search terms were entered: “positive psychology coaching,” “strengths coaching,” “strengths-based coaching,” “positive coaching,” “positive therapy at work,” “positive personal development,” “integrative positive coaching,” “well-being coaching,” and “happiness coaching.” After first applying the primary search term, we subsequently and secondly conducted a search with a combination of each primary term with the secondary terms “model OR process OR theory OR program” (e.g., “positive psychology coaching” AND “model OR process OR theory OR program”). We identified 2252 titles from the year 2000 up until June 2019 (Figure 2 shows the flow diagram of the article selection). The year 2000 marked the start of the positive psychology paradigm. Therefore, this starting point for the literature search seemed most appropriate.

Eligibility Criteria

This review aimed to identify *academic* peer-reviewed, theoretical articles with a focus on positive coaching psychology. Specifically, for *inclusion* in the present paper, manuscripts needed to be (1) academic peer-reviewed, theoretical articles, books, or book chapters focusing on model- or theory construction, (2) centered around positive coaching psychology, (3) aligned with the theoretical approach of positive psychology but could emerge from any field of application (e.g., sports or business), (4) written in English, (5) published in journals that were ISI, Web of Science and Scopus listed, (6) published between 2000 and June 2019, and (7) needed to mention specific coaching tools/techniques.

Excluded were all manuscripts that were (1) published in languages other than English; (2) non-peer-reviewed books and articles (e.g., popular psychology or management books), (3) manuscripts focusing on developing instruments, empirical work or coaching intervention validations, (4) unpublished master and doctoral theses, (5) textbooks and conference proceedings,

(6) publications with a focus on non-psychological and/or non-behavioral coaching (e.g., physical strengths conditioning in professional sports), (7) publications with a focus on positive coaching outcomes, and (8) publications that do not include the specific use of tools/techniques/interventions¹.

Study Selection

Following the systematic literature search, studies were selected in four distinct phases involving all four authors. In the first phase, we screened all titles against the inclusion and exclusion criteria. In the second phase, the abstracts of those publications included in the first phase were extracted and screened. The full papers were screened in the third phase, and a final decision was made regarding their inclusion. In the fourth and final phase, the complete list of identified publications was sent to five academics, who are experts in positive psychology and positive coaching psychology, for review. They did not suggest additional publications that met our eligibility criteria.

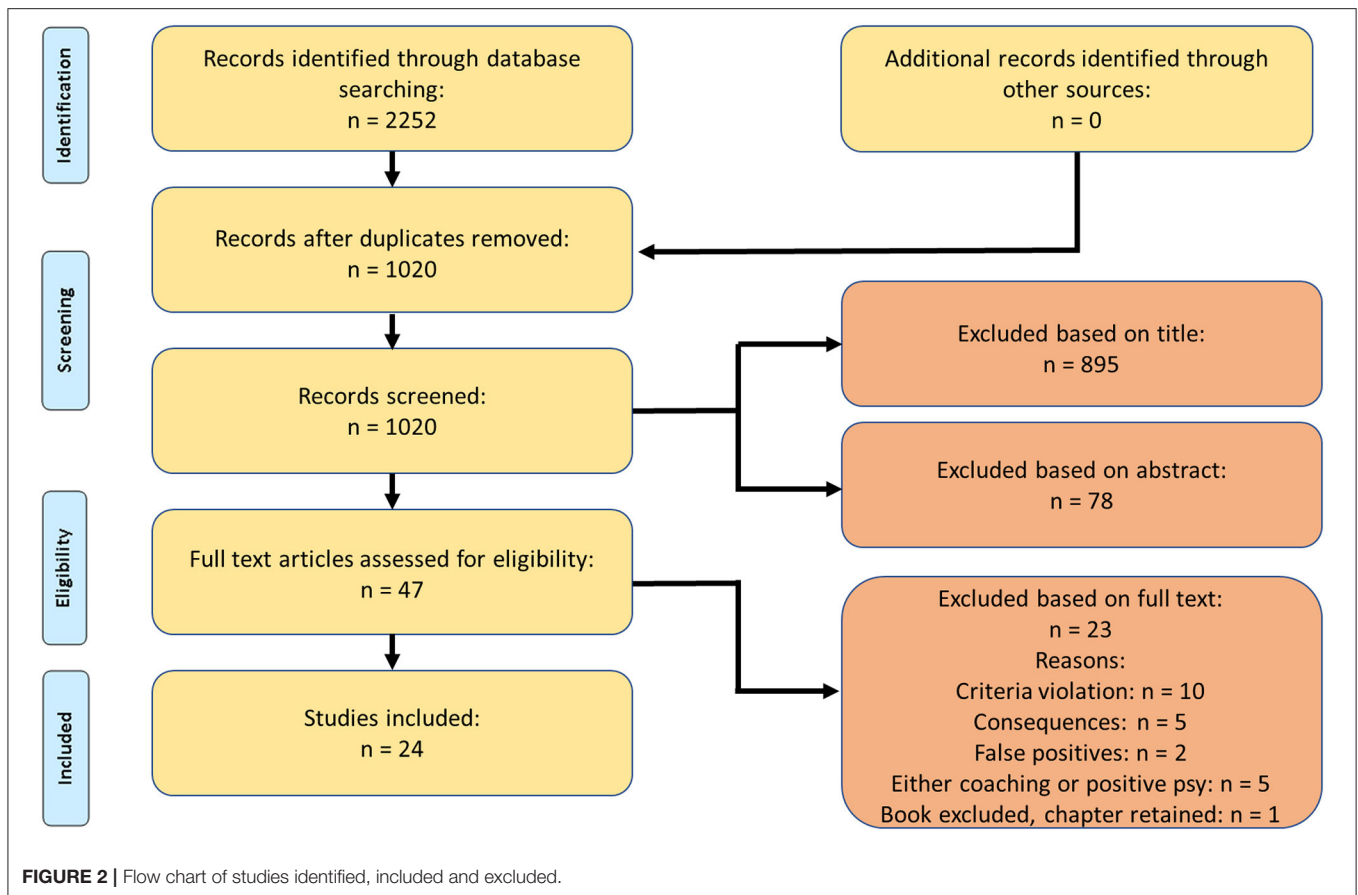
The initial systematic literature search provided 2,252 hits (Figure 2). Once duplicates were removed, 1,020 unique titles were revealed. A total of 895 publications were removed based on titles, 80 publications after screening their abstracts, and 21 manuscripts after reading the full texts. Ten manuscripts were excluded based on violating the inclusion criteria (e.g., empirical intervention studies). Further, five articles were excluded because the focus was specifically on the consequences of positive psychology coaching. Four papers were excluded as the focus was either on general coaching or on positive psychology, but not on their combination of the two. Two abstracts were initially selected because they contained our keywords. Yet, they were later excluded when the main text did not explicitly discuss such and was subsequently classified as false positives. In one book, only one chapter was relevant and hence the remaining chapters were excluded. As such, 24 articles were identified and included in the final selection. Each of these 24 articles was reviewed and the tools, techniques or interventions mentioned were extracted. All 24 articles were deemed relevant for further analysis (see Appendix).

Data Recording and Analyses

Verbatim data from the included studies were extracted and captured onto a Microsoft Excel Spreadsheet. Subsequently, thematic content analysis (30) was applied because this procedure allowed the quantification of large amounts of textual information (31). This procedure has the advantages that (a) it is non-intrusive (32), (b) flexible (30), and (c) allows for the replication and quantification of results in terms of frequencies and percentages (Van Zyl, 2013). Still, this analysis carries the same types of limitations as traditional nominal-oriented measurement techniques (33).

For the data analysis, we followed best practice guidelines as outlined by Miles and Huberman (34), who recommend the following six steps: First, all researchers read all included articles to get an overview and make initial notes (30). Second, when

¹Given the nature of the review, the effectiveness of the identified tools and techniques to promote positive psychological outcomes were not considered.



working through the data set, initial codes are generated based on data features. Third, those codes are clustered into potential themes according to their similar characteristics. Fourth, the researchers revisited the themes to generate a thematic map based on the frequency of occurrence. Fifth, analyses are refined to ensure coherence between definitions, names and labels for each theme. Sixth, the themes are combined based on their frequency of occurrence. Following these steps, the researchers derived the most common techniques or tools employed in positive coaching presented in **Table 1**.

Selection Bias

We implemented three strategies to manage selection bias, enhance the credibility, conformability, and transparency of this systematic review. First, the initial search process, as outlined above, was independently conducted by two authors of this paper to ensure that no records were missed or excluded (29). Second, titles, abstracts and full papers were coded by a co-ordinating author in addition to one of the co-authors. Before each phase was completed, all four authors met to debate the reasons for the in- and exclusion of titles, abstracts, and final papers.

Moreover, to ensure inter-rater reliability, we utilized Cohen's kappa coefficient, which is a function of the relative observed agreement between raters (Pr_o) from which the theoretical probability of agreement by chance (Pr_c) is subtracted, and subsequently divided by the standardized probability of chance

(35). The minimum recommended kappa level of 0.61 (36) was exceeded, which demonstrated substantial agreement between ratters ($k = 0.87$; $p < 0.01$).

Classification of Techniques and Tools

Drawing on the PPCM (10) and based on the systematic literature review results, we aimed to identify the coaching phases and continuous processes in which the derived coaching tools/techniques are actively used. For this purpose, we engaged in a three-step approach.

First, all authors independently classified the derived coaching techniques to their respective coaching phases and/or continuous processes. Fleiss' Kappa was then calculated for every technique to evaluate the agreement between the four researchers' classifications. The agreement was evaluated based on Fleiss' recommendations for the interpretation of Kappa, i.e., 0.75–1.00 indicating an excellent agreement, 0.40–0.74 a fair to good agreement, and values below 0.40 a poor agreement (37).

In the next step, the opinion of six independent experts in the field of positive coaching psychology was sought. Based on their scientific and practical experience, the experts were asked to link the derived coaching techniques to the phases or processes of the PPCM (10) in which the respective techniques are most actively used. For this purpose, the experts were provided with (a) descriptions of the techniques and respective tools as well as (b) a link to the paper of Van Zyl et al. (10) to ensure that

TABLE 1 | Common positive psychological coaching tools and techniques.

Technique (frequency)	Brief description	Positive psychological coaching tools
Providing self-administered intentional activity $f = 15$	Providing clients with brief evidence-based positive psychological intervention strategies to aid in developing positive states, traits and behaviors through encouraging deliberate practice outside the coaching sessions (e.g., Gratitude visit).	<ul style="list-style-type: none"> • Gratitude visit • Writing letters of gratitude • Counting one's blessing • Practicing optimism • Performing acts of kindness • Using one's strengths in new ways • Affirming one's most important values • Meditating on positive feelings toward self and others • Visualizing ideal future selves • Recommending books from positive psychology researchers • Positive journaling • Generating a favor bank • Three good things activity • Daily savoring task • Best-possible self-activity • Using an optimism-building exercise • Having a strengths date: choosing a companion and identifying as well as utilizing strengths together • Practicing active, constructive responding • Planning a day with a personally enjoyable activity or an altruistic activity • Creating a strengths family tree • Writing a life summary • Reflecting on the meaning of daily activities • Keeping a gratitude journal • String of pearls intervention • Strengths-based journaling
Strength-focused psychometric assessments $f = 15$	Employing various forms of psychometric assessments, or simulations exercises, to identify the manifested strengths of the client (e.g., VIA Signature Strengths Inventory).	<ul style="list-style-type: none"> • Positive 360-degree evaluation • VIA Signature Strengths Inventory • Projective techniques • Gallup-Clifton Strengths Finder 2.0 • Realise2 • Assessing and tracking positive states, traits and strengths.
Guided self-reflection $f = 14$	Employing validated tools to aid the client in systematically discovering his/her own potential, strengths or solutions to manifested problems. Insights are developed under the supervision of a coach (e.g., History of the Future Exercise).	<ul style="list-style-type: none"> • Sense checking—status checking • Reflect upon previous achievements and accomplishments • Appreciative questions to encourage individuals to relive past events where they felt hopeful • “Developing a history of the future” to help clients describe their picture of success by identifying their legacy • Envision himself in the shoes of a mentor he emulates • BEARS (barriers to change, evidence of behavior and overcome barriers, resources needed for success, and strengths a client can draw upon). • Change, specific actions to accomplish the dream • Reflecting on the purpose of positive emotion • Raising awareness for the contribution of all valued areas of life for the overall well-being and the inclusion of these areas in the life priorities • Awareness of the “accept, change or leave principle” • Reflecting on past failures while attributing them externally • Reflecting on past success while attributing them internally • Reflecting on how problems were solved in the past • Values from a list: sort a deck of value cards into different piles according to how much each value printed on the card
Goal setting $f = 10$	Tools that aim to translate the desired positive end state (or Dream) of the client into actionable, achievable short- and long-term goals in different life domains (e.g., SMART goals).	<ul style="list-style-type: none"> • Applying CASIO brainstorming strategy • Using the Wheel of Life domains as a Brainstorming framework • Set SMART Goals and Objectives • Set two value informed, achievable, long- term, and short- term approach type goals in different life areas • Translating values into observable action steps • Mind maps to aid in goal setting and strength clarification • Developing a shared vision of the future

(Continued)

TABLE 1 | Continued

Technique (frequency)	Brief description	Tool
Strengths spotting $f = 9$	Refers to tools centered around active, deliberate, and constructive attempts to identify the manifested strengths of oneself or others (e.g., Strengths Camera).	<ul style="list-style-type: none"> • Strengths-Spotting / Listening for Strengths • Strengths-based interview • The Strengths Camera (Strengths ID): list a personal strength or value clockwise around the “lens” of the camera and then indicate how effectively they have been utilizing that strength, or implementing that value in the last 30 days • Strengths Map: Map how strengths can be used to achieve goals
Strengths utilization and development $f = 9$	Explore ways through which clients’ strengths could be intentionally activated both at home and at work.	<ul style="list-style-type: none"> • Explore new ways to use strengths • Exploring ways to use strengths at work in life • Asking clients to use their top strengths in new ways for 1 week • Developing a plan for intentionally using strengths in the service of something or someone the person believes is worth fighting for
Creating a personal development plan $f = 7$	It is a strategic personal/ professional development map which translates strength development, developmental needs, and personal/professional goals into an actionable, implementable, and trackable operational strategy (e.g., The Appreciative Inquiry Framework).	<ul style="list-style-type: none"> • Help them develop a plan for reaching those goals, and then help him or her implement the plan and adapt it over time • Developing an action plan on how to build relationships and with whom • Developing a strategy for developing competencies • Identify specific competencies which need to develop in order to effectively manage the presented challenges, or highlighting the personal/professional goal the client wants to achieve, • Develop Action Plan to achieve goals • Determine resources needed • Determine how success will be measured and implement an action tracker
Building relationships and establishing rapport $f = 6$	Tools employed to develop a psychological contract between all stakeholders within the coaching process and to ensure a psychologically safe environment conducive to development (e.g., SOLER; Clarify expectations between coach/client).	<ul style="list-style-type: none"> • ARTS of communication: Ask first and listen, Respond with empathy, Teach your own perspective, Share decision making to achieve collaborative solutions • PEARLS: Partnership examples, Emotion/Empathy, Appreciation or apology, Respect, Legitimation, Support autonomy • Focus on what is going right and not what’s going wrong • Establishing a psychological contract • Appreciative interviewing • Awareness on the 10, 40, 50% principle • Using curiosity to delve deeper into the client’s world view • Positive introduction exercise
(Cognitive) reframing $f = 6$	Tools employed to cognitively reframe negative experiences in a positive manner or problems as opportunities (e.g., Telling stories as a survivor rather than a victim).	<ul style="list-style-type: none"> • Retell stories as survivors, not victims • Finding 15 positive things about a person who has done something hurtful • Reframe failures into learning opportunities • Appreciative interviewing • Pivoting: “the conscious act of turning attention from what the client does not want to what he wants” • Teaching the client how to reframe situations (look for the positive)
Resource activation $f = 5$	Guiding the client to rediscover and utilize existing but neglected personal, social, or environmental resources or energizing activities (e.g., reflecting upon past engaging activities).	<ul style="list-style-type: none"> • Exploring engaging activities • Identifying areas of flow and practicing flow activities • Identifying an expert friend who is doing well at handling the same challenges
Employing micro-skills (active listening) $f = 5$	Coaching communication skills employed that can aid clients to access their deepest thoughts, facilitate the development of self-insight and aids in creating an empowering environment conducive to change (e.g., Active listening).	<ul style="list-style-type: none"> • Framing questions in a positive, constructive manner (Positively Infused Language) • Active listening (attending behaviors, positive open questioning, paraphrasing and summarizing, noting and reflecting emotions, basic behavioral observation skills, nudging and influencing) • Solution-building conversations • Use affirmations to help the client more fully recognize and appreciate his or her effort, values, or achievement
Encouraging active skill development $f = 4$	Developmental interventions aimed at enhancing specific skills required to facilitate goal achievement.	<ul style="list-style-type: none"> • Social Competency Development (expressing affection and liking, general conversation skills, forgiving, apologizing, listening, assertiveness, affirming, and problem-solving) • Learning to enhance relaxation responses in the face of stress (e.g., Diaphragmatic breathing and mindfulness meditation) • Deliberate practice

(Continued)

TABLE 1 | Continued

Technique (frequency)	Brief description	Tool
Re-contracting $f = 4$	A technique used to reflect upon and evaluate the effectiveness of the coaching intervention at the end of the process in order to determine if further development is required/needed.	<ul style="list-style-type: none"> • Recontract relationship after completion of goals
Evaluating progress $f = 3$	Tools employed to evaluate the developmental- and goal achievement progress of the client throughout the coaching process (e.g., coaching logbook).	<ul style="list-style-type: none"> • Coaching log (record keeping) • Map development over time based on the Action Tracker • Measure life satisfaction on a monthly basis
Assessing personality, well-being, and work preferences $f = 3$	Psychometric instruments employed to assess the well-being, personality, and work preferences of the client (e.g., Baron EQ assessment).	<ul style="list-style-type: none"> • Diagnosing the position on the Languishing-Flourishing and Goal striving framework • Quality of Life Inventory • Baron Emotional Intelligence assessment • Positive Diagnosis: Identifying strengths, positive emotions and meaning, examining what the solution looks like • Belbin Leadership Roles • Myers-Briggs Type Indicator • 16 Factor Personality Index • Satisfaction with Life Scale
Managing difficult emotions $f = 3$	Techniques employed in managing destructive or negative emotions (e.g., practicing mindful awareness).	<ul style="list-style-type: none"> • Using Metaphors to clarify points • Employ expressive writing to draw out emotions • Employ loving and kindness Meditation • Practicing appreciative and expressive communications skills • Focus on solutions, not on the emotion • Practice mindful awareness • Employ strengths to buffer negative emotions • Develop stress management methods • Make lifestyle changes (healthy eating, exercise, etc.) • Parallel processing. Using the relationship between the coach and client to highlight what's going on in "real life"
Conducting competency-based assessments $f = 3$	Assessing specific competencies aligned to the role of the client (e.g., Developing and assessing the client against a positive capability matrix).	<ul style="list-style-type: none"> • Positive capability matrix • Simulations, job shadowing, and debriefing
Meaning making $f = 1$	A technique used to aid clients in crafting meaningful work experiences (e.g., job crafting)	<ul style="list-style-type: none"> • Job-crafting

the experts have a clear understanding of the model as well as derived technique Finally, Fleiss' Kappa based on only the experts' classification, was calculated for each coaching technique.

Once all results were obtained, a meeting was held in which all authors discussed the experts' and authors' classifications with the aim of deriving at a final classification. The following criteria was used to finalize the classification: (a) at least seven persons agreed on a respective classification, among them (b) at least half of the research team ($n = 2$) and (c) half of the experts ($n = 3$). Where disagreement was still present during the final integrated classification phase, such was noted and the frequency of total classifications were then used as the final guiding principle for classification.

RESULTS

Common Techniques and Tools Used in Positive Psychological Coaching

The data obtained *via* the systematic literature review was processed using thematic content analyses. From the 24 articles, 117 different coaching tools could be extracted.

Based on these tools, we derived 18 overarching coaching techniques applied by coaches during a positive psychological coaching process. **Table 1** provides a descriptive overview of the techniques, the associated tools employed and their frequency of occurrence.

Providing Self-Administered Intentional Activities. The majority of the examined articles ($f = 15$) endorsed the provision of brief evidence-based positive psychological self-administered intentional activities. They represent a means of supporting clients in deepening insights as well as encouraging practice outside the coaching sessions. Frisch points out that such "homework" may foster "the effectiveness of in-session interventions by having clients think about and implement in-session ideas and techniques between sessions and after coaching [...] is over." [(15), p. 217]. Thus, these activities may ensure the continuous transfer of insights into the clients' everyday life. Coaches can choose from a wide range of exercises depending on the goals that should be pursued. For example, Kauffman (38) proposes a gratitude visit to enhance positive emotions about the past. Activities such as performing acts of kindness and meditating on positive feelings toward self and

others were shown to increase well-being, specifically individuals' happiness (39).

Strengths-Focused Psychometric Assessments. Another highly recommended technique ($f = 15$) relates to the assessment of strengths by using simulation exercises or established inventories, e.g., the VIA signature Strengths (40), the Realise2 (41), or the Gallup Clifton Strengths Finder 2.0 (42). These assessments are applied to systematically identify strengths and show potential developmental needs (41). Moreover, the application of standardized inventories facilitates the examination of a client's strengths from an objective viewpoint. In this way, also unconscious strengths can be brought to light (9).

Guided Self-Reflection. Fourteen out of 24 articles suggested tools associated with gaining insights under supervision. Compared to self-administered activities, the technique *Guided Self-Reflection* encompasses tools that are implemented within coaching sessions to aid the client in systematically discovering his/her potential, strengths, and solutions to manifested problems through active involvement and guidance from the coach. Here as well, a wide range of specific tools were suggested depending on the objective. Aiming at providing tools to enhance the experience of positive emotions, Anstiss and Passmore (43) describe that coaches may firstly initiate a talk about the importance of positive emotions followed by questions about the client's current experiences and further joint exploration of possibilities to stimulate the experience of positive emotions in the future. Furthermore, some of these tools give an orientation how coaches may structure the elaboration of different topics [e.g., by following the BEARS approach; (44)].

Goal setting. As the third most frequently occurring technique, 10 articles mentioned the deployment of specific goal setting techniques to facilitate personal and professional development in a structured and systematic way. The focus here lies on tools that aid the client in setting achievable short- and long-term goals in different life domains to achieve a desired state (9, 38). Most articles referred to the use of the popular SMART (specific, measurable, attainable, realistic and time-bound) goals technique (9, 44, 45) or employing the Wheel of Life domains framework to brainstorm ideas around the specific needs of the client (38). This aided in crafting a shared vision of the future which guides the coaching process.

Strengths Spotting. Strength-spotting ($f = 9$) relates to an active, deliberate and constructive process initiated by either a coach to identify the manifested strengths of the client, or by a client to identify her/his own strengths or those of others. These techniques and the respective tools are used to provide the client with the strengths-vocabulary, -diagnostic framework and criteria needed to identify the strengths of oneself or others. These tools are more qualitative in nature. For example, Kauffman proposes a positive introduction exercise where based on events from the prior week, clients are asked to describe themselves at their very best and thus learn to focus specifically on their strengths (38).

Strengths Utilization and Development. With an equal frequency ($f = 9$), articles also emphasized tools focusing on utilizing and developing the clients' strengths. The respective tools aim at exploring ways through which the strengths could

be intentionally activated both at home and at work. Here the focus is on deliberate strengths-use to attain goals or to address developmental areas. Additionally, clients may also search for ways to use their strengths in a new way (46).

Creating a Personal Development Plan. Seven out of 24 articles referred to the construction of a personal development plan (PDP). The PDP refers to a strategic personal/professional development map that translates strength development, developmental needs, and personal/professional goals in to an actionable, implementable operational strategy (26). The plan highlights the clients' ideal vision of their desired future, areas of strength, development, and specific competencies that clients present with. This PDP also captures the specific short- medium- and long-term goals of the client, which are broken down into clear action steps, deadlines, means to track progress and clarifies the support/resources needed to aid in goal achievement (9). Furthermore, the PDP highlights the resources, support and developmental interventions needed to aid the client to bridge the current vs. desired state gap (5). A popular framework suggested was Appreciative Inquiry as it provides a structured, "positive psychological approach to frame solutions and develop action plans" (5).

Building relationships and establishing rapport. Six articles suggested tools to clarify expectations and set up rapport between coach and client. These tools are used to develop a psychological contract between the stakeholders and a psychologically safe environment conducive to development (9). For example, several articles recommended the SOLER technique by Egan (24) "facing the coachee squarely, displaying body language that can be considered open and inviting, leaning toward the coachee to display interest, ensuring eye-contact is made and relaxing as to ensure a comforting climate is created for the coaching process" [(9), p. 284]. Van Zyl and Stander (26) sum up other tools that may build the basis of a good contact between coach and client, e.g., creating a calm and trusting environment, clarifying expectations, presenting a genuine unconditional positive regard.

(Cognitive) Reframing. Just as frequently, six articles mention tools that could be used to cognitively reframe negative experiences in a positive manner or problems as opportunities (5, 9, 38). For this purpose, clients can be requested to re-tell their negative stories from a survivor rather than a victim perspective (5, 9, 26). Kauffman (38) describes an optimism-building exercise where clients are asked to reflect upon their lives and specific times when they did not succeed, or when their plans were ruined. In the next step, clients have to reveal what good things resulted from these situations.

Resource Activation. Resource Activation was mentioned by five articles as a technique aimed at guiding the client to rediscover and utilize existing but neglected personal, social, or environmental resources, e.g., social support networks, mentors, etc. (9), or energizing activities (43). In this regard, Anstiss and Passmore (43) suggest "exploring with the client the kind of activities he or she currently finds engaging, the things she or he used to find engaging but have stopped doing, and the activities she or he might wish to do more of in the future." (p. 244).

Employing Micro-Skills (Active Listening). Five articles mentioned the use of micro-skills by coaches in order to

facilitate meaningful conversations with clients. This technique represents a fundamental coaching communication skill that can aid clients to access their deepest thoughts, facilitate the development of self-insight and aids in creating an empowering environment conducive to change (5). For example, Van Zyl and colleagues propose active listening and the use of positively infused language (5, 26). This includes attending behaviors, positive open-questioning, paraphrasing and summarizing, noting and reflecting emotions, basic behavioral observation skills, nudging, and influencing (5). Additionally, Anstiss and Passmore (43) endorse the use of affirmations “to help the client more fully recognize and appreciate his or her effort, values, or achievement” (p. 245).

Encouraging Active Skill Development. Besides strengths development, several articles ($f = 4$) also endorse the active development of skills in positive psychological coaching. This refers to developmental interventions aimed at enhancing specific skills, competencies or capabilities required to facilitate effective and efficient goal achievement (47). For example, Anstiss and Passmore (43) propose developing social competencies to support positive relationships. Furthermore, Kauffman et al. (47) emphasize the value of methods to reduce physiological activation in the face of stress, e.g., mindfulness meditation.

Re-Contracting. With an equal frequency, four articles referred to re-contracting as a summative technique used to reflect upon and evaluate the coaching process to determine whether further development is required. Van Zyl and Stander (26) point out that initiating a new coaching process may be appropriate if expectations have not been met at the end of a current coaching process, and thus, the client expresses the need for further development.

Evaluating Progress. In three articles, the authors mention tools used to evaluate clients’ developmental- and goal achievement progress in the coaching process. For example, Stander (9) highlights the application of a coaching logbook to revisit expectations at regular intervals.

Assessing Personality, Well-being, and Work Preferences. Apart from assessing strengths, three articles suggested psychometric tests to be employed to assess the clients’ personality, well-being, and work preferences. The results are valuable to develop a holistic picture of the client and to ensure contextual alignment to the environment in which he/she functions. Van Zyl et al. (5) mention the Belbin teamwork test (48) as an example to assess preferred roles when working in teams.

Managing Difficult Emotions. While most articles focused on strengthening positive emotions and well-being, three articles discussed additional tools that can be applied to deal with clients’ difficult emotions, e.g., expressive writing or practicing mindful awareness (49).

Conducting Competency-Based Assessments. Similar to strengths-based assessments, three articles emphasized the need to assess specific work-related competencies. The authors suggested the development a positive capability matrix comprised out of strengths-based competencies (e.g., strategic visioning), experiences (e.g., career accolades), abilities (e.g., learning potential), and values (e.g., authenticity) (5, 9, 26). Competencies and experiences act as indicators of individual

performance, whereas individual potential is estimated *via* ability and values. Clients can be assessed against these competencies through, for example, fit-for-purpose simulations, job shadowing, and debriefing.

Meaning Making. One article discussed the value of tools aiding clients in crafting meaningful work experiences (5). This may include job-crafting activities.

Classification of Positive Psychological Tools and Techniques Into the PPC Model

The second objective of this paper was to classify the identified psychological tools and techniques into a known positive psychological coaching framework: the PPCM (10). An iterative heuristic classification process was employed with three steps: First, researchers independently classified the coaching themes into their respective categories. Second, the same was done by six independent experts and third, the results were combined to derive a final classification.

Step 1: Researcher Classifications

The researchers individually classified the 18 coaching themes into their respective coaching phases/ processes. The results are depicted in **Table 2**. Based on Fleiss’ recommendations for the interpretation of Kappa, we found an excellent agreement for five coaching techniques, i.e., encouraging active skill development; assessing personality, well-being, and work preferences; building relationships and establishing rapport; (cognitive) reframing as well as employing micro-skills. The research team members’ classification showed a fair to good agreement on nine techniques, e.g., evaluating progress and meaning-making. However, a poor level of agreement was established for competency-based assessment, managing difficult emotions, creating a personal development plan, and strengths spotting.

Step 2: Expert Classifications

In the second step, six experts provided their own independent classification. **Table 2** displays the experts’ results together with the Fleiss’ Kappa for each coaching technique (only based on the experts’ classification). Only for one technique, i.e., re-contracting, experts showed excellent agreement. A “fair” to “good” level agreement was found for five coaching techniques, whereas for 11 techniques, the experts’ opinions diverged widely, resulting in a poor agreement.

Step 3: Final Classification

Third, the results stemming from Step 1 and 2 were integrated into a common classification scheme based on the predefined integration criteria. The results of the integration process are depicted in **Table 3**. Ten of the coaching techniques were applicable to at least two of the coaching phases. However, the use of micro-skills was deemed to be relevant to each phase of the coaching process. Only seven techniques (Building relationships and establishing rapport, strength spotting, strength utilization and development, goal setting, meaning-making, creating a personal development plan, and re-contracting) were specifically deployed in a single coaching phase.

TABLE 2 | Authors' and experts' classification of the coaching techniques with regard to their predominant use along the phases and processes of the PPCM (10).

Technique	Rater	Phase 1: creating the relationship	Phase 2: strengths profiling and feedback	Phase 3: developing an ideal vision	Phase 4: goal setting, strategizing, and execution-based on strengths	Phase 5: concluding relationship and re-contracting	Continuous process 1: learning transfer	Continuous process 2: action tracking and continuous evaluation	Continuous process 3: empowerment	Fleiss' Kappa
1. Encouraging active skill development	Authors				1, 2, 3, 4		1, 2, 3, 4		1	0.85
	Experts		C		B, D, E, F			E	B	0.23
2. Psychometric assessments focused at personality, well-being, and work preferences	Authors		1, 2, 3, 4			2, 3, 4		1, 2, 3, 4		0.86
	Experts	E	A, B, C, D, E, F	F				B, D, E		0.55
3. Building relationships and establishing rapport	Authors	1, 2, 3, 4			1	1, 2, 3, 4				0.85
	Experts	A, B, C, D, E, F				C, E			B	0.64
4. (Cognitive) reframing	Authors		1, 2, 3, 4	2, 3, 4	1, 2, 3, 4		1, 2, 3, 4	1		0.75
	Experts		C, E	A, B, F	C, F		B		D, E	0.04
5. Conducting competency-based assessments	Authors	1	1, 2, 3, 4	1	1	2, 3, 4		1, 4		0.29
	Experts	B	A, C, D, E, F	F	F		F	B, E, F	D	0.18
6. Evaluating progress	Authors				1, 4	2, 3, 4		1, 2, 3, 4		0.64
	Experts				B	A, B, F	A, E, F	A, B, C, D, E, F	F	0.44
7. Goal setting	Authors			1, 4	1, 2, 3, 4	1, 2, 3, 4		1, 4		0.64
	Experts	B		A, C	C, D, E, F	F	E		B	0.09
8. Guided self-reflection	Authors	2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	2, 3, 4		1	1, 2, 3, 4	0.54
	Experts	B	A, C, D, E, F	D, F	F	B	E	E	B, E	0.07
9. Managing difficult emotions	Authors	2, 3	2, 3	2, 3, 4	1, 2, 3	2, 3, 4	1, 2, 3, 4	2, 3	1, 2, 3, 4	-0.08
	Experts	B, C, E	C, E	C, F	B, C, E, F	F	A, F	F	B, D, E	-0.07
10. Meaning making	Authors			1, 4	1, 2, 3, 4		1, 2, 4		1, 3, 4	0.56
	Experts		C	A, B, F	C, E, F		E	E	D, E	0.03
11. Employing micro-skills (active listening)	Authors	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1.00
	Experts	C, D, E, F	C, D, E, F	C, D, E, F	A, B, C, D, F	C, D, F	C, F	C, D, F	A, C, D, E, F	-0.07
12. Creating a personal development plan	Authors		1	1, 4	1, 2, 3, 4		1	1, 4	1	0.22
	Experts	B	B		C, D, F	A, F		A, B, E		0.09
13. Providing self-administered intentional activities	Authors		2, 3, 4	2, 3, 4	1, 2, 3, 4	2, 3, 4	1, 2, 3, 4		1, 2, 4	0.46
	Experts			F	A, B, F	F	C, D, E		B	0.10
14. Re-contracting	Authors					1, 2, 3, 4		1, 4		0.73
	Experts					A, B, C, D, E, F		E		0.83
15. Resource activation	Authors			1, 4	1, 2, 3, 4		1, 2, 3, 4		1, 2, 4	0.70
	Experts		B, C, E, F	F	A, B, F	B	C, E		B, C, D, E	0.17
16. Strengths spotting	Authors	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3	2, 3	1, 2, 3, 4	2, 3	1, 2, 3, 4	0.13
	Experts		A, B, C, D, E, F				E	B		0.70
17. Strengths utilization and development	Authors		1	1, 4	1, 2, 3, 4		1, 2, 3, 4		1, 2, 4	0.58
	Experts		F, B, C		A, C, D, E, F	F	E	F, B		0.29
18. Strengths-focused psychometric assessments	Authors		1, 2, 3, 4			2, 3, 4		1, 4	1	0.52
	Experts	B	A, B, C, D, E, F			E	C	B, C, E		0.47

Letters A–E refer to the single experts' classification. Numbers 1–4 represent the classification of the respective authors.

DISCUSSION

The purpose of this paper was to identify which positive psychology coaching tools and techniques positive psychological coaching researchers employ and how such can be classified into the various phases of Van Zyl et al.'s PPCM (10). First, a systematic review was used to determine which coaching tools and techniques stem from the positive psychological coaching literature. The results showed that positive psychological coaches employ 18 types of PPC techniques and 117 different coaching tools to aid clients in their personal and professional development journeys. Each set of these techniques is comprised of various evidence-based tools or strategies ranging from psychometric assessments to SMART goal setting and job-crafting. Second, an iterative heuristic classification process was employed to systematically associate the tools and techniques into the various phases of Van Zyl et al.'s PPCM (10). The results showed that most tools and techniques should be employed in at least two phases/ continuous processes; however, the results also highlighted significant differences between professional coaches in how tools/techniques should be classified.

Positive Psychological Coaching Tools and Techniques

The results showed that positive psychological coaches have a wide array of resources at their disposal to aid clients to achieve their personal- or professional goals. It would seem as though the most popularly suggested tools or techniques pertain to the use of *psychometric instruments aimed at identifying clients psychological or signature strengths*. The popularity of such could be attributable to the fact that positive psychology is considered the scientific study of psychological strengths and that strengths-based assessment forms a large part of this paradigm (50). As PPC aims to identify and utilize psychological strengths, assessment of such is a natural step in the process (10). Therefore, coaches need to have access to and be competent in using a wide array of strengths-based psychometric assessment measures to scientifically determine the manifested or unconscious strengths of a client (51). These assessment tools could either be aimed at measuring inherent psychological (or character) strengths [e.g., VIA Signature Strengths Inventory; (52)] or behavioral strengths (or competencies) through the Clifton Strengths Finder 2.0 (53). Strengths-Based psychometric tools provide a means to assess these underlying strengths and give way to a conversation around the function and purpose of these strengths in clients' lives (54). This, in itself, leads to a heightened awareness of one's strengths when it can be used and could lead to reframing events from a strengths-based perspective (26).

Strengths Spotting was also identified as an important (qualitative) tool positive coaches can use to identify strengths. It differs from the use of psychometric instruments in the sense that the coach facilitates an active and constructive process/conversation to help identify the client's strengths qualitatively (without the use of a psychometric instrument). The advantage of this technique is identifying strengths taking place in the context of the client's work and social environment. This ensures that the identified strengths are more relatable and contextualized within the clients' environment. Relating

to the strengths will enable the client to utilize and reinforce the strengths. For example, Kauffman (38) propose an exercise to identify strengths based on behavior and experiences from the prior week. Although formal approaches (psychometric instruments, self-administered instruments) are, arguably, the most common methods of identifying strengths, there are also more informal methods, such as strengths spotting. Fouracres and Van Nieuwerburgh (55) postulate that coaching theory itself does not imply that coaches require objective measures to ensure successful coaching outcomes. They suggest that self-identification, as an alternative to objective psychometrics, allows clients to identify their own strengths, which in turn increases the active use thereof in clients' daily lives.

Strengths spotting is an open-ended method of observing behavioral cues with the purpose to identify a client's strengths. The advantage of more open-ended or qualitative approaches is that the language and construction of the strengths are grounded firmly in the client's lived experience; ensuring authenticity and ownership (56). Strengths spotting involves the careful, intentional observation of strengths within the stories, interactions, and behaviors of others or oneself. It involves the labeling of observed strength(s) and offers a rationale for how it was expressed (57). Facilitating clients to identify their own strengths could allow the client space to engage in both self-insight and self-reflection, permitting the observation or strength to transfer from the sub-conscious into visibility and motivate conscious actions (55). When using strengths spotting, it is essential to facilitate a process *with* the client to determine the extent to which they, themselves, identify with a particular strength (56). Gaining awareness of other's strengths is dependent on how openly they display strengths, and one's own ability to observe strengths in others (58). This technique will expect the coach to be sensitive and continuously practice observing strengths in everyday interactions. Furthermore, the coach must strive to develop clients' competence in self-insight and self-reflection to the extent that it becomes a habit to observe strengths. Strengths spotting and strengths utilization and development is at the heart of a PPS approach.

Equally as prevalent, the results showed that authors suggest using evidence-based positive psychological *self-administered intentional activities* (e.g., Gratitude Visit) to aid clients in enhancing their well-being or to practice strengths in a validated manner. These evidence-based practices refer to tools developed to enhance specific positive states (e.g., happiness), traits (e.g., hope) or behaviors (e.g., deliberate practice) (59). These positive psychological tools provide structured guidelines for enhancing a particular state/trait/behavior and do not require the presence or support of the coaching practitioner (56). These can be classified into three broad categories of tools: First, *cognitive tools* which aim to change how a client thinks about him/herself, a given event or the future such as visualizing an ideal future self, or self-monitoring (positive journaling) (60). Second, *behavioral tools* which require clients to action or show a particular behavior such as looking for ways to use strengths in a new way or performing random acts of kindness (59). Finally, *emotional tools* which clients can use to relive positive experiences from the past (e.g., gratitude visit), extending positive experiences in the present (e.g., savoring life's joys) or to anticipate positive experience in the

future (e.g., practicing optimism) (52). These tools should not be applied in a prescriptive manner but rather be strongly aligned to clients' strengths and their goals for them to be effective (19).

A further prominent factor emanating from the literature was *Guided Self-Reflection*. These techniques relate to strategies coaches can employ to facilitate clients in discovering their own hidden potential (e.g., reflecting on successes), re-enforce strengths use (e.g., appreciative questioning), or to generate solutions to problems (e.g., sense checking or reflecting on how similar problems were solved in the past) during a given coaching session. Although guided self-reflection is not own to the positive psychological paradigm (61), it is applied uniquely within the PPC process. Here, clients are guided to focus on or look for positive experiences or outcomes of a given event, where the specific emphasis is placed on the role and use of psychological strengths and positive emotions (62). In traditional coaching frameworks, clients are guided to identify the underlying causes of poor performance (or other problems) and generate solutions to compensate for such (46). From the positive perspective, clients are guided to explore the positive, focus on what already works well and determine ways and means to optimize such (63). Therefore, the focus is firmly placed on the tools required to facilitate clients to become more mindfully aware of the positive aspects of their lives and to reinforce this mindset.

Goal Setting, as a technique to clarify the needs of a client in order to structure the developmental process, was identified as one of the more frequently used techniques reported in the PPC literature. This technique is part of most, if not all, coaching models and approaches (10). Goal setting forms an integral part of any training and development process or intervention. Achieving these goals will determine the success of the coaching process. Locke and Latham's seminal work on the Goal-setting theory is based on the underlying assumption that conscious human behavior is purposeful and regulated by the individual's goals, given the person has the requisite ability, goal-directedness will motivate and drive the actions of people (64). Within a PPC approach, Cheavens et al. (65) postulate that from hope theory, goals create the context for developing specific pathways and agency thoughts and serves as a means for people to use feedback from goal outcomes to inform their future actions. They furthermore state that goals perceived as important by the client will ensure that they are more intrinsically motivated to implement strategies to facilitate goal achievement. Latham (66) suggests that setting specific goals will increase the likelihood that people will respond positively to the feedback they receive in goal progression. Yalom (67) believes that concrete, attainable goals defined by the client, will increase their sense of responsibility for taking ownership of their own development. Various tools to aid in setting clear and concrete goals were identified in this study. Most articles referred to the use of the famous SMART (specific, measurable, attainable, realistic and time-bound) goals (9, 44, 45) that can be formulated to achieve short- or long-term goals in different life domains (6, 38). This technique will set the direction and action plans of the PPC process. In this respect, goal setting from the PPC differs from traditional coaching in the sense that it is not only training needs-driven, but can also focus on optimizing the use of strengths (63).

Strengths Utilization and Development is aimed at exploring ways through which strengths could be intentionally activated both at home and work. The success of a PPC approach rest strongly on the optimization of identified strengths. Coaching interventions should therefore not only involve the identification of strengths, but also focus on using strengths in an innovative way or as a means to achieve a goal (7, 38, 46). Identified strengths can be cultivated through practice and developing related knowledge and skills so that they can ultimately be productively applied (58). Strengths can be seen as "those (trait-level) personality characteristics that, when activated (state-level), are associated with the optimal functioning of a particular person" [(58), p. 3]. For organizations to benefit from this strengths-based focus, Biswas-Diener et al. (68) believed that buy-in to this approach should be established at all levels of an organization. Specifically, organizations should construct strengths-based capability models that aims to identify, explore, develop and celebrate the strengths of individuals and teams. Establishing a strengths-based climate may increase the ability organizations to recognize and appreciate the function of strengths in the professional development journeys of individuals and the function of strengths in team contexts (58). Creating such a culture will be supportive of a PPC approach and aid in fast tracking the development of employees.

Employees need to be encouraged to explore or optimize their strengths in different work-related contexts through structured strengths-based utilization and development approaches. One example of such is appreciative inquiry (AI), where the focus is on what people or teams do exceptionally well. When applied in the coaching process, this facilitated conversation approach emphasizes confirming language, exploring past successes, identifying strengths and resources, and transforming abstract values into concrete goals and behavioral efforts to facilitate healthy work-related changes (69, 70). This leads to valuable individual- (e.g., mental health), team- (e.g., team flow), and organizational (e.g., performance) outcomes (12).

Further, our results showed that some tools and techniques were less prevalent and, therefore, seem to not be specific to the positive psychological coaching approach but rather relate to generic coaching practices. These include tools and techniques relating to: the creation of a personal development plan, building relationships and establishing rapport, cognitive reframing, resource activation, employing micro-skills, encouraging active skills development, re-contracting the coaching relationship, assessing other personal characteristics (personality, well-being, and work preferences), ways to manage difficult emotions, conducting competency-based assessments, and meaning-making activities. These tools and techniques are generic in nature and foundational approaches in all coaching models, processes, or interventions (12).

Operationalising the Positive Psychological Coaching Model With Tools and Techniques

The final component of this paper was to determine how the identified tools and techniques could be classified into a known

PPC framework to operationalize the model further. This in turn would aid practitioners in selecting the right tool/technique necessary to address the needs of a client at the right time (71). Through an iterative heuristic classification process, it was found that the majority of the coaching tools and techniques could be classified or “used” in at least two of the PPC model’s phases/processes. The results showed that there was poor agreement in how 11 of the 18 techniques should be classified into Van Zyl et al.’s PPCM. Given that the coaching interventions do not follow a linear path, these coaching tools and techniques could therefore be used in multiple phases and at different times during the coaching relationship (22). Our results therefore highlight the fluidity in the use of these PPC tools/techniques throughout the coaching process. **Table 3**, therefore provides a visual representation of the final classification framework and highlights how each tool or technique relates to a given phase/process of the PPCM.

The results showed that tools or techniques associated with *building relationships and establishing rapport* as well as the use of *micro-skills* are associated with Phase 1 (*Creating the Relationship*) of the PPC model. This phase is primarily focused on establishing a positive relationship with the client, as the success of the process is fundamentally dependent thereon (19). These tools and techniques would aid the coach to ensure that he/she understands the nature of the clients’ work and those factors that matter most. Through employing micro-skills, the coach ensures that (a) a client feels “heard” (i.e. it communicates empathy and understanding), (b) a psychologically safe environment is created, and (c) fosters a positive relationship that is conducive to change (72). These strategies, therefore, place the relationship first and aids in not only establishing rapport but also facilitates in building a positive working relationship conducive to change.

Phase 2 (*Strengths Profiling and Feedback*) of the PPC model relates to the means through which clients psychological or behavioral strengths are assessed and how feedback is provided. This phase is strongly associated with strengths-based assessment, and it incorporates a wide variety of techniques to identify strengths. The results showed that both *strengths-focused and general psychometric assessments, competency-based assessments, strength spotting initiatives, micro-skills use, guided self-reflection, and cognitive reframing* could be employed in this phase. The assessment is supported by processes to reconfigure possibilities and look for opportunities (73). The client should be aware of his/her strengths and develop self-insight as to how these strengths could be used to foster personal development and achieve goals (8, 51).

In Phase 3, (*Developing an Ideal Vision*) the client develops a clear picture of the perfect version of him/herself in the future. The results indicate that *micro-skills* is associated with this phase. It entails communication skills that enable clients to access their deepest thoughts, facilitate self-insight development, and determine an ideal state as an outcome of coaching. Carkhuff (61) in his well-known work on “the art of helping” emphasizes the importance of attending (physical, active listening, and observing), responding (empathy, respect, and warmth), and personalizing (helping the client

to understand where he/she wants to be) as crucial skills in interacting with the client. Instead of directing the discussion, the coach should encourage the client to develop self-insight (74). Furthermore, these authors recommended that coaches (themselves) should also engage in self-reflection to enhance their own self-insight and well-being. Passmore and Oades (73) support a positive case conceptualization approach where possible preferred situations are identified with the client. Instead of diagnosing deficits, possibilities and opportunities should be explored and formulated to direct the coaching process going forward.

Phase 4 (*Realistic Goal Setting, Strategizing and Execution*), is a core function within the coaching process and its therefore not surprising that a large number of tools and techniques seemed to apply to this phase. The coach must facilitate a process to set specific, measurable, attainable, realistic, and time-bound goals aligned to the client’s strengths and ideal vision. Grant and O’Connor (74) confirm the importance of understanding why the goal is set and that the coach and client agree with the reason for achieving the specific goal. These goals need to be translated into a clear personal development plan, with specific implementable actions. A wide array of techniques could be applied within this phase of the coaching process, *including managing difficult emotions, meaning-making, micro-skills, self-administrated activities, resource activation*. Within the PPC approach, the core focus in this phase will be on and strengths development. The coach must assist the client in appreciating the power and opportunities that his/her strengths provide the client (42). According to Passmore and Oades (75), the client will perform, feel and function better when using their strengths. These can all be outcomes of the coaching process. The coach needs to encourage the client to identify potential personal resources and coaching themes as these will direct the coaching process (76).

The results further showed that tools or techniques associated with *evaluating process, re-contracting*, as well as the use of *micro-skills*, are primarily associated with Phase 5 (*Concluding Relationships and Re-contracting*). Given that this phase signifies the end of the current coaching trajectory, appropriate tools and techniques need to be deployed to either finalize the coaching process or prepare the client for another developmental journey. Evaluative and reflective practices are therefore important. Passmore (51) briefly describes three evaluation options: First, using psychometric instruments or a 360-competence assessment in a pre- and post-measurement. Second to compare data, for example absenteeism, before and after coaching and lastly assessing overall performance like sales made. It will be essential to identify and control all contamination factors. The ideal will be to apply a five-level evaluation with a return on investment as the ultimate measure as proposed by Phillips et al. (77). Towards the end of the coaching process, the client must be prepared to conclude or re-negotiate the relationship (26). In some cases, the coach and client will jointly decide to continue with the coaching process. If goals were achieved, new goals could be set, and the coaching relationship continues. In re-contracting, it is once again essential to get mutual agreement on goals, roles and expectations. Clarity and positive

TABLE 3 | Focal application of coaching techniques during the positive psychological coaching process.

Technique	Phase 1: creating the relationship	Phase 2: strengths profiling and feedback	Phase 3: developing an ideal vision	Phase 4: goal setting, strategizing, and execution based on strengths	Phase 5: concluding relationship and re-contracting	Continuous process 1: learning transfer	Continuous process 2: action tracking and continuous evaluation	Continuous process 3: empowerment
1. Encouraging active skill development				X		X		
2. Psychometric assessments focused at personality, well-being and work preferences		X					X	
3. Building relationships and establishing rapport	X							
4. (Cognitive) reframing		X						X
5. Conducting competency-based assessments		X					X	
6. Evaluating progress					X		X	
7. Goal setting				X				
8. Guided self-reflection		X						X
9. Managing difficult emotions				X				X
10. Meaning making				X				
11. Employing micro-skills (active listening)	X	X	X	X	X	X	X	X
12. Creating a personal development plan				X				
13. Providing self-administered intentional activities				X		X		
14. Re-contracting					X			
15. Resource activation				X		X		X
16. Strengths spotting		X						
17. Strengths utilization and development				X				
18. Strengths-focused psychometric assessments		X					X	

feelings of shared purpose will increase trust in the coaching intervention (78).

The sequential phases of the PPCM are supported by three dynamic or “continuous processes” that strengthens the interaction between the different phases. These three continuous processes apply to all the phases of the coaching model, build on, and are supported by each other (10). In *Continuous Process 1 (Learning Transfer)*, learning from the coaching process should be transferred to the work environment while the client takes ownership of the learning process. Cook (79) states that organizations have high expectations for coaching. One of these expectations is that the process will enable learning in the workplace. Four techniques were prominent in this continuous process, *active skill development, micro-skills, self-administered intentional activities and resource activation*. Taking into consideration that there is an interaction between phases, one should expect a variety of overlap in tools and techniques used in this phase/process. The purpose of these techniques is to guide the client to rediscover and utilize existing personal, social, or environmental resources and align it to their own as well as the company's advantage. In addition, the coach can provide “homework” to aid the client in developing competence in adherence to the coaching process (60). Clients need to be empowered to introduce newly learned practices or skills in the workplace and be made aware that failures should be seen as a learning opportunity (9, 38).

Continuous Process 2 (Action Tracking and Continuous Evaluation) aims to track the effectiveness of the intervention in both goal achievement and an increase in well-being. Tracing the developmental process ensures that the coaching intervention supports the client to achieve his/her goals and to intervene if evidence suggests that the client is not on track with his/her goal achievement (26). Four techniques were prominent in this process, namely *psychometric assessments, micro-skills, competency, and strengths-focused assessments*. Although the PPCM has a definite start and end date, within an ambiguous business environment, the development process in itself is not linear (10). Continuous changes in the client's roles, or the demands of the business, could result in the reformulation or reprioritization of goals. Should changes or demands in the developmental process occur, the coach and client need to re-prioritize goals to ensure goal achievement is still on target (9). Continuous assessment (*psychometric, competency, and strengths-focused*) enables the coach to assess the client's progress. Using micro-skills are imperative to facilitate the identification of goals and to help the client formulate concrete plans to achieve these goals (61). The coaching process should therefore incorporate active elements to monitor and evaluate the development of the client to ensure that active steps are taken toward goal achievement (46).

Continuous Process 3 (Empowerment, Reframing, and Reinforcement) aims to aid the client to experience a sense of control over initiating and regulating behavior to make a difference in their context. The focus is on reframing challenges as opportunities and to find the positive in negative experiences. This continuous process applies to each of the five chronological phases and supports both learning transfer and the evaluation

process. Five techniques (*reframing, guided self-reflection, managing difficult emotions, and resource activation*) were identified as essential in this phase. Here, positive confirmations and positively infused questions should be used to reinforce clients' faith in their own strengths (46, 80), challenges should be reframed as opportunities, clients' needs to be assisted to internalize strengths as personal resource, and client should be facilitated to move away from a victim to a survivor-oriented mindset (5). The coach should strive to empower the client to take ownership of his/her personal development and reduce his/her dependency on external resources (80). Noble et al. (81) describe empowerment as the linchpin of the strengths coaching model. They value a coach that believes in the client's ability to cope and change in positive ways.

Limitations and Recommendations

Although various strategies were implemented to enhance the relevance and rigor of the current study, a number of limitations in terms of the research design and generalizability is apparent. First, the current review focused solely upon theoretical papers aligned to the original PPCM and not empirical studies investigating the effectiveness of PPC as an intervention framework. In intervention studies, authors are encouraged to fully describe the intervention protocol, including specific tools and techniques used (27). As such, empirical papers which are aligned to the PPC paradigm might become interesting sources of information relating to tools and techniques in the future. Second, only peer reviewed, academic manuscripts or chapters were included in the review, therefore excluding gray literature and popular psychology/management books. Although these sources are not aligned to the scientific method nor exposed to the rigor of peer-review, they do usually provide more practice orientated guidelines, strategies, tools, and techniques than the academic literature. Therefore, a number of PPC tools and techniques may have been excluded. Third, the classification process involved only a single round of iterative heuristics. Although the methodology employed was rigorous, a number of additional iterations of review, classification and refinement could have increased the inter-rater reliability and aided in providing more evidence for the final classification (especially on the factors where low inter-rater reliability was established). Fourth, although this systematic literature review and classification provides an overview of various positive psychological tools and techniques, it does not provide evidence as to the effectiveness or usefulness thereof. Therefore, it is not known to what extent each specific tool or technique contributes to the effectiveness of the overall positive psychological coaching process. It is suggested that future researchers embark upon a meta-analysis in order to determine the specific effect each coaching tool or technique has on desired positive psychological outcomes during the coaching process. Finally, the identified experts were only sent brief instructions, coupled with a very short description of each phase. Therefore, each rater may have not fully understood each component or interpreted it from his/her own paradigm. In the future it may be more rigorous, to invite all members of the expert panel to first attend a brief presentation about the model and its phases and then let them

proceed to rate / classify. This way a shared understanding of each component of the model could be established.

These limitations do give way to the potential for future research. Future research should aim to extend the classification of the tools and techniques to the competencies or characteristics coaches require to effectively use such during the coaching process. Further, future research should not only be focused on the classification of tools/techniques to a given phase, but also on dissecting what specifically constitutes a positive psychological tool vs. a generic coaching strategy. Another aspect which needs to be considered is whether there is (or should be) a difference between the tools psychologists or therapists employ (e.g., psychological tools that are classified as psychological acts) and those that regular (non-psychologist) coaches interested in PPC could use in practice. A final matter that needs investigation is the empirical validation of the PPCM within a real-world environment.

CONCLUSIONS

In conclusion, although Van Zyl et al. (10) addressed the need for an articulated definition and a process-orientated positive psychological coaching model, very little evidence existed in terms of clarity about techniques and tools explicitly applicable to PPC. Scientific knowledge should be available for other researchers to utilize, implement, validate, evaluate, critique, and update in an objective and systematic manner. With this article

all four factors identified by George et al. (21) as important to operationalise a theoretical model have been theoretically confirmed, opening the way for further research and most importantly, empirical validation of the PPC model.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

All authors contributed equally to conceptualization, data collection, analyses, and drafting of the manuscript.

ACKNOWLEDGMENTS

The authors would like to extend their appreciation to Marisa Salanova, Jonathan Passmore, Tim Lomas, Zelda di Blasi, María Josefina Peláez, and Diane Arijs for their extensive contribution to this manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsy.2021.667200/full#supplementary-material>

REFERENCES

- Lomas T. Positive coaching psychology: a case study in the hybridization of positive psychology. *Int J Wellbeing*. (2020) 10:37–52. doi: 10.5502/ijw.v10i2.1083
- Biswas-Diener R, Dean B. *Positive Psychology Coaching: Putting the Science of Happiness to Work for Your Clients*. Hoboken, NY: Wiley. (2007).
- Ng W, Tov W, Veenhoven R, Rothmann S, Cambel MJ, Van Zyl LE. In memory of Edward Diener: reflections on his career, contributions and the science of happiness. *Front Psychol*. (2021) 12:706447. doi: 10.3389/fpsyg.2021.706447
- Passmore J, Oades LG. Positive Psychology Coaching - a model for coaching practice. *Coaching Psychol*. (2014) 10:68–70.
- Van Zyl LE, Motschnig-Pitrik R, Stander MW. Exploring positive psychology and person-centred psychology in multi-cultural coaching. In: van Zyl LE, Stander MW, Odendaal A, editors. *Coaching Psychology: Meta-Theoretical Perspectives and Applications in Multicultural Contexts*. Cham: Springer (2016). p. 315–55. doi: 10.1007/978-3-319-31012-1_15
- Kauffman C, Scoular A. Toward a positive psychology of executive coaching. In: Linley PA, Joseph S, editors. *Positive Psychology in Practice*. Hoboken, NY: Wiley (2004). p. 287–302. doi: 10.1002/9780470939338.ch18
- Van Zyl LE, Arijs D, Cole ML, Glinska A, Roll LC, Rothmann S, et al. The strengths use scale: psychometric properties, longitudinal invariance and criterion validity. *Front Psychol*. (2021) 12:676153. doi: 10.3389/fpsyg.2021.676153
- McQuaid M, Niemiec R, Doman F. A character strengths-based approach to positive psychology coaching. In: Green S, Palmer S, editors. *Positive Psychology Coaching in Practice*. Oxford: Routledge (2018). p. 71–9. doi: 10.4324/9781315716169-5
- Stander FW. Strength coaching as an enabler of positive athlete outcomes in a multi-cultural sport environment. In: van Zyl LE, Stander MW, Odendaal A, editors. *Coaching Psychology: Meta-theoretical Perspectives and Applications in Multicultural Contexts*. Cham: Springer (2016). p. 279–98. doi: 10.1007/978-3-319-31012-1_13
- van Zyl LE, Roll LC, Stander MW, Richter S. Positive psychological coaching definitions and models: a systematic literature review. *Front. Psychol*. (2020) 11:793. doi: 10.3389/fpsyg.2020.00793
- Passmore J, Lai Y-L. Coaching psychology: exploring definitions and research contribution to practice? *Int Coaching Psychol Rev*. (2019) 14:69–83.
- Van Zyl LE, Stander MW, Odendaal A. *Coaching Psychology: Meta-Theoretical Perspectives and Applications in Multi-Cultural Contexts*. New York, NY: Springer. (2016). doi: 10.1007/978-3-319-31012-1
- Seligman MEP, Steen TA, Park N, Peterson C. Positive psychology progress: empirical validation of interventions. *Am Psychol*. (2005) 60:410–21. doi: 10.1037/0003-066X.60.5.410
- Gordon S, Gucciardi DF. A strengths-based approach to coaching mental toughness. *J Sport Psychol Action*. (2011) 2:143–55. doi: 10.1080/21520704.2011.598222
- Frisch MB. Evidence-based well-being/positive psychology assessment and intervention with quality of life therapy and coaching and the quality of life inventory (QOLI). *Soc Indic Res*. (2013) 114:193–227. doi: 10.1007/s11205-012-0140-7
- Palmer S, Whybrow A. *Handbook of Coaching Psychology: A Guide for Practitioners*. Routledge (2007). Available online at: <http://gbv.ebib.com/patron/FullRecord.aspx?p=1588482> (accessed June 23, 2021).
- Wolf A. *Essentials of Scientific Method*. Oxford: Routledge (2019). doi: 10.4324/9780429054105
- Van Zyl LE, Olckers C, van der Vaart L. *Multidisciplinary Perspectives on Grit: Contemporary Theories, Assessments, Applications and Critiques*. Cham: Springer (2021). doi: 10.1007/978-3-030-57389-8
- Biswas-Diener R. The practice of positive psychology coaching. *J Posit Psychol*. (2020) 2020:1–4. doi: 10.1080/17439760.2020.1789705
- Compton WC, Hoffman E. *Positive Psychology: The Science of Happiness and Flourishing*. 3rd ed. New York, NY: SAGE. (2019).
- George AL, Bennett A, Lynn-Jones SM, Miller SE. *Case Studies and Theory Development in the Social Sciences*. Cambridge, MA: The MIT Press. (2005).
- Herd AM, Russell JEA. Tools and techniques: what's in your toolbox? In: Hernez-Broome G, Boyce LA, editors. *Advancing Executive Coaching: Setting*

- the Course for Successful Leadership Coaching*. Hoboken, NY: Wiley (2010). p. 229–83. doi: 10.1002/9781118255995.ch10
23. Lancer N, Clutterbuck D, Megginson D. *Techniques for Coaching and Mentoring*. Oxford: Routledge. (2016). doi: 10.4324/9781315691251
 24. Egan G. *The Skilled Helper: A Problem-Management and Opportunity-Development Approach to Helping*. 7th ed. Pacific Grove, CA: Brooks/Cole. (2007).
 25. Smith EJ. The strength-based counseling model. *Couns Psychol*. (2006) 34:13–79. doi: 10.1177/0011000005277018
 26. van Zyl LE, Stander MW. A strengths-based approach towards coaching in a multicultural environment. In: Cornelius-White JHD, Motschnig-Pitrik R, Lux M, editors, *Interdisciplinary Handbook of the Person-Centered Approach*. Cham: Springer (2013). p. 245–57. doi: 10.1007/978-1-4614-7141-7_17
 27. van Zyl LE, Efendic E, Rothmann S, Shankland R. Best-practice guidelines for positive psychological intervention research design. In: van Zyl LE, Rothmann S, editors, *Positive Psychological Intervention Design and Protocols for Multi-Cultural Contexts*. Cham: Springer (2019). p. 1–32. doi: 10.1007/978-3-030-20020-6_1
 28. Booth A, Sutton A, Papaioannou D. *Systematic Approaches to a Successful Literature Review*. 2nd ed. Thousand Oaks, CA: SAGE. (2016).
 29. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. (2009) 6:e1000097. doi: 10.1371/journal.pmed.1000097
 30. Creswell JW. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. 3rd ed. Thousand Oaks, CA: SAGE. (2013).
 31. van Zyl LE. *Research Methodology for the Economic and Management Sciences*. Upper Saddle River, NJ: Pearson Education International. (2013).
 32. Duriau VJ, Reger RK, Pfarrer MD. A content analysis of the content analysis literature in organization studies: research themes, data sources, and methodological refinements. *Org Res Methods*. (2007) 10:5–34. doi: 10.1177/1094428106289252
 33. Salkind NJ. *Exploring Research: International Edition*. 8th ed. New York, NY: Pearson Publications. (2012).
 34. Miles MB, Huberman AM. *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. New York, NY: SAGE. (2009).
 35. McHugh ML. Interrater reliability: the kappa statistic. *Biochemia Medica*. (2012) 22:276–82. doi: 10.11613/BM.2012.031
 36. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. (1977) 33:159. doi: 10.2307/2529310
 37. Fleiss JL. *Statistical Methods for Rates and Proportions*. 2nd ed. Wiley series in probability and mathematical statistics Applied probability and statistics. Hoboken, NY: Wiley. (1981).
 38. Kauffman C. Positive psychology: the science at the heart of coaching. In: Stober DR, Grant AM, editors, *Evidence Based Coaching Handbook: Putting Best Practices to Work for Your Clients*. Hoboken, NY: Wiley (2006). p. 219–253.
 39. Tarragona M. Positive psychology and life coaching. In: Joseph S, editor, *Positive Psychology in Practice: Promoting Human Flourishing in Work, Health, Education, and Everyday Life*. 2nd ed. Hoboken, NY: Wiley (2015). p. 249–64. doi: 10.1002/9781118996874.ch15
 40. Freire T. Positive psychology approaches. In: Peterson DB, Passmore J, Freire T, editors, *Wiley-Blackwell Handbooks in Organizational Psychology Series. The Wiley-Blackwell Handbook of the Psychology of Coaching and Mentoring*. Hoboken, NY: Wiley-Blackwell (2013). p. 426–42. doi: 10.1002/9781118326459.ch22
 41. Gordon S. Strengths-based coaching: case of mental toughness. In: Davis PA, editor, *Sports and Athletics Preparation, Performance, and Psychology. The Psychology of Effective Coaching and Management*. Hoboken, NY: Nova Science Publishers (2016). p. 267–83.
 42. Dyess SM, Sherman R, Opalinski A, Eggenberger T. Structured coaching programs to develop staff. *J Contin Educ Nurs*. (2017) 48:373–8. doi: 10.3928/00220124-20170712-10
 43. Anstiss T, Passmore J. Wellbeing coaching. In: Cooper CL, Leiter MP, editors, *The Routledge Companion to Wellbeing at Work*. Oxford: Routledge (2017). p. 237–48. doi: 10.4324/9781315665979-17
 44. White MK, Barnett P. A five step model of appreciative coaching: a positive process for remediation. In: Kalet A, Chou CL, editors, *Remediation in Medical Education: A Mid-Course Correction*. Cham: Springer (2014). p. 265–81. doi: 10.1007/978-1-4614-9025-8_16
 45. Linley PA, Kauffman C. Positive coaching psychology: integrating the science of positive psychology with the practice of coaching psychology. *Int Coaching Psychol Rev*. (2007) 2:5–8.
 46. Grant AM, Spence GB. Using coaching and positive psychology to promote a flourishing workforce: a model of goal-striving and mental health. In: Linley PA, Harrington S, Garcea N, editors, *Oxford Library of Psychology. Oxford Handbook of Positive Psychology and Work*. Oxford: Oxford University Press (2010). p. 175–88. doi: 10.1093/oxfordhb/9780195335446.013.0014
 47. Kauffman C, Joseph S, Scoular A. Leadership coaching and positive psychology. In: Joseph S, editor, *Positive Psychology in Practice: Promoting Human Flourishing in Work, Health, Education, and Everyday Life*. 2nd ed. Hoboken, NY: Wiley (2015). p. 377–90. doi: 10.1002/9781118996874.ch23
 48. Belbin RM. *Team Roles at Work*. New York, NY: Butterworth-Heinemann. (2010).
 49. Sims C. Second wave positive psychology coaching with difficult emotions: introducing the mnemonic of “TEARS HOPE”. *Coaching Psychol*. (2017) 13:66–78.
 50. Seligman MEP, Csikszentmihalyi M. Positive psychology: an introduction. In: Csikszentmihalyi M, editor, *Flow and the Foundations of Positive Psychology*. Springer (2014). p. 279–98. doi: 10.1007/978-94-017-9088-8_18
 51. Passmore J. Mindfulness in organizations (Part 2): a practitioners’ guide to applying mindfulness-based approaches in leadership development, workplace wellbeing and coaching. *Indus Commercial Training*. (2019) 51:165–73. doi: 10.1108/ICT-07-2018-0064
 52. Seligman MEP. *Authentic Happiness: Using the New Positive Psychology to Realize Your Potential for Lasting Fulfillment*. New York, NY: Simon and Schuster. (2004).
 53. Asplund J, Lopez SJ, Hodges T, Harter J. *The Clifton StrengthsFinder 2.0 Technical Report: Development and Validation*. (2007). Available online at: <https://www.gallup.com/services/176321/clifton-strengthsfinder-technical-report-development-validation.aspx> (accessed June 23, 2021).
 54. Peláez Zuberbuhler MJ, Salanova M, Martínez IM. Coaching-based leadership intervention program: a controlled trial study. *Front Psychol*. (2020) 10:3066. doi: 10.3389/fpsyg.2019.03066
 55. Fouracres AJS, van Nieuwerburgh C. The lived experience of self-identifying character strengths through coaching: an interpretative phenomenological analysis. *Int J Evid Based Coach Mentor*. (2020) 18:43–56. doi: 10.24384/e0jp-9m61
 56. Diener E, Heintzelman SJ, Kushlev K, Tay L, Wirtz D, Lutes LD, et al. Findings all psychologists should know from the new science on subjective well-being. *Can Psychol*. (2017) 58:87–104. doi: 10.1037/cap0000063
 57. Niemiec RM, Shogren KA, Wehmeyer ML. Character strengths and intellectual and developmental disability: a strengths-based approach from positive psychology. *Educ Training Autism Dev Disabil*. (2017) 52:13–25.
 58. van Woerkom M, Meyers MC, Bakker AB. Considering strengths use in organizations as a multilevel construct. *Hum Resource Manag Rev*. (2020) 2020:100767. doi: 10.1016/j.hrmr.2020.100767
 59. Sin NL, Lyubomirsky S. Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: a practice-friendly meta-analysis. *J Clin Psychol*. (2009) 65:467–87. doi: 10.1002/jclp.20593
 60. Hayes MC, van Zyl LE. Positive journal writing across multicultural contexts: a protocol for practice. In: van Zyl LE, Rothmann S, editors, *Positive Psychological Intervention Design and Protocols for Multi-Cultural Contexts*. Cham: Springer (2019). p. 415–33. doi: 10.1007/978-3-030-20020-6_19
 61. Carkhuff RR. *The Art of Helping in the 21st Century*. Cham: Human Resource Development Press. (2000).
 62. Kauffman C, Linley PA. A pragmatic perspective: putting positive coaching psychology into action. *Int Coach Psychol Rev*. (2007) 2:97–102.
 63. Biswas-Diener R. *Practicing Positive Psychology Coaching: Assessment, Activities and Strategies for Success*. Hoboken, NY: Wiley. (2010). doi: 10.1002/9781118269633
 64. Latham GP, Locke EA. Self-regulation through goal setting. *Organ Behav Hum Decis Process*. (1991) 50:212–47. doi: 10.1016/0749-5978(91)90021-K
 65. Cheavens JS, Heiy JE, Feldman DB, Benitez C, Rand KL. Hope, goals, and pathways: further validating the hope scale with observer ratings. *J Posit Psychol*. (2019) 14:452–62. doi: 10.1080/17439760.2018.1484937
 66. Latham GP. Motivate employee performance through goal setting. In: Locke EA, editor, *Handbook of Principles of Organizational Behavior: Indispensable*

- Knowledge for Evidence-Based Management*. Hoboken, NY: Wiley (2000). p. 161–78. doi: 10.1002/9781119206422.ch9
67. Yalom ID. *Existential Psychotherapy*. New York, NY: Basic Books. (1980).
 68. Biswas-Diener R, Kashdan TB, Lyubchik N. Psychological strengths at work. In: Oades LG, Steger MF, Fave AD, Passmore J, editors, *The Wiley Blackwell Handbook of the Psychology of Positivity and Strengths-Based Approaches at Work*. Hoboken, NY: Wiley-Blackwell (2017). p. 34–47. doi: 10.1002/9781118977620.ch3
 69. Cantore SP, Cooperrider DL. Positive psychology and appreciative inquiry. In: Leonard HS, Lewis R, Freedman AM, Passmore J, editors, *Wiley-Blackwell Handbooks in Organizational Psychology. The Wiley-Blackwell Handbook of the Psychology of Leadership, Change and Organizational Development*. Hoboken, NY: Wiley-Blackwell (2013). p. 267–87. doi: 10.1002/9781118326404.ch13
 70. Cooperrider DL, Whitney DK, Stavros JM. *Appreciative Inquiry Handbook: For Leaders of Change*. 2nd ed. San Francisco, CA: Berrett-Koehler. (2008).
 71. Stout-Rostron S. *Leadership Coaching for Results: Cutting-Edge Practices for Coach and Client*. Johannesburg: Knowledge Resources Publishing. (2014).
 72. Ridley CR, Kelly SM, Mollen D. Microskills training. *Couns Psychol*. (2011) 39:800–24. doi: 10.1177/0011000010378438
 73. Passmore J, Oades LG. Positive psychology techniques: positive case conceptualisation. *Coaching Psychol*. (2015) 11:43–5.
 74. Grant AM, O'Connor S. A brief primer for those new to coaching research and evidence-based practice. *Coaching Psychol*. (2019) 15:3–10.
 75. Passmore J, Oades LG. Positive psychology techniques: active constructive responding. *Coaching Psychol*. (2014) 10:71–3.
 76. Palmer S, Green S. PERMA-powered coaching: building foundations for a flourishing life. In: Green S, Palmer S, editors, *Positive Psychology Coaching in Practice*. Oxford: Routledge (2018). p. 125–42.
 77. Phillips PP, Phillips JJ, Ray R. *Measuring the Success of Employee Engagement: A Step-by-Step Guide for Measuring Impact and Calculating ROI*. New York, NY: American Society for Training and Development. (2016).
 78. Gettman HJ, Edinger SK, Wouters K. Assessing contracting and the coaching relationship: Necessary infrastructure? *Int J Evid Based Coach Mentor*. (2019) 17:46–62. doi: 10.24384/Onfx-0779
 79. Cook J. Collaborative Action Coaching for Leaders: a way of enabling transfer and sustainability of learning for all external coaches? *Int J Evid Based Coach Mentor*. (2016) 10:76–83.
 80. Yeager JM, Britton KH. Positive psychology coaching for sports leaders. In: Brady A, Grenville-Cleave B, editors, *Positive Psychology in Sport and Physical Activity: An Introduction*. Oxford: Routledge (2018). p. 243–55. doi: 10.4324/9781315304397-20
 81. Noble DN, Perkins K, Fatout M. On being a strength coach: child welfare and the strengths model. *Child Adolesc Soc Work J*. (2000) 17:141–53. doi: 10.1023/A:1007510407262

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Richter, van Zyl, Roll and Stander. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Decreasing Social Isolation to Enhance Mental Health among Older Adults in China: A Mediation Analysis of Aging Attitude

Xinfeng Cheng¹, Theodore D. Cosco² and Tolulope Ariyo^{3*}

¹ School of Economics and Management, Xi'an Technological University, Xi'an, China, ² Department of Gerontology, Gerontology Research Center, Simon Fraser University, Vancouver, BC, Canada, ³ Institute for Population and Development Studies, School of Public Policy and Administration, Xi'an Jiaotong University, Xi'an, China

OPEN ACCESS

Edited by:

Wenjie Duan,
East China University of Science and
Technology, China

Reviewed by:

Chibueze Anosike,
University of Nigeria, Nsukka, Nigeria
Jennifer N. Bress,
Cornell University, United States
Shi Zhilei,
Zhongnan University of Economics
and Law, China

*Correspondence:

Tolulope Ariyo
ariyotolu@gmail.com

Specialty section:

This article was submitted to
Health Psychology,
a section of the journal
Frontiers in Psychology

Received: 03 July 2021

Accepted: 24 August 2021

Published: 24 September 2021

Citation:

Cheng X, Cosco TD and Ariyo T
(2021) Decreasing Social Isolation to
Enhance Mental Health among Older
Adults in China: A Mediation Analysis
of Aging Attitude.
Front. Psychol. 12:735740.
doi: 10.3389/fpsyg.2021.735740

A large body of literature has examined the relationship between social isolation and mental health in older adults. However, only a few studies have examined the mediating effects of aging attitudes on this relationship. This study investigated the impact of objective isolation (family isolation, friend isolation, and community isolation), and subjective social isolation (perceived isolation) on the mental health of Chinese older adults, and the mediating effect of aging attitudes. Mental health was assessed through depressive symptoms, using the Epidemiological Studies Depression Scale. The research sample comprising 7,024 elderly adults (60 years old), was obtained from the nationally representative 2014 Chinese Longitudinal Aging Social Survey. The regression analysis indicated that objective social isolation and subjective social isolation are independently related to mental health among older adults. Furthermore, in the mediation analysis, aging attitude was found to play a significant mediating role between social isolation and mental health. Our study concludes that though, objective and subjective social isolation are issues affecting mental health in older people, however, aging attitude also needs to be factored in that relationship as we have shown that there is a significant mediating effect.

Keywords: social isolation, aging, mediation analysis, mental health, China

INTRODUCTION

Five years ago in 2015, the population of China was 1.37 billion, and people aged 60 years or older constituted 16.6%. It is projected that by 2030, this will increase to 25% (United Nations, 2019). Old age may often be accompanied by failing health status (Robins et al., 2018), such that it may affect the physical, mental, or emotional state of mind of the elderly. Also, the reduced social participation that may come as an extended effect could exacerbate any physical, psychological, financial, or emotional difficulties (Kaye and Singer, 2018). According to estimations based on national household surveys, the prevalence of severe depression among Chinese older adults is 7.1%, while depression symptom is reported to be 37.9% (Qin et al., 2016). A higher prevalence of depression symptoms at 43.4% has also been reported among the group of older adults who are socially isolated (Huang et al., 2020).

Social relationships are important for mental and physical well-being all through one's life span (Cacioppo and Cacioppo, 2014). The social convoy model suggests that social relationships can protect an individual's health (Antonucci and Akiyama, 1995; Antonucci et al., 2014). Individuals with enhanced social relationships not only experience improved psychological well-being but also, better physical health (Cohen, 2004). The extent to which a person is socially isolated (objective social isolation), and the extent to which they feel socially isolated (subjective social isolation) are some of the ways of evaluating social relationships (Cacioppo and Cacioppo, 2014). Objective social isolation specifically relates to physical separation from other people or a deficiency in interaction (Taylor et al., 2018). On the other hand, subjective social isolation indicates one's perception of the quality of relationships or interaction with others (Valtorta et al., 2016).

Social isolation has often been measured in an objective or subjective context. Individuals may experience loneliness without also suffering social isolation, or vice versa (Valtorta and Hanratty, 2012). The advancement of social isolation research over the years has helped scholars realize that both objective and subjective components of social isolation must be examined (Cho et al., 2019). It is important to differentiate between objective and subjective social isolation, particularly in how they are both associated with health. Knowing their specific contributions to health may shed some light on their relatedness or independence, and provide insight on possible interventions (Holt-Lunstad et al., 2015).

Social isolation affects mental health through psychological, behavioral, and physiological pathways (Holt-Lunstad et al., 2010). The psychological pathway has been established as an important linkage between social relationships and health (Berkman et al., 2000). For example, social isolation can cause low self-efficacy and self-respect (Umberson and Montez, 2010), reduced emotional support (Santini et al., 2017), and increase perceived lack of well-being (Berkman et al., 2000), which then affect the mental health of older people.

Aging attitude is a predictor of successful aging (Korkmaz Aslan et al., 2019). It refers to an individual's cognition and opinion on the aging of oneself and others (Laidlaw et al., 2007), and the manner it affects the individual's physical and mental health (Jang et al., 2004; Wurm et al., 2017). Previous studies have shown that a positive aging attitude among older adults can stimulate good self-rated health and better life satisfaction. Conversely, a negative aging attitude can lead to poor physical health, depression, and low subjective well-being (Diehl et al., 2014).

While it is generally perceived that an individual's aging attitude is affected by factors such as age, gender, and socioeconomic status (Laidlaw et al., 2007; Diehl et al., 2014), social relationships, or more specifically, social support/isolation is also an important factor that may affect aging attitude (Tong and Lai, 2016; Santini et al., 2017). For instance, social support is likely to increase access to emotional (e.g., love and care) and instrumental supports (e.g., material assistance and information), both of which are germane to dissuading negative attitudes toward aging (Lamont et al., 2017). Furthermore, the model of

Awareness of Aging (AoA) as proposed by Diehl et al. (2014), depicts aging attitude as an important mediator between social relationships and health and also emphasizing the influence of aging attitude on health. This goes to suggest that while aging attitude may have a direct link with mental health among older adults, it may also act as a potential mediator for any effect from social isolation.

Based on the avalanche of evidence in the literature, both objective and subjective aspects of social isolation may be similar or different in how they impact the mental health of older adults, and in light of the contradictory findings, researchers have often drawn contrary conclusions. For instance, some studies have found that older adults who experience objective social isolation are likely to be more depressed (Cornwell and Waite, 2009), and have a lower rating on life satisfaction (Thompson and Heller, 1990; Zebhauser et al., 2014; Courtin and Knapp, 2017). Conversely, other studies have reported that it is not objective social isolation, but rather, perceived isolation (that is, loneliness) that poses a risk for depression in older adults (Umberson et al., 2010; Lim and Kua, 2011; Taylor et al., 2018). Another study had yet, reported that both objective and subjective social isolation are significantly related to depression in older adults, emphasizing no difference in the sizes of effect (Ge et al., 2017). Additionally, while the conclusions from another study (Coyle and Dugan, 2012), is partly in agreement with Ge et al. (2017), their point of departure is that there is a difference in the sizes of effect. They posited that given the same magnitude of depression, older adults tend to have a higher degree of social isolation, and a lower degree of perceived isolation (Coyle and Dugan, 2012). Further evidence from Taylor et al. (2018), suggested that while the experience of objective isolation from relatives and friends is uncorrelated with depressive symptoms and psychological stress in older adults, the experience of subjective isolation from relatives and friends is correlated with depression and psychological stress.

From the perspective of the internal mechanism of the impact of social isolation on mental health in older adults, most existing studies have indicated that social isolation can reduce self-efficacy (Schrempft et al., 2019), and self-esteem (Umberson and Montez, 2010), decrease emotional support (Santini et al., 2015), and reduce perceived happiness (Berkman et al., 2000). Although various mechanisms have been verified to operate between social isolation and the mental health of older adults, few studies have considered that social isolation could affect the mental health of older adults through a psychological mechanism such as aging attitudes (Liu et al., 2020). While social isolation has been linked to the risk of morbidity and mortality (Laugesen et al., 2018), however, it has most commonly been associated with mental health-related issues, particularly among older adults (Gerino et al., 2017; Wang et al., 2017). According to the American Academy of Social Work and Social Welfare, social isolation is a major problem of special concern for older people (Kaye, 2017). Although there are lots of older people in China, only a few studies have investigated how social isolation impacts their mental health, concluding that social isolation is linked to mental health, and the links are independent of loneliness (Wu and Sheng, 2020; Yu et al., 2020).

Against the backdrop of Confucian ideology, the Chinese culture is heavily characterized by the principles of collectivism, emphasizing family togetherness and the interdependency of relationships. In such a context, families, friends, and acquaintances provide different types of social support to the Chinese elderly. By implication, isolation from family, friends, and acquaintances may have adverse effects on Chinese older adults. Therefore, the main objective of this study is to investigate how forms of social isolation are associated with the mental health of older adults, using depression symptoms as a measure. Also, to examine how the attitude to aging plays a mediating role in that relationship. In this study, objective social isolation has been divided into family isolation, friend isolation, and community isolation. The following questions are of concern: (1) Is there an independent effect of objective and subjective social isolation on the mental health of older Chinese adults? (2) Are there variations in how the different forms of social isolation impact the mental health of older adults in China? (3) Is aging attitude a mediator of the relationship between social isolation and the mental health of Chinese older adults?

MATERIALS AND METHODS

Data Set

We analyzed secondary data obtained from the 2014 Chinese Longitudinal Aging Social Survey (CLASS). The survey was conducted by Renmin University with the help of the Chinese government. It aimed to gather data from Chinese elderly adults aged 60 and above to identify their issues and challenges. The questionnaire included questions about social, economic, and physical well-being, among other topics. The survey protocol was approved by the Ethics Committee of the Renmin University of China. Data collection lasted from March to December 2014, and it followed a multi-stage sampling technique covering a total of 462 villages/neighborhood communities across 28 provinces (autonomous regions/municipalities). Data were collected through a face-to-face interview by trained interviewers. Each participant was informed of the purpose of the survey. Participation was voluntary, and participants were assured of the confidentiality of any information collected. Informed verbal consent was obtained from the participants before the questions were administered, and no financial compensation was given for participation. The survey response rate was reported to be 97%. More details about the survey procedure can be found in the survey final report (National Survey Research Center, 2014).

The total sample obtained for the survey was 11,511. Among these, 4,487 observations were excluded based on missing responses on key variables of interest. For this group, the average age was 72.6 years, showing that they were much older people. About 46.1% of them were widowed, 48.3% rural residents, and 62.3% women. Among these excluded samples, about 65.5% (2,943) was because they did not respond to questions on aging attitude due to low cognitive ability. The final sample included in our analysis was 7,024. Our comparison of the deleted and analyzed samples showed some differences. Compared to the excluded observations, the included observations had a better

cognitive ability, younger average age, a larger proportion of males, a higher proportion of rural residents, and a lower proportion of widowed.

Dependent Variable

In the current study, the dependent variable is depression. During the survey, this was measured through the revised Center for Epidemiological Studies Depression Scale (CES-D) which contained 9 items (Silverstein et al., 2006). Each item has three possible responses: “no” = 1; “sometimes” = 2; “frequently” = 3. The total score ranges from 9 to 27, with a higher score indicating more depressive symptoms. Some examples of the items on the scale are: “Do you think you are in a good mood?” “Do you feel lonely?” and “Do you think you are useless?” The Cronbach alpha reliability coefficient of the scale for the current study is 0.755.

Key Independent Variables

The key independent variable is social isolation, which was divided into objective social isolation and subjective social isolation.

Objective Social Isolation

Objective social isolation was divided into “family isolation,” “friend isolation,” and “community isolation.”

Family Isolation

Family isolation was measured using the Lubben Social Network Scale (LSNS) (Lubben et al., 2006), which has been cross-validated for a Chinese context (Chang et al., 2018). The following items in the questionnaire relating to the family member network were used to measure the construct of family isolation. (1) “How many relatives do you see or hear from at least once a month?”; (2) “How many relatives do you feel at ease with that you can talk about private matters?”; and (3) “How many relatives do you feel close to such that you could call on them for help?” The participants had to choose from six options: “none” = 0; “one” = 1; “two” = 2; “three or four” = 3; “five to eight” = 4; or “nine or more” = 5. The responses to the three questions were aggregated to get the total score for family isolation. We used the cut-off score suggested by Lubben et al. (2006), which is “6 points,” meaning that older adults with a home network score of below 6 were considered to be in family isolation (1 = experienced family isolation), and those with a score of 6 and above were considered not to have experienced family isolation (0 = no family isolation). The Cronbach alpha reliability coefficient of the family isolation dimension in the current study is 0.797.

Friend Isolation

Friend isolation was also measured using the following items from the LSNS. (1) “How many of your friends do you see or hear from at least once a month?”; (2) “How many friends do you feel at ease with that you can talk about private matters?”; (3) “How many friends do you feel close to such that you could call on them for help?” The participants had to choose from five options: “none” = 0; “one” = 1; “two” = 2; “three or four” = 3; “five to eight” = 4; or “nine or more” = 5. Similar to family isolation, the responses to the three questions were aggregated

to get the total score for friend isolation. Respondents with a friend network score below 6 were considered to be in a state of friend isolation (1 = experienced friend isolation), and those with a friend network score of 6 and above are regarded as not having experienced friend isolation (0 = no friend isolation). The Cronbach alpha reliability coefficient of the friend isolation dimension in the current study is 0.837.

Community Isolation

Based on Menec et al. (2019), community isolation was measured through one question item. “Did you participate in the following activities in the past three months?”: community security patrols, caring for other older people, environmental sanitation protection, dispute resolution, escort chat, voluntary services requiring professional skills, and help to look after other’s children. Each of the activities had the following response options: “Participated”; “I have participated, but not in the past three months”; “Never participated.” In this study, the total score was calculated by combining the responses to each activity. If the respondent chose “Never participated,” it was regarded as experiencing community isolation, while the other two options were regarded as not experiencing community isolation (0 = not experiencing community isolation; 1 = experiencing community isolation).

Subjective Social Isolation

In this study, subjective social isolation was conceptualized as “perceived isolation.” In the survey, questions bothering on this concept were based on the Hughes et al. (2004) revised three-item loneliness scale known for high-reliability of construct. The three questions are: (1) “In the past week, did you feel that you lacked companionship?”; (2) “In the past week, did you feel that you were ignored by others?” and (3) “In the past week, did you feel that you were isolated by others?” Each question had three response choices: “no” = 1, “sometimes” = 2, and “frequently” = 3. Aggregating the answers to the questions yielded the total score for loneliness, with a possible range from 3 to 9 points. Adopting the criterion of Shaw et al. (2017), a score of three or less was defined as no perceived isolation, and scores above 3 were considered to indicate perceived isolation (0 = no perceived isolation; 1 = perceived isolation). The Cronbach alpha reliability coefficient of the perceived isolation dimension in the current study is 0.821.

Mediation Variable

The mediating variable in this study is “aging attitude.” In the survey, The Attitudes to Aging Questionnaire (AAQ) (Laidlaw et al., 2007), was used to elicit questions relating to the construct on aging attitude. The AAQ had been previously validated across multiple cultures and has often been used in studies on the Chinese context (Wang et al., 2009; Laidlaw, 2010). The AAQ uses a five-point response scale ranging from “completely disagree” to “completely agree” on the following seven items: (1) “I think I am old”; (2) “In my opinion, aging is a process of constant loss (such as loss of health, loss of friends and relatives, loss of ability, etc.)”; (3) “I found it harder to make new friends when aging”; (4) “For my age, I feel that I was

excluded”; (5) “The older the person, the stronger the ability to deal with life problems”; (6) “Wisdom grows with age”; and (7) “There are many pleasant things about aging.” Reversing the order of the responses to the last three items and then adding the responses to all the items yielded the individuals’ “aging attitude.” The Cronbach alpha reliability coefficient of the aging attitude dimension in the current study is 0.752. The “aging attitude” variable was a continuous variable, with higher scores indicating a more positive aging attitude.

Control Variables

Based on the factors that may affect the mental health of older adults, as have been reported in the literature (Thompson and Heller, 1990; Courtin and Knapp, 2017; Taylor et al., 2018; Huang et al., 2020; Liu et al., 2020; Wu and Sheng, 2020), the following variables were selected as control variables for this study: social and demographic characteristics, such as age, gender, marital status, education level, household registration attributes, working status, and living arrangements (“living alone” = 0; “live only with spouse” = 1; “live only with children” = 2; “live only with others” = 3). Additionally, the instrumental activity of daily living (IADL) (Lawton and Brody, 1988), indicating how well-respondents can cater to self needs was also part of the control variables. The IADL items in the 2014 CLASS covered sundry questions relating to shopping, cooking, telephoning, medicine, funds management, traveling, and doing chores. Furthermore, cognitive ability was part of the control variable and in the 2014 CLASS, it was measured through the mini-mental state examination (MMSE) scale (Folstein et al., 1975). Both the IADL and the MMSE had previously been validated and translated for a Chinese context (Chiu et al., 1994; Tong and Man, 2002). The selected control variables also include the number of children and religious faith (0 = No, 1 = Yes). The coding and operationalization of all variables in this study are depicted in Table 1.

Analysis

We used a multiple linear regression model to analyze the relationship between social isolation and mental health. Following this, structural equation modeling was used for mediation analysis, and the Bootstrap method was used to verify the mediation effects of aging attitudes.

To solve the sample selection bias and address the causal relationship of social isolation and mental health, the propensity score matching (PSM) method was used. The PSM is a technique appropriate for the estimation of the causal effect in a situation where treatment is non-randomized (Rosenbaum and Rubin, 1983). One major advantage of the PSM in such a context is that it can simulate a randomized trial, assigning individuals into treatment and control groups (Lian et al., 2011). The categorization into two groups allows the assumption that the socio-demographic characteristics are similar across the groups. The method involves developing a *post-hoc* quasi-experimental *post-hoc* design that compares people who are comparable in measurable characteristics, but where some of them have received treatment, while others have not.

TABLE 1 | Coding and operationalization of variables.

Variables	Definitions
Independent Variables	
Objective social isolation	
Family isolation	1 = experienced family isolation; 0 = no family isolation
Friend isolation	1 = experienced friend isolation; 0 = no friend isolation
Community isolation	1 = experienced community isolation; 0 = no community isolation
Subjective social isolation	
Perceived isolation	1 = perceived isolated; 0 = no perceived isolated
Dependent Variable	
Depression	9–27
Mediation Variable	
Aging attitude	7–35
Control Variables	
Age (years)	60–113
Gender	0 = Female; 1 = Male
Education	0 = Elementary school and below; 1 = Junior high school; 2 = High school and above
Urban	0 = Rural area; 1 = Urban area
Married	0 = Married; 1 = No spouse (Widowed, Divorced, Unmarried)
Working	0 = No; 1 = Yes
Log of income (Chinese Yuan)	2.30–13.77
Religious faith	0 = No; 1 = Yes
Instrumental Activity of Daily Living (IADL)	7–20 (higher score represents better IADL)
Cognitive ability	3–16 (higher score represents better cognitive ability)
Living arrangement	0 = Live alone; 1 = Live only with spouse; 2 = Live only with children; 3 = Live with other people
Number of children	0–9

Our treatment condition was social isolation. Using the PSM, we obtain propensity scores (PS), which measure the extent of matching of the treatment group and the control group, and also, the average effect of treatment on the treated (ATT) (Rosenbaum and Rubin, 1983; Lian et al., 2011). We adopted three PSM methods, namely, nearest-neighbor matching, radius matching, and kernel matching (Baser, 2006). The specific analysis strategies used in this study were as follows: First, we used descriptive statistical analysis to understand the mental health status of Chinese older adults, and ANOVA to explore the relationship between social isolation and mental health. Second, we used multiple linear regression models to gradually verify the correlations among subjective social isolation, aging attitude, and mental health. At the same time, the score matching method was used to explore the causal relationship between social isolation and mental health in older adults. Finally, the mediation analysis was carried out using the structural equation model, and the mediation effect of the aging attitude was verified using the bootstrap method (Hayes, 2009). The bootstrap method was

TABLE 2 | Descriptive statistics of the relevant variables.

Variables	Percent	Average	Standard deviation (SD)
Independent Variables			
Objective social isolation			
Family isolation	13.88		
Friend isolation	39.88		
Community isolation	71.20		
Subjective social isolation			
Perceived isolation	27.29		
Mediation Variable			
Aging attitude		19.52	5.45
Dependent Variable			
Depression		13.54	3.56
Control Variables			
Age (years)		68.88	7.35
Gender (male)	55.00		
Education			
Elementary school and below	55.60		
Junior high school	23.93		
High school and above	20.47		
Urban	64.78		
Married	28.56		
Working	20.39		
Log of income		9.21	1.58
Religious faith (Yes)	11.25		
Instrumental activity of daily living (IADL)		7.80	1.87
Cognitive ability		13.05	2.97
Number of children		2.36	0.97
Living arrangement			
Live alone	12.20		
Live only with spouse	35.72		
Live only with children	41.71		
Live with other people	10.36		

used to test the intermediary effect with the random sampling replications set to 5,000, and a 95% confidence interval. All statistical analyses, as well as data cleaning, were performed in STATA software version 13.0 (StataCorp, College Station, TX, USA), and results are reported at a 95% significance threshold.

RESULTS

Descriptive Statistics

Table 2 shows the descriptive statistics of the relevant variables. Approximately 13.9% of older adults suffer from family isolation, 39.9% from friend isolation, 71.2% from community isolation, and 27.3% from perceived isolation (i.e., loneliness). The average depression score among older adults was 13.5 ($SD = 3.56$), the proportion of older adults living alone was 12.2%, and those widowed were 28.6%.

Multiple Regression Results

To test the independent correlations of objective and subjective social isolation with depression among older adults, we established three multiple linear regression models, gradually incorporating objective social isolation, subjective social isolation, and aging attitude into the analysis model. **Table 3** shows the models of the regression analysis.

In model 1, depression was regressed on objective social isolation and the control variables. As can be seen from the Table, compared with older adults who did not experience family isolation, older adults experiencing family isolation had higher depression ($\beta = 1.158, p < 0.001$). Similarly, compared with older adults who did not experience friend isolation, older adults separated from friends had higher depression ($\beta = 0.453, p < 0.001$). Overall, model 1 shows that family isolation has a higher correlation with depression among older people, followed by friend isolation, while community isolation has no significant relationship.

In model 2, depression was regressed on objective isolation, subjective isolation, and the control variables. As can be seen in the second model, there was a relative attenuation in the effects for both family and friend isolation, compared with the previous model. In model 2, compared with the respective reference groups, the effect sizes for family and friend isolation reduced to ($\beta = 0.798, p < 0.001$) and ($\beta = 0.449, p < 0.001$), respectively. Furthermore, compared with older adults who did not experience perceived isolation, depression was higher ($\beta = 3.365, p < 0.001$) among those who experienced perceived isolation. Overall, model 2 shows that both objective and subjective social isolation have independent correlations with depression among older adults, with the latter having a higher effect size.

In model 3, depression was regressed on objective isolation, subjective isolation, aging attitude, and the control variables. It can be seen that the correlation coefficients of social isolation and depression in different dimensions were further reduced, and the explanatory power of the model increased from 34.5 to 40.3%. This result suggests that the attitude to aging may mediate the relationship between social isolation and depression. The variance inflation factor (VIF) of all models was below 4, indicating that there was no issue of multicollinearity in the models.

Among the set of control variables, education, working status, higher income, urban residency, residing with relatives or other people, and higher cognitive ability were all protective factors from depression symptoms. While on the other hand, a higher IADL score, and surprisingly, a higher number of children acted as a risk factor for depression symptoms.

Propensity Score Matching Results

Table 4 shows the ATT results of the propensity value score matching method. It can be seen that after the matching of the sample errors of the control and treatment groups, the causal effects of family isolation, friend isolation, and perceived isolation on depression in older adults are verified. Combining the matching results of the three methods, it can be concluded

that family isolation, friend isolation, and perceived isolation had ATT values of 1.3, 0.8, and 3.6, respectively, on depression.

We further analyzed the density distribution map of the control group and the treatment group before and after matching with different propensity score matching methods. The results show that the difference between the treatment group and the control group was greatly reduced after matching.

A comparison of the results of propensity score matching and multiple linear regression shows that the results of the two methods are consistent. It further illustrates the causal effect of social isolation on the mental health of older adults, specifically underscoring the fact that family isolation, friend isolation, and perceived isolation are important predictors of depression in older adults.

Mediating Effects

We conducted a mediation analysis based on the structural equation model and used the bootstrap method to test the mediating effects of aging attitudes on the relationship between social isolation and depression in older adults.

Table 5 shows the results of the mediating effect of aging attitude. It can be seen from **Table 5** that the direct effect of family isolation on depression was 0.805 ($p = 0.000$) and the indirect effect was 0.017 ($p = 0.609$); the direct effect of friend isolation on depression was 0.184 ($p = 0.016$) and the indirect effect was 0.264 ($p = 0.000$); the direct effect of perceptual isolation on depression was 2.950 ($p = 0.000$), and the indirect effect was 0.425 ($p = 0.000$). This shows that the direct effect of family isolation on depression was significant, but the indirect effect was not significant; the direct and indirect effects of friend isolation and perceived isolation on depression were significant.

It can be seen that aging attitude had a significant indirect effect on the relationship between social isolation (friend isolation and perceived isolation) and depression. **Figure 1** shows the path of the mediating role of aging attitude between social isolation and depression in older adults. As can be seen from **Figure 1**, friend isolation \rightarrow aging attitude ($\beta = -1.553$, significant at $p = 0.001$), aging attitude \rightarrow depression ($\beta = -0.172$, significant at $p = 0.001$), friend isolation \rightarrow depression ($\beta = 0.184$, significant at $p = 0.05$); perceived isolation \rightarrow aging attitude ($\beta = -2.463$, significant at $p = 0.001$), aging attitude \rightarrow depression ($\beta = -0.172$, significant at $p = 0.001$), perceived isolation \rightarrow depression ($\beta = 2.950$, significant at $p = 0.001$).

Therefore, we found two significant pathways in the relationship between social isolation, aging attitudes, and depression: Path 1, friend isolation \rightarrow aging attitude \rightarrow depression, where aging attitude plays an intermediary role; Path 2, perceived isolation \rightarrow aging attitude \rightarrow depression, where aging attitude plays an intermediary role.

The test shows that friend isolation and perceived isolation not only directly cause depression in older adults, but also indirectly cause depression among older adults through aging attitude.

DISCUSSION

This study examined the relationships between social isolation, attitudes toward aging, and mental health among older adults in

TABLE 3 | The linear regression results of social isolation and depression in older adults ($N = 7,024$).

Variables	Depression			VIF
	Model 1	Model 2	Model 3	
Family isolation	1.158*** (0.116)	0.798*** (0.105)	0.788*** (0.100)	1.11
Friend isolation	0.453*** (0.083)	0.449*** (0.074)	0.185** (0.071)	1.13
Community isolation	0.038 (0.086)	0.079 (0.077)	0.050 (0.073)	1.02
Perceived isolation		3.365*** (0.082)	2.944*** (0.080)	1.16
Age (years)	-0.059*** (0.007)	-0.047*** (0.006)	-0.048*** (0.006)	1.60
Gender	0.041 (0.083)	-0.005 (0.075)	-0.036 (0.071)	1.16
Education				
Junior high school	-0.343*** (0.103)	-0.259** (0.092)	-0.174* (0.088)	1.31
High school and above	-0.468*** (0.117)	-0.347*** (0.105)	-0.235* (0.100)	1.51
Married	0.670*** (0.116)	0.124 (0.105)	0.154 (0.101)	1.90
Working	-0.373*** (0.106)	-0.365*** (0.095)	-0.330*** (0.091)	1.24
Urban	-0.404*** (0.097)	-0.334*** (0.087)	-0.174* (0.084)	1.48
IADL	0.429*** (0.023)	0.332*** (0.020)	0.277*** (0.020)	1.24
Religious faith	0.088 (0.124)	0.166 (0.111)	0.194 (0.106)	1.04
Living arrangement				
Live with spouse	-0.801*** (0.159)	-0.362* (0.143)	-0.359** (0.136)	3.95
Live with children	-1.114*** (0.139)	-0.510*** (0.125)	-0.449*** (0.120)	3.22
Live with other people	-0.646*** (0.177)	-0.168 (0.159)	-0.164 (0.152)	1.99
Number of children	0.156*** (0.046)	0.143*** (0.042)	0.108** (0.040)	1.39
Cognitive ability	-0.152*** (0.014)	-0.131*** (0.013)	-0.098*** (0.012)	1.27
Log of income	-0.166*** (0.029)	-0.105*** (0.026)	-0.075** (0.025)	1.42
Aging attitude			-0.172*** (0.007)	1.21
Constant	18.145*** (0.546)	15.961*** (0.492)	19.286*** (0.487)	
R-squared	0.186	0.345	0.403	

VIF, variance inflation factor; IADL, instrumental activity of daily living.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 4 | The average effect of treatment on the treated results of social isolation and mental health.

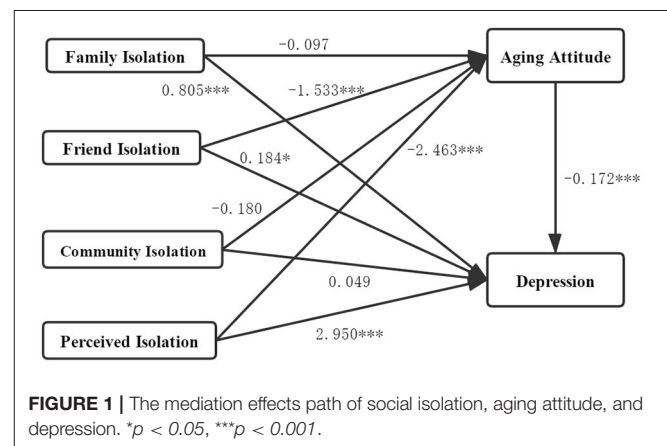
Method of Score Matching	Depression			
	Family isolation	Friendisolation	Community isolation	Perceivedisolation
Propensity score matching				
Nearest neighbor matching	1.240***	0.780***	0.119	3.643***
Radius matching	1.263***	0.753***	0.147	3.617***
Kernel matching	1.291***	0.773***	0.187	3.636***

*** $p < 0.001$.**TABLE 5 |** The mediation effect size of aging attitude in the effect of social isolation on depression.

Path	Effect	Effect Size	Bootstrap SE	p-Value
Family isolation—Depression	Direct effect	0.805	0.1092	0.000
	Indirect effect	0.017	0.0327	0.609
Friend isolation—Depression	Direct effect	0.184	0.0762	0.016
	Indirect effect	0.264	0.0251	0.000
Community isolation—Depression	Direct effect	0.049	0.0712	0.491
	Indirect effect	0.031	0.0247	0.210
Perceived isolation—Depression	Direct effect	2.950	0.0838	0.000
	Indirect effect	0.425	0.0278	0.000

China. The purpose was to study the effects of social isolation and aging attitudes on the mental health of older adults. Our analytical tools included multiple linear regression, structural equation modeling, and the Bootstrap technique. Against the backdrop of the research questions that guided the analysis in this study, the finding shows that (1) objective and subjective social isolation are independently and negatively associated with depression among older adults. (2) There are variations with regards to how each form of social isolation is associated with depression among older adults. Specifically, objective social isolation from family or friends had a significant effect on depression, thus underlying the importance of support from family and friends toward older people. (3) Aging attitude act as a significant mediator between social isolation and depression. To the best of our knowledge, the association between the dimensions of social isolation (in the manner we have decomposed it), and depression among Chinese older adults has never been examined. The same can also be said for the mediating role of aging attitude. The current study is therefore significant and contributes to knowledge by broadening the understanding of what dimensions of social isolation are most associated with depression among Chinese older adults. More importantly, it also provided evidence of the mediating role of aging attitude in the relationship between social isolation and depression.

Consistent with previous studies (Umberson and Montez, 2010), our findings indicate that objective and subjective social isolation have independent negative effects on the mental health of older adults. Studies have shown that when only objective social isolation variables are considered, both family and friend isolation are significantly related to depression among older adults, while community isolation was unrelated (Umberson and Montez, 2010). The introduction of the subjective social isolation



variable (perceived isolation) in our study did not significantly alter this pattern, while the variable itself was also significantly and negatively associated with depression. The “net effect” for the dimensions of social isolation on depression obtained from the PSM had further underscored this finding, consistent with previous studies that have inferred that when older adults feel socially isolated, it tends to impact their mental health (Cornwell and Waite, 2009; Cacioppo et al., 2010). The measures of subjective isolation in this study may be theoretically related to that of perceived social rejection which also has a well-established relationship with depression (Slavich et al., 2010), and may also explain the strong association observed in the result.

However, it is also important to acknowledge that while our finding shows consistency with some sections of the literature, it did have dissimilarities with some others. Some research

has reported that objective social isolation (family isolation and friend isolation) was unrelated to depressive symptoms and psychological distress in older adults in the United States (Taylor et al., 2018), which is inconsistent with our findings. A possible reason for the difference could be related to cultural factors. While the Chinese culture leans toward the Confucian ideology characterized by collectivism which emphasizes family togetherness and interdependencies, the Western culture which is characterized by individualism on the other hand could mean that older adults in those cultures are less reliant on relatives and friends.

Furthermore, our finding had shown in part, that isolation from family or friends is negatively associated with depression in older adults, while community isolation was not. This finding, which is also consistent with Yeung and Fung (2007), can also be similarly linked to the Chinese's collectivist cultural context. In Chinese culture, the family is the basis of an individual's existence as well as an important source of individual social support (Li et al., 2014). Also, friends are an important network unit for individuals to connect with society, as well as useful channels to obtain emotional support (Huxhold et al., 2014). With the adjustment to lifestyles, failing physical health, a shrunken network of friends, or social support that usually characterizes old age (Kaye and Singer, 2018), the perceived feeling of growing isolation could negatively influence the mental health of older adults. As already stated, community isolation was not associated with depression among older adults in the current study. The reason could be related to the issue of construct. Community isolation was measured from the question of whether or not the respondent engaged in some listed community activities. However, participation in such activities may depend on several factors like actual availability of the activity in their residential community, interest to participate, or physical health status. It may also be due to the composite nature in which the variable was formed. A respondent would only need to participate in one event to be considered to have experienced community participation. Whereas in reality, frequency and diversity may be necessary for a positive effect on mental health. Future studies could devise more objective tools to measure community participation.

This study found a partial mediating role of aging attitudes between social isolation and the mental health of older adults with two significant intermediary paths. First, friend isolation → aging attitude → mental health; and second, perceived isolation → aging attitude → mental health. These results show that friend isolation and perceived isolation not only have a direct impact on the mental health of older adults but also have an indirect impact on their health through aging attitudes. This, therefore, provides empirical evidence supporting the AoA model espoused in Diehl et al. (2014), which underscored the mediating role of aging attitude in the relationship between social isolation and mental health. The mechanism of such mediating role is explained by the fact that social connections could produce both emotional and instrumental support that helps older adults to form a positive attitude toward aging which may, in turn, have positive implications on their mental health.

Older people will inevitably encounter decreased mental health if they encounter friend isolation in old age and have a negative attitude toward aging. Also, older adults with perceived isolation are more likely to lack interactions with society and to be more dissatisfied with the quality of their social relationships (Ryan and Willits, 2007), which increases their pessimism, and makes them have more negative attitudes toward aging, thus affecting their mental health.

Several limitations are associated with this study. First, we used cross-sectional data and as a result, it is difficult to make claims of causality. For instance, there may be an unobserved factor such as mental illness, which has a propensity for the creation of social isolation. Also, individuals may report social isolation due to a lack of bonding with relatives or friends. Second, this study focused only on depression among older adults, leaving the possibility of certain gaps in getting a more comprehensive account of the relationship between social isolation and the overall mental health of older adults. Third, the factors impacting the mental health of older adults are very complicated. For example, personality characteristics and major stressful life events such as chronic diseases or disabilities, are all important aspects that affect the mental health of older adults. The limitation of the data in capturing these variables did not allow us to control for them in our analysis. This, to some extent, may have affected the results of the current study. Fourth, the questionnaire of the 2014 CLASS did not include more types of community activities. For instance, there was no question bordering on taking classes, attending senior groups or centers, or religious services. This inadequacy could lead to crude measurement of the "community isolation" variable. Also, about the data, the 2014 CLASS may be considered to have aged. However, we resorted to it because the 2016 and 2018 follow-up waves of the CLASS data are not available for public use. Besides, the AAQ was not captured in the follow-up waves according to the available reports from those surveys.

Despite these limitations, this study significantly expands the extant literature on the relationship between social isolation and the mental health of older adults in China. The use of large and nationally representative data makes our finding generalizable for a national context. Not only does the study provide evidence from the Chinese context about the mechanisms operating in the relationship between social isolation and mental health, but it also highlights the mediating role of aging attitudes.

CONCLUSION

We used data from the 2014 CLASS to investigate the impact of objective isolation (family isolation, friend isolation, and community isolation), and subjective social isolation (perceived isolation) on the mental health of Chinese older adults, and the mediating effect of aging attitudes. The regression analysis indicated that objective social isolation and subjective social isolation were independently related to mental health among older adults. The mediation analysis further showed that aging

attitude plays a significant mediating role between social isolation and mental health. This study has important implications for intervention from the perspective of promoting social relations and improving aging attitudes to enhance the mental health of older adults. Mental health in old age could be enhanced by reducing social isolation and a mechanism to achieve this would be to improve aging attitudes. The government, communities, relatives, and friends need to pay more attention to decreasing the social isolation of older adults, particularly in this time of COVID-19 which specifically requires social distancing and isolation as an epidemic prevention and control measure. Where physical contact is not possible, the community, relatives, and friends should strive to use modern social communication mediums to facilitate regular communication and engagement with the elderly to mitigate the negative effect of social isolation.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found here: [http://class.ruc.edu.cn/index.php?r=index/index&hl=\\$en](http://class.ruc.edu.cn/index.php?r=index/index&hl=$en).

REFERENCES

- Antonucci, T. C., Ajrouch, K. J., and Birditt, K. S. (2014). The convoy model: explaining social relations from a multidisciplinary perspective. *Gerontologist* 54, 82–92. doi: 10.1093/geront/gnt118
- Antonucci, T. C., and Akiyama, H. (1995). *Convoys of Social Relations: Family and Friendships Within a Life Span Context*. Westport: Greenwood Press/Greenwood Publishing Group.
- Baser, O. (2006). Too much ado about propensity score models? Comparing methods of propensity score matching. *Value Health* 9, 377–385. doi: 10.1111/j.1524-4733.2006.00130.x
- Berkman, L. F., Glass, T., Brissette, I., and Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Soc. Sci. Med.* 51, 843–857. doi: 10.1016/S0277-9536(00)00065-4
- Cacioppo, J. T., and Cacioppo, S. (2014). Social relationships and health: the toxic effects of perceived social isolation. *Soc. Pers. Psychol. Compass* 8, 58–72. doi: 10.1111/spc3.12087
- Cacioppo, J. T., Hawkley, L. C., and Thisted, R. A. (2010). Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago health, aging, and social relations study. *Psychol. Aging* 25, 453–463. doi: 10.1037/a0017216
- Chang, Q., Sha, F., Chan, C. H., Yip, P., and Harris, K. M. (2018). Validation of an abbreviated version of the Lubben Social Network Scale (“LSNS-6”) and its associations with suicidality among older adults in China. *PLoS ONE* 13:e0201612. doi: 10.1371/journal.pone.0201612
- Chiu, H., Lee, H. C., Chung, W. S., and Kwong, P. K. (1994). Reliability and validity of the cantonese version of Mini-Mental State Examination-A preliminary study. *Hong Kong J. Psychiatry* 4, 25–28.
- Cho, J. H., Olmstead, R., Choi, H., Carrillo, C., Seeman, T. E., and Irwin, M. R. (2019). Associations of objective versus subjective social isolation with sleep disturbance, depression, and fatigue in community-dwelling older adults. *Aging Ment. Health* 23, 1130–1138. doi: 10.1080/13607863.2018.1481928
- Cohen, S. (2004). Social relationships and health. *Am. Psychol.* 59, 676–684. doi: 10.1037/0003-066X.59.8.676

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of Renmin University of China. The patients/participants provided their verbal informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

XC: conceptualization, methodology, formal analysis, and writing—original draft. TC: methodology and formal analysis. TA: writing—review & editing. All authors contributed to the article and approved the submitted version.

FUNDING

This study was supported by the Science and Technological Department of Shaanxi Province (No. 2020JM-570, PI: XC).

ACKNOWLEDGMENTS

We would like to thank the Institute of Gerontology and the National Survey Research Center at Renmin University of China for providing the CLASS data.

- Cornwell, E. Y., and Waite, L. J. (2009). Social disconnectedness, perceived isolation, and health among older adults. *J. Health Soc. Behav.* 50, 31–48. doi: 10.1177/002214650905000103
- Courtin, E., and Knapp, M. (2017). Social isolation, loneliness and health in old age: a scoping review. *Health Soc. Care Commun.* 25, 799–812. doi: 10.1111/hsc.12311
- Coyle, C. E., and Dugan, E. (2012). Social isolation, loneliness and health among older adults. *J. Aging Health* 24, 1346–1363. doi: 10.1177/0898264312460275
- Diehl, M., Wahl, H. W., Barrett, A. E., Brothers, A. F., Miche, M., Montepare, J. M., et al. (2014). Awareness of aging: theoretical considerations on an emerging concept. *Dev. Rev.* 34, 93–113. doi: 10.1016/j.dr.2014.01.001
- Folstein, M. F., Folstein, S. E., and McHugh, P. R. (1975). “Mini-mental state”: a practical method for grading the cognitive state of patients for the clinician. *J. Psychiatr. Res.* 12, 189–198. doi: 10.1016/0022-3956(75)90026-6
- Ge, L., Yap, C. W., Ong, R., and Heng, B. H. (2017). Social isolation, loneliness and their relationships with depressive symptoms: a population-based study. *PLoS ONE* 12:e0182145. doi: 10.1371/journal.pone.0182145
- Gerino, E., Rollé, L., Sechi, C., and Brustia, P. (2017). Loneliness, resilience, mental health, and quality of life in old age: a structural equation model. *Front. Psychol.* 8:2003. doi: 10.3389/fpsyg.2017.02003
- Hayes, A. F. (2009). Beyond Baron and Kenny: statistical mediation analysis in the new millennium. *Commun. Monogr.* 76, 408–420. doi: 10.1080/03637750903310360
- Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., and Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspect. Psychol. Sci.* 10, 227–237. doi: 10.1177/1745691614568352
- Holt-Lunstad, J., Smith, T. B., and Layton, J. B. (2010). Social relationships and mortality risk: a meta-analytic review. *PLoS Med.* 7:e1000316. doi: 10.1371/journal.pmed.1000316
- Huang, G., Duan, Y., Guo, F., and Chen, G. (2020). Prevalence and related influencing factors of depression symptoms among empty-nest older adults in China. *Arch. Gerontol. Geriatr.* 91:104183. doi: 10.1016/j.archger.2020.104183
- Hughes, M. E., Waite, L. J., Hawkey, L. C., and Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys - Results from two population-based studies. *Res. Aging* 26, 655–672. doi: 10.1177/0164027504268574

- Huxhold, O., Miche, M., and Schuz, B. (2014). Benefits of having friends in older ages: differential effects of informal social activities on well-being in middle-aged and older adults. *J. Gerontol. Ser. B. Psychol. Sci. Soc. Sci.* 69, 366–375. doi: 10.1093/geronb/gbt029
- Jang, Y., Poon, L. W., Kim, S.-Y., and Shin, B.-K. (2004). Self-perception of aging and health among older adults in Korea. *J. Aging Stud.* 18, 485–496. doi: 10.1016/j.jaging.2004.06.001
- Kaye, L. W. (2017). Older adults, rural living, and the escalating risk of social isolation. *Public Policy Aging Rep.* 27, 139–144. doi: 10.1093/ppar/prx029
- Kaye, L. W., and Singer, C. (2018). *Social Isolation of Older Adults: Strategies to Bolster Health and Well-Being*. New York, NY: Springer Publishing Company. doi: 10.1891/9780826146991
- Korkmaz Aslan, G., Kulakci Altinta, S. H., Ozen Cinar, I., and Veren, F. (2019). Attitudes to ageing and their relationship with quality of life in older adults in Turkey. *Psychogeriatrics* 19, 157–164. doi: 10.1111/psyg.12378
- Laidlaw, K. (2010). Attitudes to ageing and expectations for filial piety across Chinese and British cultures: a pilot exploratory evaluation. *Aging Ment. Health* 14, 283–292. doi: 10.1080/13607860903483060
- Laidlaw, K., Power, M. J., Schmidt, S., and Group, W.-O. (2007). The Attitudes to Ageing Questionnaire (AAQ): development and psychometric properties. *Int. J. Geriatr. Psychiatry* 22, 367–379. doi: 10.1002/gps.1683
- Lamont, R. A., Nelis, S. M., Quinn, C., and Clare, L. (2017). Social support and attitudes to aging in later life. *Int. J. Aging Hum. Dev.* 84, 109–125. doi: 10.1177/0091415016668351
- Laugesen, K., Baggesen, L. M., Schmidt, S. A. J., Glymour, M. M., Lasgaard, M., Milstein, A., et al. (2018). Social isolation and all-cause mortality: a population-based cohort study in Denmark. *Sci. Rep.* 8:4731. doi: 10.1038/s41598-018-22963-w
- Lawton, M. P., and Brody, E. M. (1988). Instrumental Activities of Daily Living (IADL) scale – self-rated version. *Psychopharmacol. Bull.* 24, 789–791.
- Li, H., Ji, Y., and Chen, T. (2014). The roles of different sources of social support on emotional well-being among Chinese elderly. *PLoS ONE* 9, 1–8. doi: 10.1371/journal.pone.0090051
- Lian, Y., Su, Z., and Gu, Y. (2011). Evaluating the effects of equity incentives using PSM: evidence from China. *Front. Bus. Res. China* 5, 266–290. doi: 10.1007/s11782-011-0131-6
- Lim, L. L., and Kua, E. H. (2011). Living alone, loneliness, and psychological well-being of older persons in Singapore. *Curr. Gerontol. Geriatr. Res.* 2011:673181. doi: 10.1155/2011/673181
- Liu, D., Xi, J., Hall, B. J., Fu, M., Zhang, B., Guo, J., et al. (2020). Attitudes toward aging, social support and depression among older adults: difference by urban and rural areas in China. *J. Affect. Disord.* 274, 85–92. doi: 10.1016/j.jad.2020.05.052
- Lubben, J., Blozik, E., Gillmann, G., Iliffe, S., Kruse, W., v. R., et al. (2006). Performance of an abbreviated version of the Lubben Social Network Scale among three European community-dwelling older adult populations. *Gerontologist* 46, 503–513. doi: 10.1093/geront/46.4.503
- Menec, V. H., Newall, N. E., Mackenzie, C. S., Shoostari, S., and Nowicki, S. (2019). Examining individual and geographic factors associated with social isolation and loneliness using Canadian Longitudinal Study on Aging (CLSA) data. *PLoS ONE* 14:e0211143. doi: 10.1371/journal.pone.0211143
- National Survey Research Center (2014). *2014 Chinese Longitudinal Aging Social Survey (CLASS) Final Report*. Beijing: National Survey Research Center, Renmin University of China.
- Qin, X., Wang, S., and Hsieh, C. R. (2016). The prevalence of depression and depressive symptoms among adults in China: Estimation based on a national household survey. *China Econ. Rev.* 51, 271–282. doi: 10.1016/j.chieco.2016.04.001
- Robins, L. M., Hill, K. D., Finch, C. F., Clemson, L., and Haines, T. (2018). The association between physical activity and social isolation in community-dwelling older adults. *Aging Ment. Health* 22, 175–182. doi: 10.1080/13607863.2016.1242116
- Rosenbaum, P. R., and Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika* 70, 41–55. doi: 10.1093/biomet/70.1.41
- Ryan, A. K., and Willits, F. K. (2007). Family ties, physical health, and psychological well-being. *J. Aging Health* 19, 907–920. doi: 10.1177/0898264307308340
- Santini, Z. I., Koyanagi, A., Tyrovolas, S., Mason, C., and Haro, J. M. (2015). The association between social relationships and depression: a systematic review. *J. Affect. Disord.* 175, 53–65. doi: 10.1016/j.jad.2014.12.049
- Santini, Z. I., Koyanagi, A. I., Tyrovolas, S., Haro, J. M., and Koushede, V. (2017). The association of social support networks and loneliness with negative perceptions of ageing: evidence from the Irish Longitudinal Study on Ageing (TILDA). *Ageing Soc.* 39, 1070–1090. doi: 10.1017/S0144686X17001465
- Schrempft, S., Jackowska, M., Hamer, M., and Steptoe, A. (2019). Associations between social isolation, loneliness, and objective physical activity in older men and women. *BMC Public Health* 19:74. doi: 10.1186/s12889-019-6424-y
- Shaw, J. G., Farid, M., Noel-Miller, C., Joseph, N., Houser, A., Asch, S. M., et al. (2017). Social isolation and Medicare spending: among older adults, objective social isolation increases expenditures while loneliness does not. *J. Aging Health* 29, 1119–1143. doi: 10.1177/0898264317703559
- Silverstein, M., Cong, Z., and Li, S. (2006). Intergenerational transfers and living arrangements of older people in rural China: consequences for psychological well-being. *J. Gerontol. Ser. B. Psychol. Sci. Soc. Sci.* 61, S256–S266. doi: 10.1093/geronb/61.5.S256
- Slavich, G. M., O'Donovan, A., Epel, E. S., and Kemeny, M. E. (2010). Black sheep get the blues: a psychobiological model of social rejection and depression. *Neurosci. Biobehav. Rev.* 35, 39–45. doi: 10.1016/j.neubiorev.2010.01.003
- Taylor, H. O., Taylor, R. J., Nguyen, A. W., and Chatters, L. (2018). Social isolation, depression, and psychological distress among older adults. *J. Aging Health* 30, 229–246. doi: 10.1177/0898264316673511
- Thompson, M. G., and Heller, K. (1990). Facets of support related to well-being: quantitative social isolation and perceived family support in a sample of elderly women. *Psychol. Aging* 5, 535–544. doi: 10.1037/0882-7974.5.4.535
- Tong, A. Y. C., and Man, D. W. K. (2002). The validation of the Hong Kong Chinese version of the Lawton instrumental activities of daily living scale for institutionalized elderly persons. *OTJR* 22, 132–142. doi: 10.1177/153944920202200402
- Tong, H., and Lai, D. W. L. (2016). Social exclusion and health among older Chinese in Shanghai, China. *Asia Pac. J. Soc. Work Dev.* 26, 120–141. doi: 10.1080/02185385.2016.1219272
- Umberson, D., Crosnoe, R., and Reczek, C. (2010). Social relationships and health behavior across life course. *Annu. Rev. Sociol.* 36, 139–157. doi: 10.1146/annurev-soc-070308-120011
- Umberson, D., and Montez, J. K. (2010). Social relationships and health: a flashpoint for health policy. *J. Health Soc. Behav.* 51, S54–S66. doi: 10.1177/0022146510383501
- United Nations, and DESA. (2019). *Population Division (2019)*. New York, NY: World Population Prospects 2019.
- Valtorta, N., and Hanratty, B. (2012). Loneliness, isolation and the health of older adults: do we need a new research agenda? *J. R. Soc. Med.* 105, 518–522. doi: 10.1258/jrsm.2012.120128
- Valtorta, N. K., Kanaan, M., Gilbody, S., and Hanratty, B. (2016). Loneliness, social isolation and social relationships: what are we measuring? A novel framework for classifying and comparing tools. *BMJ Open* 6:e010799. doi: 10.1136/bmjopen-2015-010799
- Wang, D., Laidlaw, K., Power, M. J., and Shen, J. (2009). Older people's belief of filial piety in China: Expectation and non-expectation. *Clin. Gerontol.* 33, 21–38. doi: 10.1080/07317110903347771
- Wang, J., Lloyd-Evans, B., Giacco, D., Forsyth, R., Nebo, C., Mann, F., et al. (2017). Social isolation in mental health: a conceptual and methodological review. *Soc. Psychiatry Psychiatr. Epidemiol.* 52, 1451–1461. doi: 10.1007/s00127-017-1446-1
- Wu, F., and Sheng, Y. (2020). Differences in social isolation between young and old elderly in urban areas of Beijing, China: a cross-sectional study. *Int. J. Nurs. Sci.* 7, 49–53. doi: 10.1016/j.ijnss.2019.11.003
- Wurm, S., Diehl, M., Kornadt, A. E., Westerhof, G. J., and Wahl, H.-W. (2017). How do views on aging affect health outcomes in adulthood and late life? Explanations for an established connection. *Dev. Rev.* 46, 27–43. doi: 10.1016/j.dr.2017.08.002
- Yeung, G. T., and Fung, H. H. (2007). Social support and life satisfaction among Hong Kong Chinese older adults: family first? *Eur. J. Ageing* 4, 219–227. doi: 10.1007/s10433-007-0065-1
- Yu, B., Steptoe, A., Chen, Y., and Jia, X. (2020). Social isolation, rather than loneliness, is associated with cognitive decline in

older adults: The China Health and Retirement Longitudinal Study. *Psychol. Med.* 1–8. doi: 10.1017/S0033291720001014. [Epub ahead of print].

Zebhauser, A., Hofmann-Xu, L., Baumert, J., Hafner, S., Lacruz, M. E., Emeny, R. T., et al. (2014). How much does it hurt to be lonely? Mental and physical differences between older men and women in the KORA-Age Study. *Int. J. Geriatr. Psychiatry* 29, 245–252. doi: 10.1002/gps.3998

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2021 Cheng, Cosco and Ariyo. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



A Randomized Controlled Trial of a Positive Family Holistic Health Intervention for Probationers in Hong Kong: A Mixed-Method Study

Agnes Y.-K. Lai^{1*}, Shirley M.-M. Sit^{1,2†}, Carol Thomas³, George O.-C. Cheung¹, Alice Wan², Sophia S.-C. Chan¹ and Tai-hing Lam²

¹ School of Nursing, The University of Hong Kong, Pokfulam, Hong Kong SAR, China, ² School of Public Health, The University of Hong Kong, Hong Kong, Hong Kong SAR, China, ³ Hong Kong Social Welfare Department, Hong Kong, Hong Kong SAR, China

OPEN ACCESS

Edited by:

Wenjie Duan,
East China University of Science
and Technology, China

Reviewed by:

Shu Ling Tan,
University of Münster, Germany
Mark C. M. Tsang,
Tung Wah College, Hong Kong SAR,
China

*Correspondence:

Agnes Y.-K. Lai
agneslai@hku.hk

[†]These authors have contributed
equally to this work and share first
authorship

Specialty section:

This article was submitted to
Health Psychology,
a section of the journal
Frontiers in Psychology

Received: 10 July 2021

Accepted: 16 November 2021

Published: 07 December 2021

Citation:

Lai AY-K, Sit SM-M, Thomas C,
Cheung GO-C, Wan A, Chan SS-C
and Lam T-h (2021) A Randomized
Controlled Trial of a Positive Family
Holistic Health Intervention
for Probationers in Hong Kong:
A Mixed-Method Study.
Front. Psychol. 12:739418.
doi: 10.3389/fpsyg.2021.739418

Introduction: Probationers, offenders with less serious and non-violent offences, and under statutory supervision, have low levels of self-esteem and physical health, and high level of family conflict, and poorer quality of family relationships. This study examined the effectiveness of the existing probation service and the additional use of a positive family holistic health intervention to enhance physical, psychological, and family well-being in probationers and relationships with probation officers.

Methods: Probationers under the care of the Hong Kong Social Welfare Department were randomized into a care-as-usual control group (CAU), a brief intervention group (BI) receiving two 1-h individual sessions [of a brief theory-based positive family holistic health intervention integrating Zero-time Exercise (simple and easy-to-do lifestyle-integrated physical activity) and positive psychology themes of “Praise and Gratitude” in the existing probation service], or a combined intervention group (CI) receiving BI and a 1-day group activity with family members. The outcomes were physical activity, fitness performance, self-esteem, happiness, anxiety and depression symptoms, life satisfaction, quality of life, family communication and well-being, and relationships with probation officers. Self-administered questionnaires and simple fitness tests were used at baseline, 1-month and 3-month follow-up. Linear mixed model analysis was used to compare difference in the changes of outcome variables among groups, adjusted of sex, age, and baseline values. Focus group interviews were conducted. Thematic content analysis was used.

Results: 318 probationers (51% male) were randomized into CAU ($n = 105$), BI ($n = 108$), or CI ($n = 105$) group. CAU showed enhanced physical activity, fitness performance and psychological health, and family communication with small effect sizes (Cohen's d : 0.19–0.41). BI and CI showed further improved physical activity, family communication and family well-being (Cohen's d : 0.37–0.70). Additionally, CI reported greater improvements in the relationships with probation officers than CAU with a small effect size (Cohen's d : 0.43). CI also reported greater increases in physical activity

and family communication than BI with small to moderate effect sizes (Cohen's d : 0.38–0.58). Qualitative feedbacks corroborated the quantitative findings.

Conclusion: Our trial provided the first evidence of the effectiveness of probation service and the additional use of an innovative, relatively low-cost, theory-based brief positive family holistic health intervention. This intervention may offer a new model for enhancing probation service.

Trial Registration: The research protocol was registered at the National Institutes of Health (identifier: NCT02770898).

Keywords: probationer, community-based, positive psychology, theory-based, physical activity, Zero-time exercise, family communication

INTRODUCTION

Probationers often have low self-esteem and physical health (Center for Substance Abuse Treatment, 2005), and experience higher levels of family conflict and strained family relationships (Comfort, 2016). Reviews have shown probationers have a high risk of mental health problems and suicide (Kolb, 2015; Skinner and Farrington, 2020). Given such vulnerabilities, there is a need to strengthen and promote a healthy lifestyle among probationers to enhance individual and family well-being.

Within the Hong Kong criminal justice system, the Hong Kong probation service is a community-based rehabilitation program that emphasizes the enabling of offenders to reform rather than “controlling, punishing or monitoring” (Chui, 2004) and offers statutory supervision for offenders who are put on probation and community service order (Social Welfare Department, 2021). Probationers are first and second offenders whose current offences are less serious and non-violent, and placed under statutory supervision of a probation officer for a specified period of time. The goals of probation service are to prepare probationers to re-integrate into the community and enhance their holistic health, including both personal and family domains. Evaluating the impact of probation service on probationers is necessary for both the effective practices of probation officers and the assessment of the success of their work. There are limited studies that have evaluated the effectiveness of probation service on social and behavioral changes in probationers in Hong Kong (Chui, 2003; Chui and Chan, 2013) and elsewhere (Sexton and Turner, 2010; Jeon et al., 2021). Two studies explored the subjective views on and experiences of probation supervision among young adult offenders (Chui, 2003), and juvenile probationers’ perceptions of probation officers as social workers in Hong Kong (Chui and Chan, 2013), respectively. Two additional studies examined the effectiveness of family functioning therapy (Sexton and Turner, 2010) and a forest therapy program (Jeon et al., 2021) in juvenile probationers.

Family holistic health focuses on the interactive, functional, psychosocial, and health processes of the family experience and encompasses wellness and illness variables (Ho et al., 2019). The increasingly complex and diverse family structure has led to significant concerns for the well-being of families in Hong Kong

(Lam et al., 2012). Unhealthy family environments, such as high levels of disruption and conflict, also place family members at greater risk for problematic behaviors. On the contrary, strong and healthy family relationships can have a positive influence on well-being (Galvin et al., 2015), and social support from family members can serve as a protective factor against problematic behaviors (Thomas et al., 2017). Thus, interventions that increase protective factors and reduce risk factors among probationers are needed.

Positive psychology is a science of happiness that focuses on positive emotions and personal strengths (Seligman and Flourish, 2012). A meta-analysis of 51 positive psychology interventions concluded that positive psychology interventions significantly enhanced psychosocial well-being (Sin and Lyubomirsky, 2009). “Praise and Gratitude” is a combination of the expression of thankfulness and an emotional sense of appreciation (Emmons and McCullough, 2003; Peterson and Seligman, 2004), which are among the easiest and most commonly applied positive psychology themes into daily life to enhance personal and family well-being (Ho et al., 2019; Lai et al., 2020).

Physical activity is an essential component of well-being and helps reduce anxiety, stress, and depression, and improve self-esteem and psychological well-being (Sonstroem and Morgan, 1989; Strauss et al., 2001). Our team created “Zero-time exercise” (ZTE_x), a new approach to integrate simple strength- and stamina-enhancing physical activity into daily life. ZTE_x does not require extra time, money, and equipment and can be done anytime, anywhere and by anybody (Lai A. et al., 2019). ZTE_x uses a foot-in-the-door approach to encourage individuals to start exercising in small steps through building exercise self-efficacy. This approach is consistent with American physical activity guidelines that moving more and sitting less is beneficial for nearly everyone, and that some physical activity is better than none (Piercy et al., 2018). ZTE_x is an innovative, creative, and fun family activity, where family members of all ages can create and compete in friendly exercise games (Lai et al., 2020). Examples of ZTE_x while sitting and standing include pedaling both legs and standing on one leg, respectively, with more examples shown in our YouTube videos.¹

¹<https://www.youtube.com/user/familyhk3h/videos>

The citywide Jockey Club FAMILY Project launched in 2008 was initiated and funded by The Hong Kong Jockey Club Charities Trust. The project, conducted in collaboration with the School of Public Health of The University of Hong Kong (HKU-SPH), aimed to promote family well-being in Hong Kong families. We integrated ZTE_x and positive psychology into various community-based programs for different populations (e.g., low-income families, parents, children, and elderly), with consistently positive impacts on family communication and personal and family well-being (Lai et al., 2018, 2020; Lai A. et al., 2019; Lai Y. et al., 2019; Ho et al., 2020).

Under the FAMILY Project, HKU-SPH was invited by the Social Welfare Department (SWD) of the Hong Kong SAR Government to collaborate in the design, implementation, and evaluation of the existing probation service. The current trial used an innovative, relatively low-cost, theory-based positive family holistic health intervention based on the Social Learning Theory, with an emphasis on the interaction among individual, behavioral, and environmental factors that allow individuals to learn by observing and imitating the behaviors of others (Akers and Jennings, 2019).

Our intervention integrated the positive psychology themes of “Praise and Gratitude” of positive psychology with a simple, lifestyle-integrating physical activity (ZTE_x) to focus on (i) enhancing probationers’ healthy lifestyle (physical activity), personal well-being (self-esteem, emotions, physical fitness and quality of life), and (ii) encouraging them to interact with family members with positive family communication with the aims of strengthening social bonds and improving family well-being. **Figure 1** shows the conceptual framework of the intervention.

Our search of PubMed and Web of Science using a combination of keywords including “exercise,” “physical activity,” “intervention,” “RCT,” “family,” and “happiness” up to 30 June 2021 yielded only one study on an exercise intervention RCT on mother-child dyads to improve sedentary behavior and exercise enjoyment (Tuominen et al., 2020), and our team’s previous RCT study on integrating physical activity to improve positive family communication and perceived health in deprived families in Hong Kong (Lai et al., 2020). To the best of our knowledge, we found no reports of RCTs with a family-based physical activity intervention to enhance personal and family well-being.

We hypothesized that probationers in the brief and combined intervention groups would show significantly greater increases in physical activity and improvements in family communication, and personal and family well-being than the care-as-usual control group. This paper reports the development and preliminary evidence on the effectiveness of the existing probation service in Hong Kong and the additional use of a family holistic health intervention on the well-being of probationers.

MATERIALS AND METHODS

Design

This study was a 3-group randomized controlled trial (RCT) with a 3-month follow-up. Participants were randomized into either the “Care-as-usual control group (CAU),” “Brief intervention

group (BI),” or “Combined intervention group (CI)” at a 1:1:1 ratio by creating a random sample in Microsoft Excel. The randomization sequence was generated by a research staff who was not involved in the recruitment process, intervention, or data collection.

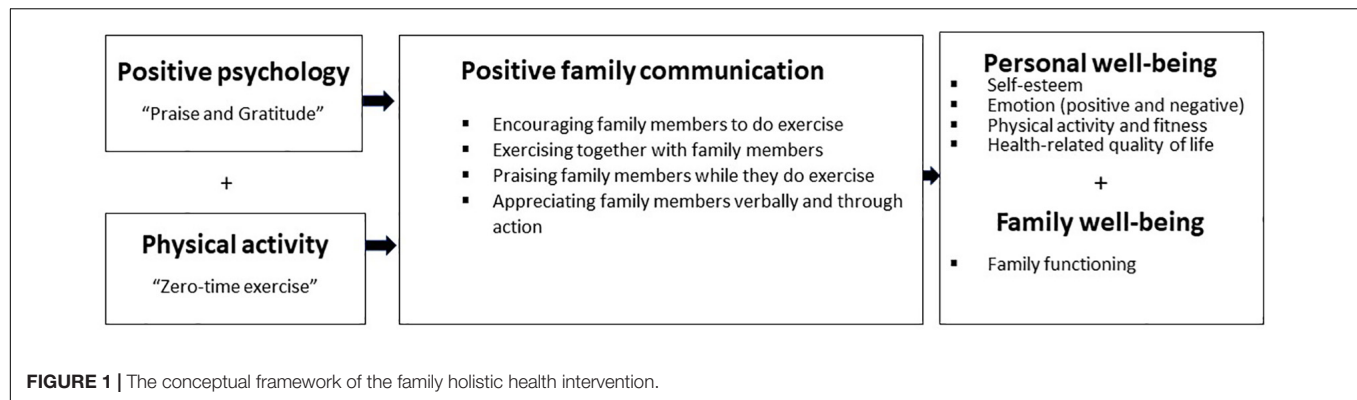
Participants

Participants for the study were recruited from probationers under the Probation and Community Service Orders with supervision and guidance from the main and sub-offices of the SWD Eastern Probation and Community Service Orders Office (SWD-PO) from April 2015 to March 2017. The inclusion criteria were: (i) under probation order at the time of recruitment, (ii) aged 13 years or above, with parental consent from those under 18; (iii) with 6 months of remaining probation term; (iv) with family members who are in Hong Kong; and (v) with basic literacy skills with the ability to comprehend and complete the evaluation questionnaires. The exclusion criteria were: (i) with active severe psychiatric problems, developmental and intellectual disabilities; and (ii) those who committed sexual offences. Recruitment was ongoing during the span of the project as new probation and community service orders were received each month. Participation was entirely voluntary, and participants had the right to withdraw at any time without any consequences. Written consent was required from the participants prior to the study.

Intervention

Working Committee and Training for Probation Officers

A working committee comprising public health academics (a medical officer and a nurse) and 3 registered social workers co-designed the intervention and evaluation questionnaires, and refined them after obtaining feedback from other probation officers. Before designing the program for probationers, a needs assessment was first conducted with probation officers to identify the perceived needs of probationers and the feasibility and challenges for program implementation and evaluation. Then, a 2-day train-the-trainer workshop (TTT) (with four sessions) for the probation officers was conducted. On the first day, the first session was to introduce ZTE_x and allow them to experience the integration of ZTE_x into daily life. The second session was to explain the rationale of the holistic health intervention and the expected role of the probation officers in the program. The third and fourth sessions were conducted one month after the first two sessions, with the aims of strengthening the competence and attitudes in relation to ZTE_x, briefly introducing the integration of positive psychology into the program, and explaining the logistics for probationers. Findings from the TTT showed that ZTE_x effectively enhanced physical activity and improved the fitness of probation officers, with details reported in our sister paper (Lai A. et al., 2019). A practice manual was given to each probation officer to reiterate the concepts of positive psychology and serve as a reference guide for the implementation of the community-based intervention. Probation officers were randomly allocated to their responsible groups to conduct the same intervention until the end of the entire program, with each



receiving a checklist for implementation. This arrangement was to ensure the fidelity of the intervention.

The Community-Based Positive Family Holistic Health Intervention for Probationers

Care-as-Usual Control Group

As a control group, participants in CAU received the usual probation service, which was a one-hour monthly meeting with their probation officers. The content of the usual probation service was to discuss general issues in relation to their daily lives and relationships with family members. Participants were offered the combined intervention and souvenir packs (including a handgrip and towel) after completing the 3-month assessments.

Brief Intervention Group

Participants in BI also received the usual probation service, but the first two one-hour monthly meetings upon joining the program were the individual brief positive family holistic health, which was run by the trained probation officers. It aimed to promote (i) participants' knowledge, intention, and behaviors related to physical activity, particularly ZTE_x, (ii) changes in behavior by setting goals and formulating realistic outcome expectancies, and (iii) family relations and well-being by praising and exercising with family members. **Table 1** shows the content outline of the brief individual intervention.

Combined Intervention Group

Participants in CI also received the same individual brief intervention with an addition of a one-day 4.5-h group activity. **Table 1** shows the content outline of the 2-session group activity. The first session in the morning was an interactive seminar on ZTE_x conducted by a medical professional (THL, the founder of ZTE_x) and theme-based interactive family games conducted by social workers. The second session in the afternoon was a positive psychology-based family session conducted by social workers. Participants were invited to join the group activity with one of their family members before starting the first individual brief intervention session. The group activity led by probation officers created a supportive environment for positive family time and communication and encouraged the engagement in physical activity with family members through role modeling and peer support.

Each participant in BI and CI was given a workbook to set their goals of engaging in physical activity by themselves and with family members, record their daily physical activity and track their exercise progress over 3 months. The workbook stated the benefits of regular physical activity and the harmful effects of physical inactivity (e.g., the relationship between sedentary behavior and cancer). It was an essential tool to share the learned information with family members and provide valuable tips (e.g., positive communication, praise, and appreciation) to enhance family relationships.

Data Collection

Self-administered questionnaires and physical fitness were assessed at baseline, 1-month and 3-month follow-up. Physical fitness assessments included single-leg stance and 30-s chair stand tests at all three-time points. Three 1-h focus group interviews were conducted with 24 probationers to obtain their feedback after completing the 3-month follow-up assessment on 12 March 2017 on the main campus of The University of Hong Kong. Probationers' feedback on the quality of intervention content was collected to triangulate the qualitative and quantitative findings.

Measures

Physical Activity and Fitness

Participants' engagement in simple strength and stamina-enhancing physical activity while seated and standing was assessed by asking two questions on the number of days the participant engaged in physical activity during the last 7 days; responses ranged from “0” to “7” days, which had been used in our previous study (Lai et al., 2018). Questions from the short form of the International Physical Activity Questionnaire—Chinese version (IPAQ-C) were used to assess participants' physical activity by asking for the number of days they engaged in at least 10 min of moderate and vigorous physical activity, respectively. The questions were: “During the last 7 days, on how many days did you do at least 10 min of moderate physical activity?”; and “During the last 7 days, on how many days did you do at least 10 min of vigorous physical activity?” The internal reliability of the Chinese version of the questionnaire was high, with an intraclass correlation coefficient of 0.79 (Macfarlane et al., 2007).

TABLE 1 | The content outline of individual brief intervention and group activity of combined intervention.**A. Content outline of the individual brief intervention****Session one (at baseline)**

Duration	Steps	Goals
20 min	<ul style="list-style-type: none"> Introduce the age- and sex-specific fitness reference values and discuss the clinical relevance. Encourage the participants to compare the normative data with their own results. 	To assess their own health and enhance the knowledge of the harmful effects of sedentary behavior and benefits of physical activity. To enhance intention of reducing sedentary behavior and increasing physical activity.
20 min	<ul style="list-style-type: none"> Introduce Zero-time exercise (ZTE), demonstrate the examples of different movements and do the exercise together with participants. Share personal experiences and benefits of doing physical activity, particularly ZTE. 	To enhance their knowledge and self-efficacy in relation to ZTE. To strength the motivation and promote its conversion to action.
20 min	<ul style="list-style-type: none"> Invite participants to set realistic goals and plan for actions and introduce the workbook to participants. Introduce the importance of "Gratitude and appreciation," encourage to share what has been learnt and communicate with family. 	To help set action plan and goals. To enhance positive family communication and well-being.

Session 2 (at 1 month after session 1)

20 min	<ul style="list-style-type: none"> Invite participants to share their experience in relation to physical activity, ZTE and family communication. Review the records of their workbook. 	To monitor the progress. To review and enhance their motivation.
20 min	<ul style="list-style-type: none"> Discuss the barriers encountered in doing physical activity and explore the solution with participants. Highlight their successfulness in exercising and positive family communication. 	To enhance self-efficacy. To provide positive reinforcement.
20 min	<ul style="list-style-type: none"> Provide encouragement and support. Conclude with a summary and key statements. 	To strengthen exercise motivation and regulatory factors.

B. Content outline of the group activity of the combined intervention (4 ho and 30 min)

30 min	<ul style="list-style-type: none"> Answer the questionnaire and perform fitness assessments at baseline. 	To provide an ice-breaking activity and increase participants' health awareness and interest that followed.
45 min	<ul style="list-style-type: none"> Receive an Interactive seminar on physical activity, particularly in ZTE. 	To introduce ZTEX by health professionals and proactively invite participation in the intervention.
45 min	<ul style="list-style-type: none"> Conduct family Interactive physical activity games. 	To provide good family interaction time and invite exercising with family members.
60 min	<ul style="list-style-type: none"> Lunch. 	
120 min	<ul style="list-style-type: none"> Conduct positive psychology-based family session. 	To encourage participants to express appreciation to family members.
20 min	<ul style="list-style-type: none"> Participants sharing session. 	To allow participants to reflect their feeling and the learnt during the group activity.
10 min	<ul style="list-style-type: none"> Closing remarks. 	

The lower limb muscular endurance was assessed using a 30-s chair stand test by recording the number of stands completed from the chair in 30-s (Jones et al., 1999). Balance was assessed using a single-leg-stance test by recording the stance duration in which balance on one leg is effectively achieved (for a maximum of 120-s) (Newton, 1989). Questions about general health were asked before the physical fitness assessments. All participants completed these assessments with no reports of discomfort or complaints.

Psychological Well-Being and Quality of Life**Rosenberg Self-Esteem Scale**

The 10-item Rosenberg Self-esteem Scale was used to measure self-esteem. Each question was a score from 1 to 4, with higher scores indicating higher self-esteem (Rosenberg, 1965). The Cronbach's alpha ranged from 0.80 to 0.84 across three-time points, indicating good reliability.

Subjective Happiness Scale

The 4-item Subjective Happiness Scale was adopted to measure subjective happiness. Responses were given on a 7-point Likert scale from 1 (less happy) to 7 (more happy), with a higher total score indicating a higher level of happiness (Lyubomirsky and Lepper, 1999). The Chinese version of the scale has been previously translated and validated in Hong Kong (Nan et al., 2014). The scale demonstrated good internal consistency (Cronbach's alpha ranged from 0.79 to 0.94), indicating good reliability.

Patient Health Questionnaire

The 4-item Patient Health Questionnaire (PHQ-4) was used to assess depression and anxiety. Responses were given on a scale of 0 to 3, with lower scores indicating a lower likelihood of being depressed or anxious (Kroenke et al., 2009). The Cronbach's alpha ranged from 0.88 to 0.91 across three time points, indicating good reliability.

Satisfaction With Life Scale

The 5-item Satisfaction with Life Scale was used with responses given on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree), with a higher total score indicating a higher level of satisfaction with life (Diener et al., 1985). The Cronbach's alpha ranged from 0.93 to 0.95 across three-time points, indicating good reliability.

Short Form Health Survey

The 12-item Short-Form Health Survey (SF-12v2) was used to assess the quality of life, consisting of both mental and physical quality of life. Responses were made on a 3-point scale (1 = "yes, limited a lot" to 3 = "no, not limited at all") or a 5-point scale (1 = "not at all" to 5 = "extremely") (Ware et al., 1996). The Chinese version of the scale has been validated in local populations with satisfactory content and criterion validity (Lam et al., 2005).

Family Communication

Four outcome-based questions were used to measure the frequency of behavior indicators of family communication, including doing physical activity with family members, praising family members to do physical activity, and expressing appreciation to family members verbally and through action in the last 4 weeks. Responses were made on a scale of 1 (never) to 5 (always), with higher scores indicating more of the target behavior. Self-reported single-item measures of physical activity have been widely used in healthy adult populations (Silsbury et al., 2015).

Family Well-Being

The 5-item Family APGAR scale was used to measure the five areas of family function (well-being), including adaptability, partnership, growth, affection, and resolve. A total score of 7–10 suggests a highly functional family, 4–6 suggests a moderately dysfunctional family, and 0–3 suggests a severely dysfunctional family (Smilkstein, 1978). The Cronbach's alpha ranged from 0.85 to 0.88 across three time points, indicating good reliability.

Relationship Between Probationers and Probation Officers

An outcome-based question was used to ask the probationers' perceived relationship with their probation officers on a 5-point scale, ranging from 1 (poor) to 5 (very good). Higher scores indicated a better relationship.

Statistical Analysis

Analyses were done using IBM SPSS Statistics 25, with a two-tailed significance of $p < 0.05$. Adhering to intention-to-treat (ITT) principles, all missing values of the outcome variables were substituted by the baseline values. Chi-square analysis was conducted to test if demographic characteristics varied among the CAU, BI, and CI. A mixed-effects model was adopted to investigate the impacts of between-group differences. The intervention group was treated as a fixed effect, and sex, age, and the baseline values of the outcome variables were included as covariates. Estimated marginal means were employed for

planned comparisons to examine whether there were within-group differences across time points. The focus group interviews were conducted by an experienced researcher from the working committee. All qualitative interviews were audiotaped and transcribed verbatim in Chinese. Two project members, one of whom had attended the interviews, coded the transcripts, which were analyzed using thematic framework analysis following the guidelines recommended by Morse and Field (1995). A mixed-methods design was used to interrelate and interpret the qualitative and quantitative data (Creswell and Clark, 2017).

RESULTS

Participants

Of the 463 eligible probationers invited to join the study, 318 joined and completed the questionnaire and fitness assessment at baseline before the first session. Around half of them were female (48.7%), aged 20–39 years (47.2%), and with about one third married (34%).

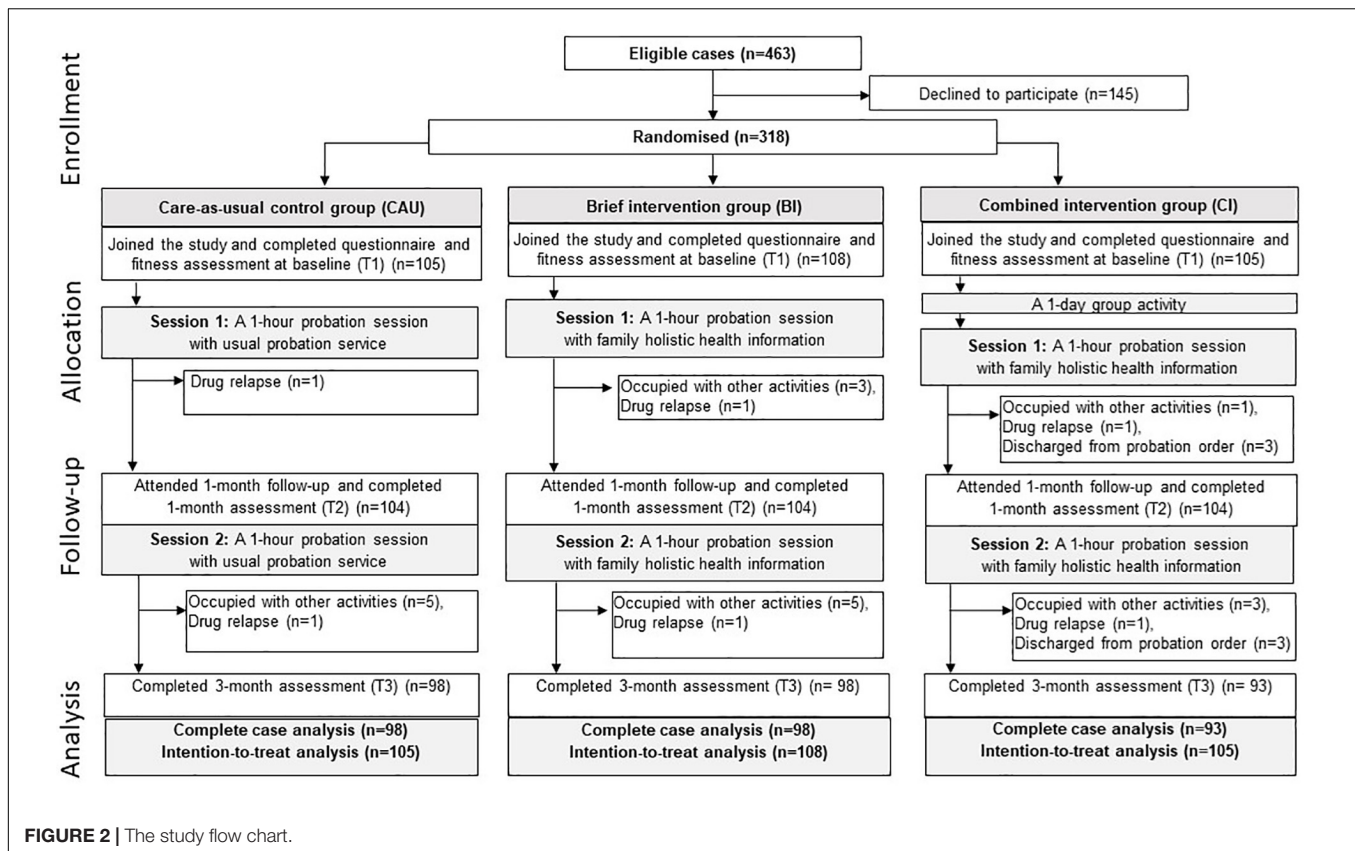
About two-thirds had secondary level education (66.7%) and were employed (64.5%). The probationers were allocated into CAU ($n = 105$), BI ($n = 108$), and CI ($n = 105$). Ten probationers (1 from CAU, 4 from BI, and 4 from CI) were absent from the 1-month follow-up, and 19 (6 from CAU, 6 from BI, and 9 from CI) were absent from the 3-month follow-up. The remaining 279 probationers completed the assessments at all time points. **Figure 2** shows the recruitment and study flowchart. **Table 2** shows no significant differences in the baseline characteristics among the three groups.

Twenty-four probationers joined the focus group interviews after completing the intervention. Half of them were female (50%), nearly half were aged 20–39 years (46%) and about one third were married (34%). About two-thirds had secondary level education or above (66.7%) and were employed (60.8%). 58.3% had less than half a year of probation term remaining. No significant differences in probationers' characteristics were observed between those who participated in the focus group interviews and those who did not. No harm or unintended effects were detected in either group.

Changes in Physical Activity

Table 3 shows CAU reported significant increases in days spent engaging in simple strength and stamina-enhancing physical activity (ZTEx) while seated at 1- and 3-month follow-up. BI reported significant increases in days spent engaging in ZTEx while seated and standing at 3-month follow-up. CI reported significant increases in days spent engaging in ZTEx while seated and standing, and moderate physical activity at 1- and 3-month follow-up, and an increase in vigorous physical activity at 1-month follow-up. Effect sizes ranged from small to moderate (Cohen's d : 0.19–0.50, all $p < 0.05$).

Figure 3 shows no significant difference in changes in physical activity between BI and CAU. Compared with CAU, CI reported significantly greater increases in days spent engaging in ZTEx while standing by 0.83 days (95% CI: 0.09, 1.56), moderate physical activity by 1.41 days (95% CI: 0.71, 2.10), and vigorous



physical activity by 0.63 days (95% CI: 0.06, 1.19) than the CAU at 1-month follow-up with small effect sizes (Cohen's d : 0.38–0.70, all $p < 0.05$), but not at 3-month follow-up. Compared with BI, CI reported significantly greater increases in days spent engaging in moderate physical activity by 1.16 days (95% CI: 0.46, 1.86) at 1-month follow-up and by 0.96 days (95% CI: 0.23, 1.68) at 3-month follow-up. The effect sizes ranged from small to moderate (Cohen's d : 0.46–0.58, all $p < 0.05$). No significant difference in the changes in days engaging in ZTE_x while seated and standing and vigorous physical activity were reported between BI and CI at 1- and 3-month follow-up.

Changes in Fitness Performance

Table 3 shows no significant improvement in the duration of the single-leg stand in all three groups. Significant improvements in the number of stands in the 30-s chair stand test were reported for all groups at both 1-month follow-up and 3-month follow-up with small effect size (Cohen's d : 0.12–0.35; all $p < 0.05$). Table 4 shows no significant differences in the changes in the duration of the single-leg stand and number of stands among three groups at 1- and 3-month follow-up.

Changes in Psychological Well-Being and Quality of Life

Table 3 shows that CAU reported significant improvements in mental quality of life at 1-month follow-up. BI reported significant improvements in self-esteem at 1-month follow-up,

and subjective happiness at 3-month follow-up. CI reported significant reductions in anxiety and depression symptoms and mental quality of life at 1-month follow-up. All effect sizes were small (Cohen's d : 0.16–0.29, all $p < 0.05$). All three groups had no significant improvements in life satisfaction and physical quality of life at 1- and 3-month follow-up (Table 4).

Table 4 shows no significant differences in the improvements in personal well-being (including self-esteem, subjective happiness, anxiety and depression symptoms, life satisfaction, and mental and physical quality of life) among three groups both at 1- and 3-month follow-up.

At the focus-group interviews after the completion of the program, participants reported feeling more motivated, happier, and healthier than before joining the program.

"You become more alert after exercising, and once you notice improvements in your physical health, then you will put in more effort into what you think and do." (Housewife, female, 65 years or above)

"I became happier. When I am not happy, I will think about happy things." (Housewife, female, 55–59 years)

"I have become healthier for sure... it's better than not moving." (Housewife, female, 45–49 years)

Change in Family Communication Physical Activity With Family Members

Table 5 shows that all three groups reported significant increases in doing physical activity with family members and praising

TABLE 2 | Baseline demographic characteristics of probationers ($n = 318$).

	All	CAU	BI	CI	
	$n = 318$	$n = 105$	$n = 108$	$n = 105$	p -value
		n (%)	n (%)	n (%)	
Sex					
Male	163 (51.3)	58 (55.2)	52 (48.1)	53 (50.5)	0.56
Female	155 (48.7)	47 (44.8)	56 (51.9)	52 (49.5)	
Age					
12–19	50 (15.7)	24 (22.9)	13 (12.0)	13 (12.4)	0.30
20–39	150 (47.2)	46 (43.8)	52 (48.1)	52 (49.5)	
40–59	85 (26.7)	23 (21.9)	33 (30.6)	29 (27.6)	
≥60	33 (10.4)	12 (11.4)	10 (9.3)	11 (10.5)	
Marital status^a					
Not married	171 (53.8)	63 (60.0)	50 (46.3)	58 (55.2)	0.30
Married	108 (34.0)	34 (32.4)	43 (39.8)	31 (29.5)	
Separated, divorced, widowed	39 (12.2)	9 (8.6)	14 (13.0)	16 (15.2)	
Education^b					
Primary or below	42 (13.2)	13 (12.4)	14 (13.0)	15 (14.3)	0.81
Secondary	12 (66.7)	75 (71.4)	71 (65.7)	66 (62.9)	
Post-secondary or above	64 (20.1)	18 (17.1)	22 (20.4)	24 (22.9)	
Employment^c					
Student	27 (8.5)	15 (14.3)	7 (6.2)	5 (4.8)	0.2
Employed full-time/part-time	205 (64.5)	68 (64.8)	68 (63.0)	69 (65.7)	
Unemployed/retired	42 (13.2)	14 (13.3)	14 (13.0)	14 (13.3)	
Homemaker	44 (13.8)	10 (9.5)	16 (14.8)	18 (17.1)	
Duration of probation					
Half year or below	207 (65.1)	68 (64.8)	76 (70.3)	63 (60.0)	0.21
Half year to 1 year	83 (27.4)	27 (25.7)	27 (25.0)	33 (31.4)	
1 to 1.5 years	20 (6.3)	10 (9.5)	3 (2.8)	7 (6.6)	
> 1.5 years	4 (1.5)	2 (0.2)	1 (1.0)	1 (1.0)	

CAU = Care-as-usual control group, BI = Brief intervention group, CI = Combined intervention group.

^a7 missing value, $n = 311$; ^b4 missing value, $n = 314$; ^c18 missing value, $n = 300$. No significant difference among three groups.

family members to do physical activity at 1- and 3-month follow-up, with small to large effect sizes (Cohen's d : 0.21–0.84; all $p < 0.05$).

Figure 4 shows, compared with CAU, BI reported significantly greater increases in doing physical activity with family members by 0.69 scores (95% CI: 0.38, 1.00) and 0.57 scores (95% CI: 0.23, 0.91); and praising family members to do physical activity by 0.33 scores (95% CI: 0.03, 0.63) and 0.33 scores (95% CI: 0.03, 0.64), with small to moderate effect sizes (Cohen's d : 0.37–0.76, $p < 0.05$) at 1- and 3-month follow-up, respectively. The CI also reported significantly greater increases in doing physical activity with family members by 0.62 scores (95% CI: 0.31, 0.93) and 0.37 scores (95% CI: 0.02, 0.71); and praising family members to do physical activity by 0.37 scores (95% CI: 0.07, 0.67) and 0.38 scores (95% CI: 0.07, 0.69) than CAU at 1- and 3-month follow-up, respectively. All effect

sizes ranged from small to moderate (Cohen's d : 0.37–0.68, all $p < 0.05$).

There were no significant differences in the increases in doing physical activity with family members and praising family members to do physical activity between BI and CI at 1- and 3-month follow-up.

Expressing Appreciation to Family Members

Table 4 shows no significant increases in expressing appreciation to family members verbally and through action in the CAU at 1- and 3-month follow-up. However, BI reported significant increases in expressing verbal appreciation with a small effect size at 3-month follow-up (Cohen's d : 0.21, $p < 0.05$), but not at 1-month follow-up. No significant increases in expressing appreciation to family members through action were reported at 1- and 3-month follow-up. CI reported significant increases in expressing appreciation verbally and through action with small effect sizes at 1- and 3-month follow-up (Cohen's d : 0.32–0.42, all $p < 0.01$).

Figure 4 shows no significant difference in changes in expressing appreciation to family members verbally and through action between BI and CAU at 1- and 3-month follow-up. Compared with CAU, CI reported significantly greater increases in expressing verbal appreciation by 0.50 scores (95% CI: 0.21, 0.79) and 0.46 scores (95% CI: 0.15, 0.76); and expressing appreciation through action by 0.39 scores (95% CI: 0.10, 0.69) and 0.54 scores (95% CI: 0.21, 0.86) with small to moderate effect sizes (Cohen's d : 0.45–0.59) at 1- and 3-month follow-up, respectively. Compared with the BI, the CI reported significantly greater increases in expressing verbal appreciation by 0.33 scores (95% CI: 0.04, 0.62) and through action by 0.33 scores (95% CI: 0.03, 0.62) with small effect sizes (Cohen's d : 0.38–0.39, all $p < 0.05$) at 1-month follow-up, but not at 3-month follow-up.

At the focus-group interviews, participants reported increased family communication because of new common topics (health and exercise) to discuss.

"I don't know if this is considered an improvement in communication, but I think it is good. For example, if we don't do it (ZTE) very well, then we can say... 'hey hey hey hey... don't hold on to it (for support)'... I think this is... also communication." (Housewife, female, 45–49 years)

"Perhaps our family will have an additional topic to talk about. Maybe normally we wouldn't discuss exercise with family members... but after this exercise and activity, we will have more to talk about with our family members." (Full-time student, male, 20–24 years)

Changes in Family Well-Being

Table 4 shows CI reported significant improvements in family well-being at 1- and 3-month follow-up with small effect size (Cohen's d : 0.20–0.30; all $p < 0.05$), but no significant changes in family well-being were reported in BI and CAU at 1-month and 3-month follow-up.

Figure 5 shows, compared with CAU, BI reported significantly greater improvement in family well-being by 0.88 scores (95% CI: 0.18, 1.59; Cohen's d : 0.43, $p < 0.01$) at 3-month follow-up, but not at 1-month follow-up. CI reported significantly

TABLE 3 | The within-group difference in physical activity, fitness performances, psychological well-being, and quality of life at 1- and 3-month follow-up in three groups: Intention-to-treat analysis.

	CAU (<i>n</i> = 105)		BI (<i>n</i> = 108)		CI (<i>n</i> = 105)	
	Mean ± SD	Cohen's <i>d</i>	Mean ± SD	Cohen's <i>d</i>	Mean ± SD	Cohen's <i>d</i>
Physical activity						
Days spent engaging in physical activity while seated						
T1	1.8 ± 2.4 ^{##}		2.4 ± 2.6 [#]		2.1 ± 2.6 ^{##}	0
T2, (T2 vs. T1)	2.5 ± 2.6	0.26**	2.8 ± 2.4	0.16	2.8 ± 2.4	0.29**
T3, (T3 vs. T1)	2.3 ± 2.4	0.19*	3.2 ± 2.5	0.30**	2.7 ± 2.5	0.26*
Days spent engaging in physical activity while standing						
T1	2.1 ± 2.4		2.5 ± 2.6 [#]		2.2 ± 2.6 ^{###}	
T2, (T2 vs. T1)	2.2 ± 2.5	0.04	3.0 ± 2.5	0.18	3.1 ± 2.5	0.36***
T3, (T3 vs. T1)	2.4 ± 2.4	0.10	3.3 ± 2.5	0.30*	3.0 ± 2.5	0.33***
Days spent engaging in moderate physical activity						
T1	2.2 ± 2.5		2.4 ± 2.5		1.9 ± 2.1 ^{###}	
T2, (T2 vs. T1)	2.0 ± 2.3	−0.09	2.3 ± 2.4	−0.07	3.0 ± 2.4	0.50***
T3, (T3 vs. T1)	2.2 ± 2.5	0.02	2.1 ± 2.3	−0.12	2.7 ± 2.3	0.36***
Days spent engaging in vigorous physical activity						
T1	1.3 ± 1.9		1.4 ± 1.8		1.1 ± 1.6 [#]	
T2, (T2 vs. T1)	1.2 ± 1.7	−0.05	1.6 ± 2.0	0.08	1.6 ± 1.9	0.30**
T3, (T3 vs. T1)	1.1 ± 1.5	−0.11	1.5 ± 1.9	0.07	1.5 ± 1.8	0.21
Fitness performance						
Single-leg stand test, seconds						
T1	85.1 ± 40.0		91.8 ± 39.8		84.6 ± 40.1	
T2, (T2 vs. T1)	84.4 ± 38.5	−0.02	90.3 ± 37.7	−0.04	83.9 ± 39.3	−0.02
T3, (T3 vs. T1)	83.6 ± 38.8	−0.05	90.5 ± 37.9	−0.06	81.7 ± 40.2	−0.03
30-s chair stand test, number of stands						
T1	19.4 ± 7.9 ^{###}		18.9 ± 7.6 ^{###}		22.4 ± 8.9 [#]	
T2, (T2 vs. T1)	21.3 ± 9.0	0.22***	21.3 ± 8.1	0.30***	23.7 ± 9.8	0.14*
T3, (T3 vs. T1)	22.1 ± 9.1	0.32***	21.8 ± 8.4	0.35***	23.5 ± 8.7	0.12*
Psychological well-being						
Self-esteem						
T1	27.0 ± 4.7		27.0 ± 3.6 [#]		27.7 ± 4.1	
T2, (T2 vs. T1)	27.4 ± 4.6	0.08	27.6 ± 3.5	0.16**	27.6 ± 4.6	−0.03
T3, (T3 vs. T1)	27.1 ± 5.1	0.02	27.5 ± 3.7	0.13	27.8 ± 4.2	0.00
Subjective happiness						
T1	17.0 ± 4.7		17.7 ± 4.1 ^{###}		17.7 ± 4.8	
T2, (T2 vs. T1)	17.5 ± 4.6	0.11	17.9 ± 4.0	0.05	18.0 ± 4.3	0.07
T3, (T3 vs. T1)	17.7 ± 4.2	0.14	18.9 ± 4.0	0.29***	18.1 ± 4.3	0.09
Anxiety and depression symptoms						
T1	2.5 ± 2.6		2.9 ± 2.8		3.0 ± 3.0	
T2, (T2 vs. T1)	2.7 ± 3.0	0.08	2.8 ± 3.0	−0.05	2.4 ± 2.4	−0.21*
T3, (T3 vs. T1)	2.5 ± 2.6	0.03	2.7 ± 2.9	−0.09	2.4 ± 2.5	−0.19
Life satisfaction						
T1	20.8 ± 7.4		21.9 ± 7.1		21.6 ± 6.8	
T2, (T2 vs. T1)	21.6 ± 7.5	0.11	21.9 ± 6.5	0.00	22.6 ± 6.8	0.16
T3, (T3 vs. T1)	21.7 ± 7.4	0.12	22.8 ± 6.2	0.14	22.8 ± 6.8	0.18
Quality of life						
Physical quality of life						
T1	47.4 ± 8.6		47.5 ± 8.5		46.3 ± 9.0	
T2, (T2 vs. T1)	46.8 ± 8.2	−0.07	47.9 ± 8.5	0.04	47.3 ± 8.3	0.12
T3, (T3 vs. T1)	48.2 ± 7.8	0.09	47.3 ± 8.2	−0.02	46.6 ± 8.3	0.04
Mental quality of life						
T1	44.3 ± 9.9 [#]		44.1 ± 8.5		44.8 ± 8.9	
T2, (T2 vs. T1)	46.4 ± 10.2	0.21**	44.9 ± 9.4	0.09	46.5 ± 9.1	0.19*
T3, (T3 vs. T1)	45.3 ± 10.4	0.10	45.1 ± 8.9	0.11	45.5 ± 8.7	0.08

CAU = Care-as-usual control group, BI = Brief intervention group, CI = Combined intervention group.

T1 = baseline, T2 = 1-month follow-up, T3 = 3-month follow-up.

Repeated Measures Analysis of Variance and paired *t*-test to compare parametric data among three timepoints and between two timepoints, respectively.

T2 vs. T1 = values at 1-month follow-up versus values at baseline; T3 vs. T1 = values at 3-month follow-up versus values at baseline.

Difference among three timepoints: [#]*p* < 0.05, ^{##}*p* < 0.01, ^{###}*p* < 0.001; Difference between two timepoints: **p* < 0.05, ***p* < 0.01, ****p* < 0.001.Effect size (Cohen's *d*): small = 0.20, moderate = 0.50, and large = 0.80.

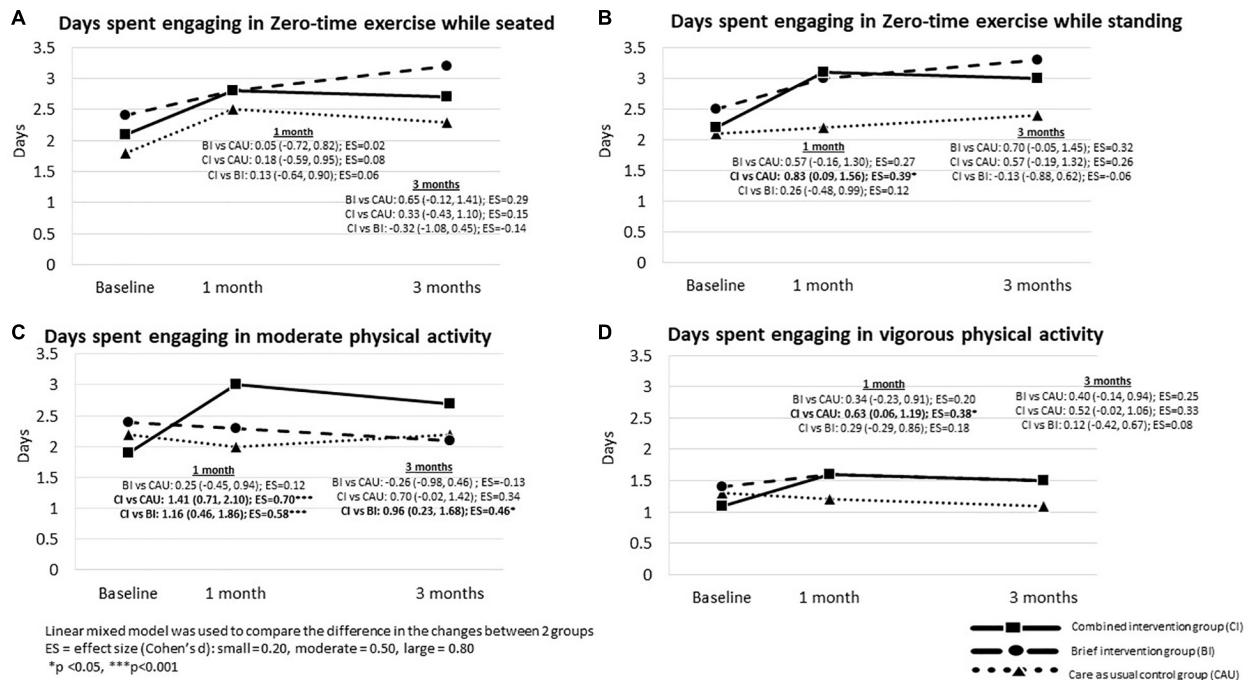


FIGURE 3 | The between-group difference in the changes in physical activity at 1- and 3-month follow-up in three groups: Intention-to-treat analysis.

greater improvements in family well-being by 1.08 scores (95% CI: 0.46, 1.70) and 0.88 scores (95% CI: 0.17, 1.59) than the CAU, with small to moderate effect sizes (Cohen's d: 0.43–0.60, all $p < 0.01$) at 1- and 3-month follow-up, respectively. No significant difference in changes between BI, and CI were reported at 1- and 3-month follow-up.

At the focus-group interviews, probationers reported improved family relationships and felt happier with their families than before.

"Ever since I joined this "ZTex" (activity), my relationship with my son has improved a lot because he is curious when I exercised, and he joined in." (Housewife, female, 40–44 years)

"It (family relationship) has become better. (We) talk more." (Housewife, female, 40–44 years).

"For example, when we do the single-leg stance, if we do it well, then we all praise each other... with a lot of smiles. I felt happier and our communication has improved." (Housewife, female, 45–49 years).

Changes in the Relationship Between Probationers and Probation Officers

Table 4 also shows BI and CI reported significant improvements in the relationship between probationers and probation officers with a small effect size at 3-month follow-up (Cohen's d: 0.21–0.31; all $p < 0.05$), but not at 1-month follow-up. CAU reported no such significant changes at 1- and 3-month follow-up.

Figure 5 shows that the CI reported significantly greater improvement in the relationship between probationers and probation officers than the CAU by 0.21 scores (95% CI: 0.04,

0.38; Cohen's d: 0.43, $p < 0.01$) with a small effect size at 3-month follow-up, but not at 1-month follow-up. There was no significant difference in the changes in the relationship between probationers and probation officers between BI and CAU and between BI and CI, at 1- and 3-month follow-up.

At the focus-group interviews, participants reported changes in their impressions of probation services, and enhanced trust with probation officers and receiving valuable advice from probation officers.

"I think it (probation service) was different from what I expected. ... there was some pressure before. But later, I realized that the probation officer is very kind and gave us practical help and advice on our real-life problems." (Full-time employee, male, 30–34 years)

"It is much better to have another person that I can share my thoughts and wants... because I do not want to make my family worry." (Full-time employee, female, 45–49 years)

The complete case analyses show similar findings to those of the main analyses (Supplementary Tables 1–4).

Feedback of the Program Design and Content and Suggestion

At the focus group interviews, probationers provided very positive feedback on using the topic of physical activity to start communication with family members. The workbook and handgrip souvenirs acted as good reminders to do regular exercise and promote positive family communication.

"I think urban dwellers are very busy... this is a way to let them know there are exercises that do not require extra time or a specific

TABLE 4 | The between-group difference in the changes in physical fitness, psychological well-being, and quality of life at 1- and 3-month follow-up in three groups: Intention-to-treat analysis.

	BI vs. CAU		CI vs. CAU		CI vs. BI	
	Mean difference (95%CI)	Cohen's d	Mean difference (95%CI)	Cohen's d	Mean difference (95%CI)	Cohen's d
Difference in the changes at 1 month						
Physical fitness						
Single-leg stand test, second	1.15 (−7.80, 10.09)	0.04	0.26 (−8.86, 9.38)	0.01	−0.89 (−10.02, 8.24)	−0.03
30-s chair stand test, number of stand	0.28 (−1.46, 2.02)	0.05	−0.41 (−2.23, 1.40)	−0.08	−0.69 (−2.50, 1.11)	−0.13
Psychological well-being						
Self-esteem	0.18 (−0.80, 1.16)	0.06	−0.34 (−1.34, 0.65)	−0.12	−0.52 (−1.52, 0.47)	−0.18
Subjective happiness	0.00 (−1.03, 1.03)	0.00	0.10 (−0.95, 1.15)	0.03	0.09 (−0.94, 1.13)	0.03
Anxiety and depression symptoms	−0.18 (−1.00, 0.65)	−0.07	−0.66 (−1.50, 0.17)	−0.27	−0.49 (−1.32, 0.35)	−0.20
Life satisfaction	−0.13 (−1.74, 1.49)	−0.03	0.58 (−1.05, 2.21)	0.12	0.71 (−0.91, 2.32)	0.15
Quality of life						
Physical quality of life	0.89 (−1.10, 2.88)	0.15	1.41 (−0.59, 3.41)	0.24	0.52 (−1.50, 2.53)	0.09
Mental quality of life	−1.52 (−4.00, 0.97)	−0.21	−0.40 (−2.91, 2.11)	−0.06	1.12 (−1.40, 3.63)	0.15
Difference in the changes at 3 months						
Physical fitness						
Single-leg stand test, second	0.68 (−8.80, 10.16)	0.02	−0.52 (−10.22, 9.18)	−0.02	−1.21 (−10.91, 8.50)	−0.04
30-s chair stand test, number of stand	−0.12 (−1.87, 1.63)	−0.02	−1.19 (−3.01, 0.63)	−0.23	−1.07 (−2.89, 0.75)	−0.21
Psychological well-being						
Self-esteem	0.47 (−0.50, 1.45)	0.17	0.20 (−0.79, 1.19)	0.07	−0.28 (−1.26, 0.71)	−0.10
Subjective happiness	0.79 (−0.26, 1.83)	0.26	0.19 (−0.87, 1.25)	0.06	−0.60 (−1.64, 0.45)	−0.20
Anxiety and depression symptoms	−0.15 (−0.92, 0.61)	−0.07	−0.38 (−1.16, 0.40)	−0.17	−0.22 (−1.00, 0.55)	−0.10
Life satisfaction	0.39 (−1.30, 2.08)	0.08	0.84 (−0.87, 2.54)	0.17	0.45 (−1.24, 2.14)	0.09
Quality of life						
Physical quality of life	−0.35 (−2.48, 1.77)	−0.06	−0.22 (−2.36, 1.93)	−0.03	0.14 (−2.02, 2.30)	0.02
Mental quality of life	−0.07 (−2.62, 2.49)	−0.01	−0.27 (−2.85, 2.30)	−0.04	−0.21 (−2.79, 2.38)	−0.03

CAU = Care-as-usual control group, BI = Brief intervention group, CI = Combined intervention group.
Linear mixed model was adopted to examine the between-group differences.

location. . . and through this way you know it (ZTEEx) improves your health, or you can do it (ZTEEx) with your family. Maybe you don't have time to communicate with your family but you can do exercises together, you don't need to talk. . . doing it together as a family will be beneficial to family health." (Full-time employee, female, 20–24 years)

"The information is excellent. It (workbook) reminds you when you see it. I can do this, so it's okay." (Housewife, female, 65 years or above)

"I think it's really clear. . . with introductions on how to do it (ZTEEx). It (workbook) has pictures. . . like how to sit." (Housewife, female, 45–49 years)

"For those who don't regularly exercise. . . it (souvenir) acts as a motivation." (Full-time employee, male, 40–44 years)

The group activity provided an opportunity for valuable family time to do fun activities with family members. The activities served as an ice-breaker to express appreciation to family members under a positive atmosphere and encouragement from probation officers.

"My favorite section was the exercises (ZTEEx). It allows us to learn different types of exercise. Maybe normally you only move your legs a bit, but you don't know about seated cycling. You probably didn't

know about them (ZTEEx) before he talked about them." (Full-time student, female, 20–24 years)

"I think without the group activity acting as a foundation, I may not be as interested in trying it (ZTEEx). So, it made both of us enthusiastic during the exercise (ZTEEx), and the group activity provided an opportunity to express appreciation to my wife, which I have not done for few years." (Full-time employee, male, 30–34 years)

DISCUSSION

This is the first RCT targeted at probationers. Our holistic health intervention, with simple, lifestyle-integrated physical activity (ZTEEx) and the integration of positive psychology themes of "Praise and Gratitude," not only enhanced probationers' holistic (physical and psychological) health and family communication and well-being but also their relationships with probation officers.

We have first shown probationers receiving existing probation service (CAU) had enhanced physical activity, fitness performance, psychological health, and family communication with small effect sizes. The probationers who additionally received a brief positive family holistic health intervention

TABLE 5 | The within-group difference in family communication, family well-being, and relationship with probation officers at 1- and 3-month follow-up in three groups: Intention-to-treat analysis.

	CAU		BI		CI	
	Mean \pm SD	Cohen's d	Mean \pm SD	Cohen's d	Mean \pm SD	Cohen's d
Family communication						
Did physical activity with family members, score						
T1	1.7 \pm 0.9 ^{###}		1.8 \pm 1.0 ^{###}		1.8 \pm 0.9 ^{###}	
T2, (T2 vs. T1)	1.9 \pm 1.0	0.21*	2.6 \pm 1.0	0.81***	2.5 \pm 1.0	0.76***
T3, (T3 vs. T1)	2.1 \pm 1.0	0.41***	2.7 \pm 1.1	0.84***	2.5 \pm 1.0	0.71***
Praised family members to do physical activity, score						
T1	2.4 \pm 1.0		2.3 \pm 1.0 ^{##}		2.6 \pm 1.0 ^{##}	
T2, (T2 vs. T1)	2.5 \pm 1.0	0.11	2.8 \pm 1.0	0.46***	2.9 \pm 0.9	0.35**
T3, (T3 vs. T1)	2.5 \pm 1.0	0.19*	2.9 \pm 0.9	0.55***	3.0 \pm 1.0	0.38**
Expressed verbal appreciation to family members, score						
T1	2.9 \pm 1.1		2.9 \pm 1.1 [#]		2.9 \pm 1.0 ^{###}	
T2, (T2 vs. T1)	2.8 \pm 1.1	-0.11	3.0 \pm 1.0	0.04	3.3 \pm 0.9	0.34**
T3, (T3 vs. T1)	2.9 \pm 1.0	0.02	3.2 \pm 1.0	0.21*	3.4 \pm 1.0	0.42***
Expressed appreciation through action to family members, score						
T1	2.9 \pm 1.0		3.1 \pm 1.1		3.0 \pm 1.1 ^{##}	
T2, (T2 vs. T1)	2.9 \pm 1.0	0.02	3.1 \pm 0.9	-0.06	3.3 \pm 1.0	0.32**
T3, (T3 vs. T1)	2.8 \pm 1.1	-0.06	3.3 \pm 1.0	0.14	3.4 \pm 1.1	0.37**
Family well-being, score						
T1	6.3 \pm 2.4		6.5 \pm 2.5		6.3 \pm 2.5 ^{##}	
T2, (T2 vs. T1)	6.0 \pm 2.5	-0.10	6.6 \pm 2.5	0.05	7.0 \pm 2.3	0.30**
T3, (T3 vs. T1)	6.0 \pm 2.7	-0.11	6.9 \pm 2.4	0.15	6.8 \pm 2.4	0.20*
Relationship with probation officers, score						
T1	4.3 \pm 0.7		4.3 \pm 0.7 [#]		4.3 \pm 0.7 ^{##}	
T2, (T2 vs. T1)	4.3 \pm 0.7	-0.04	4.4 \pm 0.6	0.09	4.4 \pm 0.6	0.15
T3, (T3 vs. T1)	4.3 \pm 0.7	-0.09	4.5 \pm 0.6	0.21*	4.5 \pm 0.6	0.31**

T1 = baseline, T2 = 1-month follow-up, T3 = 3-month follow-up.

T2 vs. T1 = values at 1-month follow-up versus values at baseline; T3 vs. T1 = values at 3-month follow-up versus values at baseline.

Repeated Measures Analysis of Variance and paired t-test to compare parametric data among three timepoints and between two timepoints, respectively.

Difference among three timepoints: [#] $p < 0.05$, ^{##} $p < 0.01$, ^{###} $p < 0.001$; Difference between two timepoints: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Effect size (Cohen's d): small = 0.02, moderate = 0.50, large = 0.80.

integrating physical activity and positive psychology (BI), and those who received both BI and group activity (CI), showed improvements in physical activity, family communication and family well-being. Using CAU as controls, we have shown evidence of the effectiveness of CI in improvements in the relationships with probation officer with a small effect size. CI also showed greater increases in physical activity and family communication than the BI with small to moderate effect sizes. Qualitative feedbacks corroborated the quantitative findings.

Our intervention utilizing simple strength and stamina-enhancing physical activity (ZTE_x) is advantageous over other physical activity interventions. It is easy for anyone to start and sustain, requiring no money, equipment or a specified location and can be done anywhere and integrated into everyday life (Lai et al., 2020). By using a foot-in-the-door approach and encouraging probationers to start behavior change in small steps by highlighting the simplicity and benefits of ZTE_x, the intervention showed further increases in ZTE_x and moderate physical activity among probationers that was similar to the findings in our community-based studies (Lai et al., 2018, 2020;

Lai A. et al., 2019; Lai Y. et al., 2019). Additionally, there are some studies on improving health and well-being and reducing psychological distress through exercise among prisoners and those who have committed more serious crimes (Kerekes et al., 2017; Sfindla et al., 2018; Wangmo et al., 2018).

Our findings suggest that integration of physical activity and positive psychology in probation services can enhance personal and family well-being. For probationers' psychological well-being, there were significant within-group improvements in the three groups (i.e., improved mental quality of life in the CAU and the CI, enhanced self-esteem and subjective happiness in the BI, and reduced anxiety and depression symptoms in the CI). However, we found no significant between-group difference in psychological well-being. This might be due to the intervention being primarily targeted at improving physical activity and family communication, thus more difficult to see the distant effects on psychological well-being.

The utilization of an experiential learning approach, "learning by doing," and interactive strategies in a group activity is recognized as a powerful teaching and learning tool

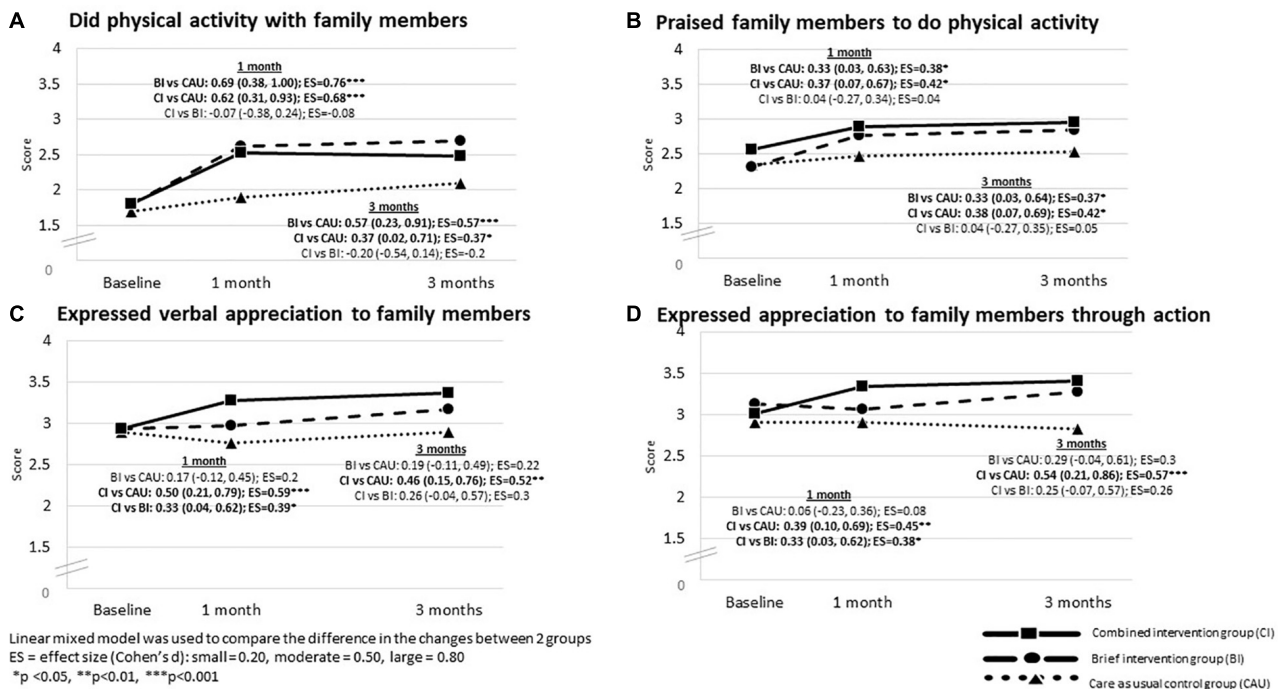


FIGURE 4 | The between-group difference in the changes in family communication at 1- and 3-month follow-up in three groups: Intention-to-treat analysis.

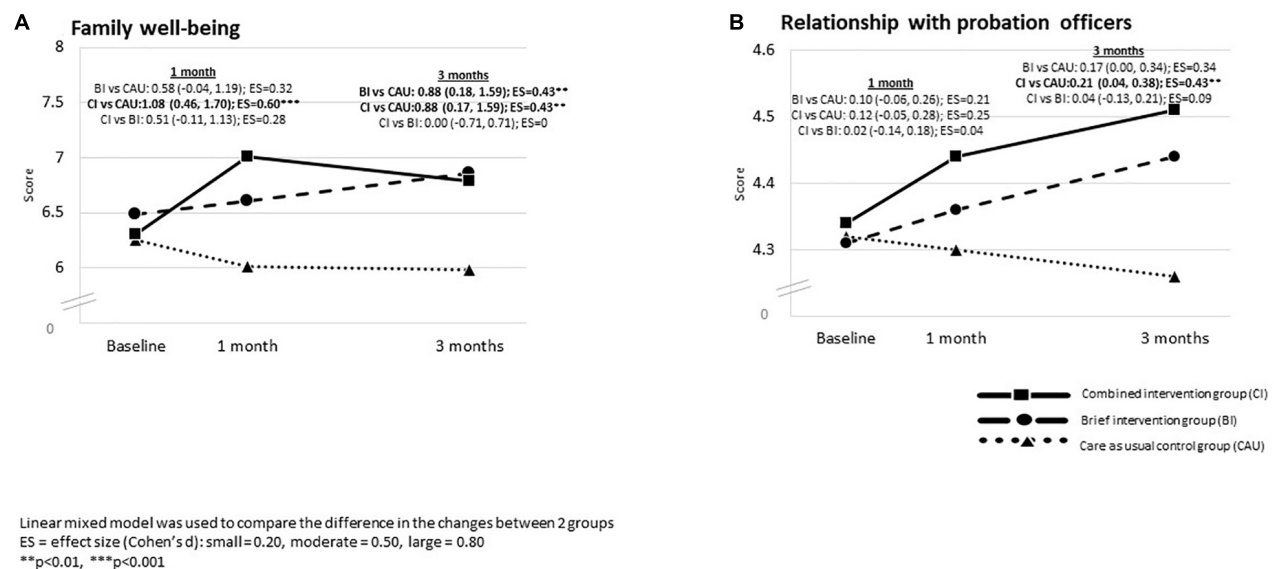


FIGURE 5 | The between-group difference in the changes in family well-being and relationship with probation officers at 1- and 3-month follow-up in three groups: Intention-to-treat analysis.

(Newman et al., 2017), and has been used to explain the learning process of individuals and groups. Practicing exercises together and doing interactive games with probationers and their family members may be particularly beneficial for engaging individuals and providing an essential opportunity to express appreciation and gratitude to family members. This strategy should be better

than didactic programs in managing the challenges of rapid engagement and an important component in many behavior change models through practice (Kolb, 2015).

Family communication is crucial for maintaining and promoting strong family relationships (Galvin et al., 2015). Our intervention showed significantly greater improvements in

family communication between probationers and their family members in CI than BI and CAU. This may be explained by the group activity experience involving family members of probationers in CI, where they observed and practiced the behaviors of others (role models) on how to express appreciation and concerns to their family members. Seeking comfort and support from family members through advice, encouragement, and affection, which is an effective coping mechanism in combating stressful and negative life events (Chou and Chi, 2001; Thomas et al., 2017). Besides, this intervention enhanced working relationships between probation officers and probationers. Better relationships predict better probation outcomes (Morash et al., 2015; Sloas et al., 2020), and higher perceived helpfulness of probation (De Lude et al., 2012). This improvement may offer a more productive and effective probation service and offer a bigger chance for the probationers to successfully re-integrate into daily life.

Our study had several limitations. First, because validated questionnaires were unavailable, we self-developed our outcome-based questions to assess the probationers' practices in relation to doing simple strength- and stamina-enhancing physical activity by themselves and with their family members and expressing appreciation to family members. The acceptability and applicability of these questions were shown in our previous studies with similar designs (Ho et al., 2020; Lai et al., 2020). Second, we were unable to assess the accumulated duration of physical activity objectively; we only measured the self-reported number of days engaged in physical activity. Self-reported moderate and vigorous physical activity values can be higher than objectively measured values, particularly in inactive participants (LeBlanc and Janssen, 2010). Third, as the intervention was a community-based intervention and the questionnaires had to be kept short, we could not assess changes in all the cognitive factors for the formation of exercise motivation and regulatory factors for regular physical activity. To further understand how intervention effects can be sustained and maintained for longer periods, future studies should identify specific effective intervention components, and assess changes in cognitive and regulatory factors such as risk perception and self-monitoring. More targeted interventions with specific components on enhancing psychological well-being and with greater involvement of family members could be conducted. Finally, we could not rule out social desirability bias. But as our assessments were anonymous and some outcomes showed no changes, such bias should not be substantial.

To conclude, our trial provided the first evidence of the effectiveness of a brief and preventive positive family holistic health intervention with ZTEx and positive psychology. This low-cost, theory- and community-based intervention, with quantitative and qualitative evaluations, offers a new model incorporating physical activity and positive psychology themes of 'Praise and Gratitude' for enhancing probation service to improve

probationers' personal and family well-being and the relationship with probation officers.

DATA AVAILABILITY STATEMENT

The dataset presented in this article is not readily available because the sharing of data to third parties was not mentioned in subjects' consent. Requests to access the dataset should be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Institutional Review Board of The University of Hong Kong/Hospital Authority Hong Kong West Cluster (reference number: UW125-249). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

AL led the conception and design of the study, and carried out the study. AL and SS were responsible for interpreting the data and drafting the manuscript. AL, GC, and T-HL were involved in statistical analysis. AL, SS, CT, AW, SC, and T-HL were closely involved in data interpretation and manuscript revision. All authors read and approved the final manuscript.

FUNDING

This project was funded by The Hong Kong Jockey Club Charities Trust, which had no role in study design, data collection and analysis, or preparation of the manuscript.

ACKNOWLEDGMENTS

We would like to thank The Hong Kong Jockey Club Charities Trust for the funding support, our collaborator, Hong Kong Social Welfare Department (SWD), and our research team (Jackie King, Patrick Cheng, Jamie Chan, and Joanna Chu) for their important contributions.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.739418/full#supplementary-material>

REFERENCES

- Akers, R. L., and Jennings, W. G. (2019). *The Social Learning Theory of Crime and Deviance*. Cham: Springer.
- Center for Substance Abuse Treatment (2005). *Substance Abuse Treatment for Adults in the Criminal Justice System*. Rockville, MD: Substance Abuse and Mental Health Services Administration (US).
- Chou, K. L., and Chi, I. (2001). Stressful life events and depressive symptoms: social support and sense of control as mediators or moderators? *Int. J. Aging Hum. Dev.* 52, 155–171. doi: 10.2190/9c97-lca5-ewb7-xk2w
- Chui, W. H. (2003). Experiences of probation supervision in Hong Kong: listening to the young adult probationers. *J. Crim. Justice* 31, 567–577.
- Chui, W. H. (2004). Adult offenders on probation in Hong Kong: an exploratory study. *Br. J. Soc. Work* 34, 443–454.
- Chui, W. H., and Chan, H. C. (2013). Juvenile offenders' perceptions of probation officers as social workers in Hong Kong. *J. Soc. Work* 14, 398–418. doi: 10.1177/1468017313478291
- Comfort, M. (2016). "A Twenty-Hour-a-Day Job": the impact of frequent low-level criminal justice involvement on family life. *Ann. Am. Acad. Pol. Soc. Sci.* 665, 63–79. doi: 10.1177/0002716215625038
- Creswell, J. W., and Clark, V. L. P. (2017). *Designing and Conducting Mixed Methods Research*. Thousand Oak, CA: Sage publications.
- De Lude, B., Mitchell, D., and Barber, C. (2012). The Probationer's perspective on the probation officer-probationer relationship and satisfaction with probation. *Fed. Probat. J.* 76, 36–39.
- Diener, E., Emmons, R. A., Larsen, R. J., and Griffin, S. (1985). The satisfaction with life scale. *J. Pers. Assess.* 49, 71–75.
- Emmons, R., and McCullough, M. (2003). Counting blessing versus burdens: an experimental investigation of gratitude and subjective well-being in daily life. *J. Pers. Soc. Psychol.* 84, 377–389. doi: 10.1037//0022-3514.84.2.377
- Galvin, K. M., Braithwaite, D. O., and Bylund, C. L. (2015). *Family Communication: Cohesion and Change*. New York, NY: Routledge.
- Ho, H. C., Mui, M. W. K., Wan, A., Yew, C. W. S., and Lam, T. H. (2019). Happy family kitchen movement: a cluster randomized controlled trial of a community-based family holistic health intervention in Hong Kong. *J. Happ. Stud.* 21, 15–36. doi: 10.1007/s10902-018-00071-w
- Ho, H. C., Mui, M. W.-K., Wan, A., Yew, C. W.-S., and Lam, T. H. (2020). A cluster randomized controlled trial of a positive physical activity intervention. *Health Psychol.* 39:667.
- Jeon, J. Y., Kim, I. O., Yeon, P. K., and Shin, W. S. (2021). The physio-psychological effect of forest therapy programs on juvenile probationers. *Int. J. Environ. Res. Public Health* 18:5467. doi: 10.3390/ijerph18105467
- Jones, C. J., Rikli, R. E., and Beam, W. C. (1999). A 30-s chair-stand test as a measure of lower body strength in community-residing older adults. *Res. Q. Exerc. Sport* 70, 113–119. doi: 10.1080/02701367.1999.10608028
- Kerekes, N., Fielding, C., and Apelqvist, S. (2017). Yoga in correctional settings: a randomized controlled study. *Front. Psychiatry* 8:204. doi: 10.3389/fpsy.2017.00204
- Kolb, D. A. (2015). *Experiential Learning: Experience as the Source of Learning and Development*. Upper Saddle River, NJ: Pearson Education Ltd.
- Kroenke, K., Spitzer, R. L., Williams, J. B., and Löwe, B. (2009). An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics* 50, 613–621. doi: 10.1176/appi.psy.50.6.613
- Lai, A. Y. K., Lam, E. Y. W., Fabrizio, C., Lee, D. P. K., Wan, A. N. T., Tsang, J. S. Y., et al. (2020). A community-based lifestyle-integrated physical activity intervention to enhance physical activity, positive family communication, and perceived health in deprived families: a cluster randomized controlled trial. *Front. Public Health* 8:434. doi: 10.3389/fpubh.2020.00434
- Lai, A., Stewart, S. M., Wan, A. N. T., Shen, C., Ng, C. K. K., Kwok, L. T., et al. (2018). Training to implement a community program has positive effects on health promoters: JC FAMILY Project. *Transl. Behav. Med.* 8, 838–850. doi: 10.1093/tbm/iby070
- Lai, A., Stewart, S., Wan, A., Thomas, C., Tse, J., Ho, D., et al. (2019). Development and feasibility of a brief Zero-time exercise intervention to reduce sedentary behaviour and enhance physical activity: a pilot trial. *Health Soc. Care Commun.* 27, e233–e245. doi: 10.1111/hsc.12728
- Lai, Y., Lam, T., and Wan, N. (2019). JC FAMILY project: development and feasibility of a pilot trial of a 15-minute zero-time exercise community-based intervention to reduce sedentary behaviour and enhance physical activity and family communication in older people. *Ageing Sci. Ment. Health Stud.* 27, e233–e245.
- Lam, C. L., Eileen, Y., and Gandek, B. (2005). Is the standard SF-12 health survey valid and equivalent for a Chinese population? *Qual. Life Res.* 14, 539–547. doi: 10.1007/s11136-004-0704-3
- Lam, W. W., Fielding, R., McDowell, I., Johnston, J., Chan, S., Leung, G. M., et al. (2012). Perspectives on family health, happiness and harmony (3H) among Hong Kong Chinese people: a qualitative study. *Health Educ. Res.* 27, 767–779. doi: 10.1093/her/cys087
- LeBlanc, A. G., and Janssen, I. (2010). Difference between self-reported and accelerometer measured moderate-to-vigorous physical activity in youth. *Pediatr. Exerc. Sci.* 22, 523–534. doi: 10.1123/pes.22.4.523
- Lyubomirsky, S., and Lepper, H. S. (1999). A measure of subjective happiness: preliminary reliability and construct validation. *Soc. Indic. Res.* 46, 137–155. doi: 10.1017/sjp.2017.8
- Macfarlane, D., Lee, C., Ho, E., Chan, K., and Chan, D. (2007). Reliability and validity of the Chinese version of IPAQ (short, last 7 days). *J. Sci. Med. Sport* 10, 45–51. doi: 10.1016/j.jsams.2006.05.003
- Morash, M., Kashy, D. A., Smith, S. W., and Cobbina, J. E. (2015). The effects of probation or parole agent relationship style and women offenders' criminogenic needs on offenders' responses to supervision interactions. *Crim. Justice Behav.* 42, 412–434.
- Morse, J. M., and Field, P. A. (1995). *Qualitative Research Methods for Health Professionals*. New York, NY: Sage Publications.
- Nan, H., Ni, M. Y., Lee, P. H., Tam, W. W., Lam, T. H., Leung, G. M., et al. (2014). Psychometric evaluation of the Chinese version of the subjective happiness scale: evidence from the Hong Kong FAMILY Cohort. *Int. J. Behav. Med.* 21, 646–652. doi: 10.1007/s12529-014-9389-3
- Newman, T. J., Alvarez, M. A. G., and Kim, M. (2017). An experiential approach to sport for youth development. *J. Exp. Educ.* 40, 308–322. doi: 10.1177/1053825917696833
- Newton, R. (1989). Review of tests of standing balance abilities. *Brain Injury* 3, 335–343. doi: 10.3109/02699058909004558
- Peterson, C., and Seligman, M. (2004). *Character Strengths and Virtues: A Handbook and Classification*. Washington, DC: American Psychological Association.
- Piercy, K. L., Troiano, R. P., Ballard, R. M., Carlson, S. A., Fulton, J. E., Galuska, D. A., et al. (2018). The physical activity guidelines for Americans. *JAMA* 320, 2020–2028.
- Rosenberg, M. (1965). Rosenberg self-esteem scale (RSE). *Accept. Commit. Ther. Meas. Pack.* 61:18.
- Seligman, M., and Flourish, P. (2012). "A visionary new understanding of happiness and well-being," in *Flourish*, ed. M. Seligman (New York, NY: Free Press), 1–368. doi: 10.1007/978-94-007-4414-1_1
- Sexton, T., and Turner, C. W. (2010). The effectiveness of functional family therapy for youth with behavioral problems in a community practice setting. *J. Fam. Psychol.* 24, 339–348. doi: 10.1037/a0019406
- Sfendla, A., Malmström, P., Torstensson, S., and Kerekes, N. (2018). Yoga practice reduces the psychological distress levels of prison inmates. *Front. Psychiatry* 9:407. doi: 10.3389/fpsy.2018.00407
- Silbury, Z., Goldsmith, R., and Rushton, A. (2015). Systematic review of the measurement properties of self-report physical activity questionnaires in healthy adult populations. *BMJ Open* 5:e008430.
- Sin, N. L., and Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: a practice-friendly meta-analysis. *J. Clin. Psychol.* 65, 467–487. doi: 10.1002/jclp.20593
- Skinner, G. C. M., and Farrington, D. P. (2020). A systematic review and meta-analysis of offending versus suicide in community (non-psychiatric and non-prison) samples. *Aggress. Violent Behav.* 52:10421.
- Sloas, L., Lerch, J., Walters, S., and Taxman, F. S. (2020). Individual-level predictors of the working relationship between probation officers and probationers. *Pris. J.* 100, 709–725. doi: 10.1177/0032885520968242

- Smilkstein, G. (1978). The family APGAR: a proposal for a family function test and its use by physicians. *J. fam. Pract.* 6, 1231–1239.
- Social Welfare Department (2021). *Probation Service*. Available online at: https://www.swd.gov.hk/en/index/site_pubsvc/page_offdr/sub_communityb/id_PO/ (accessed June 25, 2021).
- Sonstroem, R. J., and Morgan, W. P. (1989). Exercise and self-esteem: rationale and model. *Med. Sci. Sports Exerc.* 21, 329–337.
- Strauss, R. S., Rodzilsky, D., Burack, G., and Colin, M. (2001). Psychosocial correlates of physical activity in healthy children. *Arch. Pediatr. Adolesc. Med.* 155, 897–902. doi: 10.1001/archpedi.155.8.897
- Thomas, P. A., Liu, H., and Umberson, D. (2017). Family relationships and well-being. *Innov. Aging* 1:igx025.
- Tuominen, P. P. A., Raitanen, J., Husu, P., Luoto, R. M., and Kujala, U. M. (2020). Relationship between mothers' enjoyment and sedentary behavior and physical activity of mother-child dyads using a movement-to-music video program: a secondary analysis of a randomized controlled trial. *BMC Public Health* 20:1659. doi: 10.1186/s12889-020-09773-4
- Wangmo, T., Handtke, V., Bretschneider, W., and Elger, B. S. (2018). Improving the Health of older prisoners: nutrition and exercise in correctional institutions. *J. Correct. Health Care* 24, 352–364. doi: 10.1177/1078345818793121
- Ware, J. E. Jr., Kosinski, M., and Keller, S. D. (1996). A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. *Med. Care* 34, 220–233. doi: 10.1097/00005650-199603000-00003

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2021 Lai, Sit, Thomas, Cheung, Wan, Chan and Lam. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Widowhood and Life Satisfaction Among Chinese Elderly Adults: The Influences of Lifestyles and Number of Children

Caiyun Yang¹, Xixi Sun² and Wenjie Duan^{2*}

¹ School of Philosophy and Law & Political Science, Shanghai Normal University, Shanghai, China, ² School of Social and Public Administration, East China University of Science and Technology, Shanghai, China

OPEN ACCESS

Edited by:

Wulf Rössler,
Charité University Medicine
Berlin, Germany

Reviewed by:

Xiaofang Liu,
Columbia University, United States
Marcus William Feldman,
Stanford University, United States

*Correspondence:

Wenjie Duan
duan.w@outlook.com

Specialty section:

This article was submitted to
Public Mental Health,
a section of the journal
Frontiers in Public Health

Received: 06 August 2021

Accepted: 14 December 2021

Published: 26 January 2022

Citation:

Yang C, Sun X and Duan W (2022)
Widowhood and Life Satisfaction
Among Chinese Elderly Adults: The
Influences of Lifestyles and Number of
Children.
Front. Public Health 9:754681.
doi: 10.3389/fpubh.2021.754681

Our study examined how lifestyle and number of children influence the relationship between widowhood and life satisfaction based on self-regulation theory. A sample of 2,968 elderly respondents (male = 1,515, female = 1,453, mean age = 69.12 years, *SD* = 7.24) participated in Chinese General Social Survey. Our findings suggest that lifestyle is positively related to life satisfaction, and number of children is positively associated with life satisfaction but negatively related to lifestyle. The moderated mediation model demonstrated that lifestyle partly mediated the relationship between widowhood and life satisfaction. Moreover, number of children moderated the relationship between widowhood and lifestyle and between lifestyle and satisfaction with life. Widowed elderly individuals who have more children are likely to show a higher level of satisfaction with life. The present study has significance in practice because it provides empirical implications obtained from a national survey on the universal two-child policy in China as two children might decrease the negative impacts of widowhood on life satisfaction.

Keywords: widowhood status, lifestyle, life satisfaction, number of children, self-regulation theory, moderated mediation

INTRODUCTION

The possibility of death in married couples increases as they age. According to a census conducted in 2000, the percentage of widowed elderly women in the United Kingdom, Italy, Finland, France, Greece, Australia, and Russia ranged from 52.8 to 65% (1). The Sixth National Population Census of China demonstrated that the widowed elderly adult population was estimated at 47.74 million, which accounted for 26.89% of the elderly adult population in China (2). The widowed population is expected to reach 118.4 million in 2050 as a result of the development of an aging society (3). Previous empirical studies recognized the death of a spouse and bereavement as a major form of trauma among elderly adults (4–6) that negatively influences their physical and mental health, thereby resulting in chronic diseases, disability, dementia, depression (7, 8), and reduced satisfaction with life (9, 10).

Similar studies indicated that widowhood tends to have negative effects on satisfaction with life (11, 12); however, some of these studies further implied that the negative influence may be transient (13). In other words, an individual only temporarily experiences low-level satisfaction

with life after losing their spouse; their life satisfaction soon returns to its initial level. Wilder (14) interviewed 23 widowed people, including six widowers and 17 widows; this study found that involvement in a social network, such as maintaining connections with friends and keeping an active lifestyle, tended to help them regain life satisfaction. In other words, individuals might adopt specific lifestyles to maintain their physical and mental well-being (15), and construct new social identities (16). According to the self-regulation model of selection, optimization, and compensation and resilience theory (17), adjusting lifestyles to reconstruct daily life can be recognized as the optimal use of personal assets to handle threatening situations (e.g., losing a spouse). The use of self-regulatory processes, or what are referred to in the self-regulation model as life management strategies, not only facilitates adjustment to loss and limitation, but also may bring about growth and enhance well-being (18, 19).

Previous studies demonstrated that the lifestyle of widowed elderly adults significantly differs from non-widowed ones (20, 21). Once a spouse passes away, the social participation and interaction of an individual narrows (21), thereby depriving them of many social roles (e.g., wives or husbands). Fortunately, some of them might successfully change their lifestyles (e.g., participating in a social network actively and performing increased indoor and outdoor activities) to acclimatize themselves to widowhood (4, 14, 22). Carr and Utz (22) conducted the longitudinal Changing Lives of Elderly Couples study of 316 elderly people who had lost their spouses. The results indicated that changing their lifestyle in several aspects (e.g., social activities, interpersonal relationships, and hobbies) may help widowed elderly people recover from pain. In a sample of 228 widowed elderly adults, a previous study indicated that some elderly people became inclined to positive lifestyle changes after experiencing widowhood (i.e., higher level of informal social participation), thereby enhancing their late-life well-being (23). Thus, we can reasonably hypothesize the mediational role of lifestyle in the relationship of marriage status and life satisfaction.

The various constructions of lifestyle may lead to mixed results. Ha and Ingersoll-Dayton (24) solely focused on social contacts with friends and relatives with one item. They found that contact had no significant effect on improving life satisfaction of widowed elderly people; they used an analytic sample of 209 elderly adults who experienced spousal loss. A lifestyle intervention study for widowed elderly adults demonstrated that widowed elderly people tended to show fewer depression symptoms and higher level of satisfaction after the implementation of a technology-based healthy lifestyle intervention (25). Therefore, Fratiglioni et al. (26) proposed a multidimensional construct of lifestyle, which contained social network (e.g., meeting with relatives who are not living together, gathering with friends), leisure (e.g., listening to music, reading books or magazines, and surfing the internet) and physical or outdoor (e.g., doing physical exercise) activities. The present study aimed to establish a mediation model using a multifaceted lifestyle construct.

China's one-child policy, which was launched in 1979, controlled the number of children in families (27); this policy significantly influenced the lifestyle of elderly adults in Chinese

culture. Previous research demonstrated that elderly individuals with one or more children received intergenerational support and had better living conditions compared to those without children (28). Using data from 2012 Chinese General Social Survey (CGSS), Wang and Yuan (29) demonstrated that elderly individuals with one or more children tended to take part in leisure activities more often. In addition, elderly individuals had shown a desire to adjust their lifestyle (e.g., going shopping, attending cultural activities, or watching live sports) to better communicate with their children (30) and foster relationships with younger family members (31). In other words, lifestyle of elderly individuals tends to change because of their children. In addition, life satisfaction could also be influenced by the number of children individuals have. For example, using the 2013 China Health and Retirement Survey data, previous studies indicated that the number of married children positively affected the life satisfaction of elderly parents (32). Moreover, elderly individuals with more children were more likely to enjoy a higher quality of life and better health conditions because they received more health care (33). However, a previous study showed that the relationship between the subjective well-being of elderly adults and the number of their children was not simply linear, but an inverted U-shaped relationship (34). In other words, to a certain extent, the subjective well-being of elderly adults increases with the number of children, and then as the number of children increases, their subjective well-being begins to decline. Fewer children will lead to a high cost of care borne by the children, which is not conducive to the welfare improvement of elder adults. Conversely, too many children will lead to high friction costs in decision making for elderly adults, resulting in a welfare decline. In short, we can hypothesize that the number of children affects lifestyle and life satisfaction among elderly adults. In summary, the present study aims to examine the effects of lifestyle and the number of children on the relationship between widowhood and life satisfaction among elderly adults using a moderated mediation model. Lifestyle is hypothesized to mediate the relationship between widowhood and life satisfaction, whereas the number of children further moderates the relationships between widowhood and lifestyle and between lifestyle and life satisfaction. National survey data were adopted to fit the proposed model. From a theoretical point of view, the present study fills a research gap by examining the indirect effects of widowhood on life satisfaction via lifestyle among elderly adults. Moreover, this study could provide implications regarding China's two-child policy whether the increase of the number of children could decrease the negative impacts of widowhood on life satisfaction.

METHODS

Participants and Procedures

The 2013 CGSS, which was adopted for the current study, is a large and comprehensive national investigation conducted on the societal, community, family, and individual levels (<http://www.chinagss.org>). The CGSS adopted a multistage, stratified random sampling design to ensure representativeness. The 2013 CGSS had a proposed sample size of 12,000 individuals and a final

sample of 11,438 participants (5,756 men; 5,682 women) with a mean age of 48.60 years ($SD = 16.39$) from all provinces in mainland China, except for Hainan Province and the Xinjiang Uygur Autonomous Region. All data were collected via face-to-face interviews. Written informed consent was obtained from all respondents. Data were published on the CGSS website on January 1, 2015. According to previous studies (35, 36), individuals aged 60 or elderly were selected. After screening for outliers and data with missing values on key variables, such as life satisfaction, number of children, lifestyle, and widowhood, the final sample was with 2,968 participants. No significant gender difference ($t = -0.041$, $p = 0.934$) or age difference ($t = -0.312$, $p = 0.861$) was observed between the included and excluded participants.

Measures

Widowhood and Number of Children

The respondents were asked to self-identify their marital status as (a) first marriage with a spouse; (b) remarried with a spouse; or (c) widowed. According to Jiao's (37) study of the first two groups, which were classified as non-widowed, the independent variable of widowhood (i.e., widowed or non-widowed) was operationalized as a binary variable (0 = *non-widowed*; 1 = *widowed*). In addition, the participants were asked to report the number of children they had, ranging from 1 to 10.

Life Satisfaction

The following item was the only item used to evaluate the participants' perceptions of life satisfaction: "Generally speaking, do you think you are living a happy and satisfying life?" The participants were asked to rate the item on a 5-point Likert scale that ranged from 1 (*very unhappy*) to 5 (*very happy*). Previous studies indicated that the single-item method was appropriate for measuring happiness and life satisfaction in large national surveys (38).

Lifestyle

Lifestyle was evaluated by a 9-item, 3-facet survey; namely, a 2-item social network subscale (i.e., meeting relatives who are not living together and gathering with friends); a 4-item outdoor activity subscale (i.e., shopping, attending cultural activities, taking part in physical exercise, and watching live sports); and a 3-item indoor leisure activity subscale (i.e., reading books, newspapers, and magazines; listening to music at home; and surfing the internet) (39). Each item was paired with a 5-point Likert scale. All participants were asked to rate the activities from 1 (*never*) to 5 (*daily*). The mean scores of the nine items were calculated to indicate the frequency of participating in various lifestyle activities (i.e., joining a social network, participating in indoor or outdoor leisure activities). Confirmatory factor analysis showed acceptable goodness of fit (chi-square = 161.107; CFI = 0.95; TLI = 0.93; RMSEA = 0.052; 90% CI = 0.045, 0.059). The standardized factor loadings ranged from 0.327 to 0.633 with significance at the 0.001 level. The Cronbach's α of the lifestyle scale was 0.655.

TABLE 1 | Sample characteristics.

Demographic characteristics ($N = 2,968$)	Mean (SD)/ N (%)
Age	69.12 (7.238)
Gender	
Male	1,515 (51%)
Female	1,453 (49%)
Residence	
Urban	1,351 (45.5%)
Rural	1,617 (54.5%)
Marital status	
Widowed	766 (25.8%)
Male	253 (33.0%)
Female	513 (67.0%)
Non-widowed	2,202 (74.2%)
Male	1,262 (57.3%)
Female	940 (42.7%)
Educational level	1.57 (0.940)
Socioeconomic state level	2.61 (0.720)
Number of children	2.82 (1.491)

Data Analysis

First, descriptive statistics and Pearson and partial correlations analysis were conducted to report demographic characteristics and relationship between lifestyle, number of children and life satisfaction. To identify whether there were differences between widowed and non-widowed groups in life satisfaction, lifestyle and the number of children, analysis of variance was conducted. After revealing the differences caused by different marital status, hierarchical regressions were then conducted to see to what extent life satisfaction was influenced by the variables. Based on these analyses, a moderated mediation model was then established to reveal the relationship between marital status, the number of children, lifestyle, and life satisfaction.

RESULTS

Description and Correlations

Table 1 presents the demographic characteristics of this study. The mean age of 2,968 participants was 69.12 ($SD = 7.24$), with 1,515 (51.0%) men and 1,453 (49.0%) women. A total of 1,351 respondents (45.5%) came from countryside, while 1,617 (54.5%) had urban residence, including 156 (5.3%) individuals used to live in the rural area. Seven hundred sixty-six respondents were widowed (253 males and 513 females) and 2,202 were non-widowed (1,262 males and 940 females). Overall, the sample had a median education level of primary school, a median socioeconomic status of average. The mean score of the number of children, life satisfaction and lifestyle were, respectively, 2.82 ($SD = 1.491$), 3.80 ($SD = 0.858$), 1.98 ($SD = 0.583$).

Table 2 lists the results of the Pearson and partial correlations. The results indicate positive correlations between lifestyle and life satisfaction ($r = 0.17$, $p < 0.01$). The number of children had a positive correlation with life satisfaction ($r = 0.04$, p

TABLE 2 | Pearson and partial correlations.

Variable	Pearson correlations (Partial correlations)		
	1	2	3
1. Lifestyle			
2. Satisfaction with life	0.17** (0.12**)		
3. Number of children	−0.22** (−0.05**)	0.04* (0.04*)	
<i>M</i>	1.98	3.80	2.82
Median	1.89	4.00	3.00
<i>SD</i>	0.58	0.86	1.49

The controlled variables were gender, age, education, socioeconomic status, and location.
* $p < 0.05$, ** $p < 0.01$.

< 0.05) but was negatively related to lifestyle ($r = -0.22$, $p < 0.01$). After controlling for demographic variables including gender, age, location, education, and socioeconomic status, the size of these correlations declined but was still significant. Thus, the demographic variables were not controlled in the following analyses.

Analysis of Variance

Analysis of variance was conducted to reveal the differences between widowed and non-widowed participants. The results indicate significant differences in life satisfaction ($F = 5.429$, $p < 0.05$), lifestyle ($F = 33.731$, $p < 0.001$), and the number of children ($F = 82.523$, $p < 0.001$) between the two groups. Specifically, the life satisfaction in the non-widowed group ($M = 3.820$, $SD = 0.834$) was higher than that of the widowed group ($M = 3.73$, $SD = 0.919$). The frequency of participating in various lifestyle activities was significantly higher among non-widowed elderly individuals ($M = 2.015$, $SD = 0.592$) than in widowed individuals ($M = 1.874$, $SD = 0.543$). The number of children was significantly lower among nonwidowed elders ($M = 2.67$, $SD = 1.406$) than among widowed elders ($M = 3.23$, $SD = 1.643$).

Hierarchical Regressions

Hierarchical regressions were conducted using life satisfaction as the dependent variable. Table 3 indicates that all four regression equations were statistically significant ($F > 4.438$, $p < 0.05$). Collinearity statistics indicated that all variance inflation factor (VIF) values were < 5.0 . This finding indicates that the multicollinearity of demographic factors, widowhood, lifestyle, life satisfaction, and the number of children is not an issue in our data. In the first step, demographic factors including gender, age, education, socioeconomic status, and location explained 9.4% of the variance of life satisfaction, with the effect size of 0.104. In the second step, widowhood ($t = -2.271$, $p < 0.05$) explained 0.2% of the variance of life satisfaction. Then in the third step, lifestyle ($t = 6.660$, $p < 0.01$) additionally contributed 1.3% of the variance and widowhood became significant. In the last step, the number of children ($t = 2.451$, $p < 0.05$) contributed 0.2% of the

variance of life satisfaction. These contributors explained 11.1% of the variance in life satisfaction among elderly individuals, with the effect size of 0.125.

Moderated Mediation Model

A moderated mediation model was established using the bias-corrected bootstrap confidence interval method (bootstrap samples = 5,000). Data were analyzed by the PROCESS macro in SPSS (Mode 59) using a path analysis method (40). According to Hayes (40), PROCESS is a computational procedure that can implement moderated mediation analysis in integrated conditional process models. The regression coefficients listed in Table 4 indicate that lifestyle mediated the relationship between widowhood and life satisfaction ($b_1 = 0.129$, $p < 0.05$; $c_1' = -0.206$, $p = 0.093$). China's One-Child Policy was proved to be an exogenous source of variation in the number of children which also influenced by mothers' age. Therefore, age was set as control variable so as to reveal the true influence caused by the number of children toward lifestyle and life satisfaction (41). When lifestyle was set as the consequent, the interaction between widowhood and the number of children was significant and positive ($a_3 = 0.053$, $t = 3.512$, $p < 0.001$, $CI = 0.024$, 0.083). By contrast, the analysis showed that widowhood has a negative effect ($a_1 = -0.264$, $t = -5.021$, $p < 0.001$) on lifestyle. The number of children negatively moderated the negative effects of widowhood on lifestyle. Since the interaction between lifestyle and the number of children was significant and positive, the number of children negatively moderated the negative influence of widowhood on life satisfaction via lifestyle. These results indicated that the elderly with more children were more likely to connect with their social networks and participate in indoor and outdoor activities after losing their spouse, leading to a higher level of life satisfaction. Moreover, the results also indicated that as the number of children increased, the degrees of direct (i.e., negative effects of widowhood on life satisfaction) and indirect (i.e., negative effects of widowhood on life satisfaction via lifestyle) effects declined. Specifically, the indirect effects of widowhood on life satisfaction through lifestyle were significant and positive at low levels (95% bootstrap $CI = -0.062$, -0.021) and moderate levels (95% bootstrap $CI = -0.048$, -0.018) of number of children, but became non-significant at high levels (95% bootstrap $CI = -0.033$, 0.007). This finding indicated that the fluctuations of life satisfaction caused by widowhood are less likely to be explained by discrepancies in lifestyle when elderly individuals have more than four children.

DISCUSSION

Using data from a national survey, the present study revealed that widowed elderly individuals were less likely to be satisfied with their lives and participate in social networks, indoor leisure activities, and outdoor activities compared with non-widowed elderly individuals. The results of the moderated mediation model demonstrated that lifestyle partly mediated the relationship between widowhood and life satisfaction. The degree of the negative effects of widowhood on lifestyle declined as

TABLE 3 | Hierarchical regression of demographic variables, marital status, lifestyle, and number of children.

Independent variables	Dependent Variable: Life satisfaction											
	Step 1				Step 2				Step 3			
	<i>b</i>	β	<i>t</i>	VIF	<i>b</i>	β	<i>t</i>	VIF	<i>b</i>	β	<i>t</i>	VIF
Age	0.006	0.048	2.748*	1.014	0.007	0.062	3.321**	1.123	0.008	0.071	3.861**	1.131
Gender	0.075	0.044	2.431*	1.048	0.089	0.052	2.842*	1.092	0.090	-0.053	2.907*	1.092
Residence	-0.009	0.010	-0.484	1.324	-0.009	-0.010	-0.488	1.324	-0.042	-0.047	-2.279*	1.429
Socioeconomic status	0.365	0.306	16.947**	1.067	0.361	0.304	16.781**	1.071	-0.037	-0.041	-1.946**	1.481
Education	-0.003	0.019	-1.37	1.383	-0.006	-0.007	-0.327	1.393	0.337	0.283	15.564	1.102
Marital status					-0.085	-0.043	-2.271*	1.186	-0.082	-0.042	-2.204*	1.186
lifestyle									0.199	0.135	6.660**	1.375
Number of children									0.109			
<i>R</i> ²	0.094				0.096				51.683**			
<i>F</i>	61.452**				52.142**				0.013			
ΔR^2					0.002				44.351**			
ΔF					5.159*							

Beta means beta densities and VIF means variance inflation factor.

p* < 0.05; *p* < 0.01.

the number of children increased. The negative influences of widowhood on life satisfaction through lifestyle were significant at low (i.e., one child) and moderate levels (i.e., two or three children) and nonsignificant at higher levels (i.e., four or more children). These results indicated that the influence of widowhood on life satisfaction can be explained by lifestyle differences between widowed elderly individuals and non-widowed elderly individuals. In addition, elderly individuals with more children—up to two or three—experience higher life satisfaction and more colorful lifestyles after spousal loss.

The discrepancy of life satisfaction between widowed elderly individuals and non-widowed elderly individuals can be attributed to the existence of “significant others,” such as a spouse (42, 43). Specifically, under the framework of cognitive theory and social interaction theory, individuals who feel lonely and less satisfied are those who experience deficiencies in their relationships with their significant others (44–46). Previous research showed that loneliness is likely to cause depression if the emptiness in one’s social life or emotional desires cannot be satisfied (47). Therefore, the loss of a significant other (e.g., spouse) tends to narrow social networks and causes damage to their social relationships; this situation offers less social support and spiritual consolation to widowed elderly adults, which negatively influences their life satisfaction (48). For example, quality of life, health, and self-perception can all be affected by spouses (21). By contrast, those who live with their spouses tend to show the lowest levels of loneliness (49).

As discussed, the lifestyles of elderly individuals were deeply influenced by their spouses (39, 50), who are the significant others in their lives. According to Hagedoorn et al. (51), the social resources of the elder linked with their spouse became increasingly important, which means that in some cases, an individual’s spouse might have been their source of motivation to stay engaged and take part in various lifestyle activities. Moreover, elderly individuals might be more comfortable engaging in activities with their spouse rather than by themselves. Therefore, widowhood, to some extent, prevents elderly people from being motivated to participate in variety lifestyle activities, during which social connections could be built to reduce loneliness (52). Research also showed that after a marriage dissolves, elderly individuals would join social networks and participate in indoor and outdoor activities less frequently (53). In this way, social resources and social relationship could be inaccessible for widowed elderly individuals. Thus, it is comparatively hard for widowed elderly people to achieve life satisfaction due to the limited social relationships with significant others (i.e., spouses) (54). These discussions were consistent with our findings that lifestyle can mediate the relationship between widowhood and life satisfaction. This indicated that the difference in life satisfaction between widowed and married elderly individuals can be explained by distinctions in their lifestyles.

However, according to the mechanism of selective optimization with compensation, activities and relationships are reviewed and prioritized selectively so that by the use of

TABLE 4 | Results of moderated mediation analysis.

Antecedent		Consequent				Life satisfaction		
		lifestyle coefficient	SE	<i>p</i>		Coefficient	SE	<i>p</i>
Marital status	a_1	-0.264	0.053	<0.001	c_1'	-0.206	0.079	0.093
Lifestyle	–	–	–	–	b_1	0.129	0.056	<0.05
Number of children	a_2	-0.100	0.009	<0.001	c_2'	-0.070	0.040	0.077
Marital status × number of children	a_3	0.053	0.015	<0.001	c_3'	0.037	0.023	0.105
Lifestyle × number of children	–	–	–	–	b_2	0.054	0.019	<0.01
Age (control variable)		0.002	0.002	<0.01		0.004	0.002	0.103
Constant		2.183	0.106	<0.001		3.197	0.194	<0.001
		$R^2 = 0.057$					$R^2 = 0.040$	
		$F_{(4,2,963)} = 44.638, p < 0.001$					$F_{(6,2,961)} = 20.522, p < 0.001$	
		Moderator level	Effect				SE	<i>p</i>
Direct effect at values of the moderator		1.328	-0.157				0.054	<0.01
		2.819	-0.102				0.038	<0.01
		4.310	-0.047				0.047	0.311
		Moderator level	Effect				Boot SE	95% Bootstrap CI
Indirect effect at values of the moderator		1.328	-0.039				0.011	-0.062, -0.021
		2.820	-0.032		0.008			-0.048, -0.018
		4.310	-0.013		0.010			-0.033, 0.007

compensatory behaviors, experiences can be optimized and well-being maintained (55). The well-documented (56, 57) continuity theory suggests that aging individuals tend to maintain similar social relationships, roles, and lifestyles compared with those in their early years; they also seek stability throughout the course of their lives. Specifically, for individuals who have experienced widowhood, being a parent of their adult children serves a role of continuity, providing them easy access to substitutional activities. Motivated by seeking stability and continuity in their later years, widowed individuals tend to get involved in child-related activities, which in turn, enrich their lifestyle and reduce the harmful effects of widowhood on social participation.

Having children can influence the lifestyles of elderly individuals in various ways. First, parenting and filial responsibilities are two core aspects in Chinese culture (58–60). When parents age, their children are obliged to care for them; thus, elderly individuals who have lost their spouse tend to live with or close to their children (61). This culture strengthens their connections and enhances the probability of mutual influence. Second, given the rapid economic and social transition in recent years, the intergenerational cultural transmission in Chinese families is commonly predominated by young individuals (62); anthropologist Margaret Mead called this concept the prefigurative culture (63). Therefore, the more children elderly individuals have, the more likely their lifestyles will be affected by their children as the frequent use of the internet and social media (64) and engaging in modern lifestyle activities (e.g., going shopping, watching live sports, and attending cultural events) to blend in with the younger generations (30). Moreover, being parents generally means having broader social networks. Assuming the social role of parenthood prompts them to engage more in community or service-oriented activities, make more connections with extended kin, and change their social lives by avoiding unhealthy lifestyles and risky behaviors (65, 66).

The mediating effects of the number of children on the relationship between lifestyle and life satisfaction, having more social interactions, and living with adult children result in improved life satisfaction (67). Many studies showed that adult children provide instrumental and emotional support for their parents, which have positive impacts on the life satisfaction of elderly individuals (68) and moderate the negative effects of widowhood on their life satisfaction (69).

In accordance with traditional Chinese culture, living in a big family is the life goal of many elderly individuals, and engaging in family-related social activities provides them with a sense of belongingness (70). In continuity theory, the continuity of elderly individuals' life goals and family roles, shown in family-related social activities, is a social integration process that increases their life satisfaction in a cultural context.

However, in some cases, more does not always mean merrier. Our result demonstrates that the negative impacts of widowhood on life satisfaction decreases when the number of children increases from one to three and the moderation effect reaches a significant level. However, for individuals with four or more children, these effects lose their statistical significance. This phenomenon suggests that the buffering

effects only occur if the number of children is no more than three. In this case, having children can help elderly parents compensate for the loss of social resources and disengagement in activities caused by widowhood, thereby enhancing their life satisfaction by enriching their lifestyle. However, the positive effects vanish as the number of children increases due to the following reasons. First, intergenerational conflicts and financial arguments are likely to occur, and the children might shirk their filial responsibilities or shift the burden of care to other siblings as the number of children increases (71). Second, the positive impacts of their children are also associated with the quality of their children. More educated children can bring about more material support and health care services for elderly parents (72), but having more children may dilute family resources; this reduces the human capital investment in each child and impairs the quality of children, according to resource dilution theory in sociology (73, 74). Therefore, having four or more children might not positively affect the life satisfaction of the widowed individuals.

The limitations of this study should be acknowledged. First, the life satisfaction was operationalized with a single-item measure in this study due to the limitations of the data. Future research should adopt more solid and comprehensive scales, such as the Flourishing Scale and Satisfaction with Life Scale. Second, we adopted self-reported, subjective measures of widowhood and lifestyle. However, the ability of this scale to reflect an individual's marital status, participation in social networks, and outdoor and indoor activities should be discussed further. Tracking observations or recording lifestyle using an objective approach can improve the reliability and validity of future research. Third, this study only considered the number of children as a moderator, whereas other factors such as the rural or urban setting, might also act as a moderator. By including more possible variables in the model, future studies might enhance the present understanding of life satisfaction among elderly individuals and the other 88.9% of the variance in life satisfaction among elderly individuals could be explained further. Despite these limitations, our findings are generally valuable because they explicitly indicate the mediating effects of lifestyle in the relationship between widowhood and life satisfaction in groups of elderly individuals. The moderator role of the number of children is also demonstrated in this study based on this finding.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found at: <http://cnsda.ruc.edu.cn/index.php?r=projects/view&id=93281139>.

AUTHOR CONTRIBUTIONS

WD designed the study, supervised, and administrated the project. CY wrote the manuscript and prepared the submission materials. XS revised the

manuscript and conducted the additional analyses. All authors contributed to the article and approved it for publication.

FUNDING

Funding was provided by the Philosophy and Social Sciences Major Theoretical and Practical Issues Research Project of Shaanxi Province Study on the Impact of Youth Social Isolation

REFERENCES

- Botev N. Population ageing in Central and Eastern Europe and its demographic and social context. *Europ J Ageing*. (2012) 9:69–79. doi: 10.1007/s10433-012-0217-9
- Pco. *Tabulation on the 2010 Population Census of the People's Republic of China*. Beijing: China Statistics Press (2012)
- Wang GZ, Ge YX. Status of widowed elderly population in China and its development trend. *Sci Res Aging*. (2013) 1:44–55. doi: 10.3969/j.issn.2095-5898.2013.01.006
- Scannell-Desch E. Women's adjustment to widowhood. theory, research, and interventions. *J Psychosoc Nurs Mental Health Serv*. (2003) 41:28–36. doi: 10.3928/0279-3695-20030501-10
- Bennett K, Soulsby L. Wellbeing in bereavement and widowhood. *Illness Crisis Loss*. (2012) 20:321–37. doi: 10.2190/IL.20.4.b
- Hahn EA, Cichy KE, Small BJ, Almeida DM. Daily emotional and physical reactivity to stressors among widowed and married older adults. *J Gerontol B*. (2014) 69B:19–28. doi: 10.1093/geronb/gbt035
- Anderson LA, Deokar A, Edwards VJ, Bouldin ED, Greenlund KJ. Demographic and health status differences among people aged 45 or older with and without functional difficulties related to increased confusion or memory loss, 2011 behavioral risk factor surveillance system. *Prevent Chronic Dis*. (2015) 12:1–7. doi: 10.5888/pcd12.140429
- Fan LY, Sun Y, Lee HJ, Yang SC, Chen TF, Lin KN, et al. Marital status, lifestyle and dementia: a nationwide survey in Taiwan. *PLoS One*. (2015) 10:e0139154. doi: 10.1371/journal.pone.0139154
- Datta Gupta N, Etcoff NL, Jaeger MM. Beauty in mind: the effects of physical attractiveness on psychological well-being and distress. *J Happiness Stud*. (2016) 17:1313–25. doi: 10.1007/s10902-015-9644-6
- Nguyen AW, Chatters LM, Taylor RJ, Mouzon DM. Social support from family and friends and subjective well-being of older African Americans. *J Happiness Stud*. (2016) 17:959–79. doi: 10.1007/s10902-015-9626-8
- Næss S, Blekesaune M, Jakobsson N. Marital transitions and life satisfaction: Evidence from longitudinal data from Norway. *Acta Sociol*. (2015) 58:63–78. doi: 10.1177/0001699314563841
- Tuinman MA, Van Nuenen FM, Hagedoorn M, Hoekstra-Weebers JEHM. Distress, problems and referral wish of cancer patients: differences according to relationship status and life phase. *Psycho-Oncology*. (2015) 24:699–704. doi: 10.1002/pon.3712
- Uglanova EA, Staudinger UM. Zooming in on life events: is hedonic adaptation sensitive to the temporal distance from the event? *Soc Indic Res*. (2013) 111:265–86. doi: 10.1007/s11205-012-0004-1
- Wilder SE. Communication practices and advice in later-life widowhood: “We just talked about what it is like to not have your buddy”. *Commun Stud*. (2016) 67:111–26. doi: 10.1080/10510974.2015.1119171
- Wade J, P., Hart R, H., Wade J, Bekenstein J, et al. Does the death of a spouse increase subjective well-being: an assessment in a population of adults with neurological illness. *Healthy Aging Res*. (2016) 5:1–9. doi: 10.1097/01.HXR.0000511870.49216.83
- Standridge SH, Dunlap R, Kleiber DA, Aday RH. Widowhood and leisure: an exploration of leisure's role in coping and finding a new self. *J Leis Res*. (2020) doi: 10.1080/00222216.2020.1844553
- Baltes PB. On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of developmental theory. *Am Psychol*. (1997) 52:366–80. doi: 10.1007/978-1-4615-0357-6_2
- Freund AM, Baltes PB. Life-management strategies of selection, optimization, and compensation: Measurement by self-report and construct validity. *J Pers Soc Psychol*. (2002) 82:642–62. doi: 10.1037/0022-3514.82.4.642
- Jopp D, Smith J. Resources and life-management strategies as determinants of successful aging: On the protective effect of selection, optimization, and compensation. *Psychol Aging*. (2006) 21:253–65. doi: 10.1037/0882-7974.21.2.253
- Bennett KM. Widowhood. In: Carr DS, editor. *Encyclopedia of the Life Course and Human Development*. Farmington Hills, MI: Gale. (2008). p. 438–44.
- Perrig-Chiello P, Spahni S, Höpflinger F, Carr D. Cohort and gender differences in psychosocial adjustment to later-life widowhood. *J Gerontol B Psychol Sci Soc Sci*. (2016) 71:765–74. doi: 10.1093/geronb/gbv004
- Carr D, Utz R. Late-life widowhood in the United States: New directions in research and theory. *Ageing Int*. (2001) 27:65–88. doi: 10.1007/s12126-001-1016-3
- Donnelly EA, Hinterlong JE. Changes in social participation and volunteer activity among recently widowed older adults. *Gerontologist*. (2010) 50:158–69. doi: 10.1093/geront/gnp103
- Ha JH, Ingersoll-Dayton B. Moderators in the relationship between social contact and psychological distress among widowed adults. *Ageing Mental Health*. (2011) 15:354–63. doi: 10.1080/13607863.2010.519325
- Stahl ST, Emanuel J, Albert SM, Dew MA, Schulz R, Robbins-Welty G, et al. Design and rationale for a technology-based healthy lifestyle intervention in older adults grieving the loss of a spouse. *Contemp Clin Trials Commun*. (2017) 8:99–105. doi: 10.1016/j.conctc.2017.09.002
- Fratiglioni L, Paillard-Borg S, Winblad B. An active and socially integrated lifestyle in late life might protect against dementia. *Lancet Neurol*. (2004) 3:343–53. doi: 10.1016/S1474-4422(04)00767-7
- Cao J, Cumming D, Wang X. One-child policy and family firms in China. *J Corporate Finance*. (2015) 33:317–29. doi: 10.1016/j.jcorpfin.2015.01.005
- Mohamad N, Alavi K, Mohamad MS, Aun NSM. Intergenerational support and intergenerational social support among elderly – a short review in Malaysian context. *Procedia Soc Behav Sci*. (2016) 219:513–9. doi: 10.1016/j.sbspro.2016.05.028
- Wang L, Yuan X. The effect of the number and gender structure of children in the family on the elderly's leisure life. *South China Populat*. (2016) 31:71–80. doi: 10.3969/j.issn.1004-1613.2016.02.007
- Zhu N, Xie C. A probe into the lifestyle of the modern elderly. *J Soochow Univ*. (2004) 24:86–88. doi: 10.3969/j.issn.1673-047X.2004.03.036
- Osmanovic S, Pecchioni L. Beyond entertainment: Motivations and outcomes of video game playing by older adults and their younger family members. *Games Cult*. (2016) 11:130–49. doi: 10.1177/1555412015602819
- Liu Y, Hu J. The number of children, parents' health and life satisfaction: the perspective of sex imbalance. *Northwest Popul J*. (2017) 38:68–75+83. doi: 10.3969/j.issn.1007-0672.2017.03.010
- Chen W, Du X. Factors influencing the living conditions of the elderly in China: a test of the number and gender of children. *Populat Sci China*. (2002) 16:49–55. doi: 10.3969/j.issn.1004-8189.2002.z1.082
- Leng C, Chen Q. Can the elderly be happier when they have more children? an empirical research based on CGSS2013. *J Dalian Univ Tech (Soc Sci)*. (2019) 40:60–8.

ACKNOWLEDGMENTS

The authors are grateful for the funding support in the writing process. They thank the editors for their hard work in the article review process and the reviewers for their professional opinions.

35. Huang C, Dong B, Lu Z, Yue J, Liu Q. Chronic diseases and risk for depression in old age: a meta-analysis of published literature. *Ageing Res Rev.* (2010) 9:131–41. doi: 10.1016/j.arr.2009.05.005
36. Plouffe L, Kalache A. Towards global age-friendly cities: determining urban features that promote active aging. *J Urban Health.* (2010) 87:733–9. doi: 10.1007/s11524-010-9466-0
37. Jiao K. The Relationship between Living Arrangements and Marital Status in the Elderly. *J Popul.* (2013) 35:78–86. doi: 10.3969/j.issn.1004-129X.2013.01.009
38. Wu J, Sun B. The impact of commuting time on subjective happiness: evidence from China family panel survey data. *Human Geogr.* (2016) 31:33–9. doi: 10.13959/j.issn.1003-2398.2016.03.005
39. Cheng X, Li X, Liu H, Cosco TD, Duan W. Widowhood and the subjective well-being of older people in china: the mediating effects of lifestyle. *Appl Res Qual Life.* (2019) 16:875–90. doi: 10.1007/s11482-019-09789-y
40. Hayes AF. *Process: A Versatile Computational Tool for Observed Variable Mediation, Moderation, and Conditional Process Modeling.* Lawrence, KS: University of Kansas, KS (2012).
41. Huang Y. Family size and children's education: evidence from the one-child policy in China. *Populat Res Policy Rev.* (2021) doi: 10.1007/s11113-021-09638-7
42. Lesser R, Algar L. Towards combining the cognitive neuropsychological and the pragmatic in aphasia therapy. *Neuropsychol Rehabil.* (1995) 5:67–92. doi: 10.1080/09602019508520176
43. Wilkinson R, Wielaert S. Rehabilitation targeted at everyday communication: can we change the talk of people with aphasia and their significant others within conversation? *Arch Phys Med Rehabil.* (2012) 93:S70–6. doi: 10.1016/j.apmr.2011.07.026
44. De Jong-Gierveld J. Developing and testing a model of loneliness. *J Personal Soc Psychol.* (1987) 53:119–28. doi: 10.1037/0022-3514.53.1.119
45. Gierveld JDJ. A review of loneliness: concept and definitions, determinants and consequences. *Rev Clin Gerontol.* (1998) 8:73–80. doi: 10.1017/S0959259898008090
46. Beal C. Loneliness in older women: a review of the literature. *Issues Mental Health Nurs.* (2006) 27:795–813. doi: 10.1080/01612840600781196
47. Killeen C. Loneliness: an epidemic in modern society. *J Adv Nurs.* (1998) 28:762–70. doi: 10.1046/j.1365-2648.1998.00703.x
48. Rubenowitz E, Waern M, Wilhelmson K, Allebeck P. Life events and psychosocial factors in elderly suicides—a case-control study. *Psychol Med.* (2001) 31:1193–202. doi: 10.1017/S0033291701004457
49. Chen Y, Hicks A, While AE. Loneliness and social support of older people in China: a systematic literature review. *Health Soc Care Commun.* (2014) 22:113–23. doi: 10.1111/hsc.12051
50. Kepic M. Life satisfaction after spousal loss: the potential influence of age, gender, and leisure. *Adultspan J.* (2019) 18:85–98. doi: 10.1002/adsp.12079
51. Hagedoorn M, Van Yperen NW, Coyne JC, Van Jaarsveld CHM, Ranchor AV, Van Sonderen E, et al. Does marriage protect older people from distress? The role of equity and recency of bereavement. *Psychol Aging.* (2006) 21:611–20. doi: 10.1037/0882-7974.21.3.611
52. Isherwood LM, King DS, Luszcz MA. A longitudinal analysis of social engagement in late-life widowhood. *Int J Aging Hum Dev.* (2012) 74:211–29. doi: 10.2190/AG.74.3.c
53. Hooyman NR, Kiyak HA. *Social Gerontology: A Multidisciplinary Perspective.* 9th ed. Boston, MA: Pearson Education (2011)
54. Zhang XJ, Sun L, Yu-Ling YU, Shen Q. Correlation between loneliness, family function and social support among elderly people. *Chinese J Clin Psychol.* (2010) 18:109–10+106.
55. Isherwood LM, King DS, Luszcz MA. Widowhood in the fourth age: support exchange, relationships and social participation. *Ageing Soc.* (2017) 37:188–212. doi: 10.1017/S0144686X15001166
56. Bukov A, Maas I, Lampert T. Social participation in very old age: cross-sectional and longitudinal findings from BASE. *J Gerontol B-Psychol Sci Soc Sci.* (2002) 57:P510–7. doi: 10.1093/geronb/57.6.P510
57. Nuttman-Shwartz O. Like a high wave: adjustment to retirement. *Gerontologist.* (2004) 44:229–36. doi: 10.1093/geront/44.2.229
58. Ho DYF, Chiu CY. Component ideas of individualism, collectivism, and social organization: an application in the study of Chinese culture. In Kim U, Triandis HC, Kagitcibasi Ç, Choi SC, & Yoon G (Eds.), *Individualism and Collectivism: Theory, Method, and Applications.* Thousand Oaks, CA, US: Sage Publications, Inc. (1994). p. 137–156.
59. Yang KS. Theories and research in Chinese personality: an indigenous approach. In: Kao HSR & Sinha D (Eds.), *Asian Perspectives on Psychology.* Thousand Oaks, CA, US: Sage Publications, Inc. (1997). p. 236–62.
60. Shek DTL, Chan LK. Hong Kong Chinese parents' perceptions of the ideal child. *J Psychol.* (1999) 133:291–302. doi: 10.1080/00223989909599742
61. Lin X. An analysis of the group characteristics of the aged without spouse in the big metropolises. *South China Populat.* (2007) 22:45–51. doi: 10.3969/j.issn.1004-1613.2007.04.007
62. Zhou X. *Cultural Feedback: The Revolution of Intergenerational Relationship in a Transforming Society.* Beijing: Commercial Press (2015).
63. Mead M. *Culture and Commitment: A Study of the Generation Gap.* Garden City, NY: Published for the American Museum of Natural History, Natural History Press (1978).
64. Yu T, Liu Y. The influence of smartphones use on the lifestyles of the “post 90s” college. *J Bimonthly.* (2016) 36:118–128+154.
65. Eggebeen DJ, Knoester C. Does fatherhood matter for men? *J Marriage Family.* (2001) 63:381–93. doi: 10.1111/j.1741-3737.2001.00381.x
66. Boyraz G, Sayger TV. An exploratory path analysis of the factors contributing to life satisfaction in fathers. *J Positive Psychol.* (2009) 4:145–54. doi: 10.1080/17439760802650592
67. Zunzunegui MV, Béland F, Otero A. Support from children, living arrangements, self-rated health and depressive symptoms of older people in Spain. *Int J Epidemiol.* (2001) 30:1090–9. doi: 10.1093/ije/30.5.1090
68. Chen X, Silverstein M. Intergenerational social support and the psychological well-being of older parents in China. *Res Aging.* (2000) 22:43–65. doi: 10.1177/0164027500221003
69. Silverstein M, Bengtson VL. Does intergenerational social support influence the psychological well-being of older parents? The contingencies of declining health and widowhood. *Soc Sci Med.* (1994) 38:943–57. doi: 10.1016/0277-9536(94)90427-8
70. Hsu FL. *Under the Ancestor's Shadow: Kinship, Personality, and Social Mobility in Village China.* Garden City, NY: Anchor Books (1967).
71. Watson JA, Kivett VR. Influences on the life satisfaction of older fathers. *Family Coordinator.* (1976) 25:482–8. doi: 10.2307/582864
72. Steelman LC, Powell B, Werum R, Carter S. Reconsidering the effects of sibling configuration: recent advances and challenges. *Ann Rev Sociol.* (2002) 28:243–69. doi: 10.1146/annurev.soc.28.111301.093304
73. Blake J. Family size and the quality of children. *Demography.* (1981) 18:421–42. doi: 10.2307/2060941
74. Downey DB. When bigger is not better: family size, parental resources, and children's educational performance. *Am Sociol Rev.* (1995) 60:746–61. doi: 10.2307/2096320

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2022 Yang, Sun and Duan. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Association of Use of Tourniquets During Total Knee Arthroplasty in the Elderly Patients With Post-operative Pain and Return to Function

OPEN ACCESS

Edited by:

Klara Komici,
University of Molise, Italy

Reviewed by:

Xian-Tao Zeng,
Wuhan University, China
Long Ge,
Lanzhou University, China

*Correspondence:

Fei-Long Wei
feilongspine@163.com
Jiyong Chen
dr_chenjiyong7100@126.com
Tian Li
fmmlt@foxmail.com

†These authors have contributed
equally to this work

Specialty section:

This article was submitted to
Aging and Public Health,
a section of the journal
Frontiers in Public Health

Received: 30 November 2021

Accepted: 09 February 2022

Published: 10 March 2022

Citation:

Zhao J, Dong X, Zhang Z, Gao Q,
Zhang Y, Song J, Niu S, Li T, Chen J
and Wei F-L (2022) Association of Use
of Tourniquets During Total Knee
Arthroplasty in the Elderly Patients
With Post-operative Pain and Return
to Function.
Front. Public Health 10:825408.
doi: 10.3389/fpubh.2022.825408

Jian Zhao^{1,2†}, **Xin Dong**^{1†}, **Ziru Zhang**^{1†}, **Quanyou Gao**^{1†}, **Yunfei Zhang**¹, **Junlei Song**²,
Shun Niu¹, **Tian Li**^{3*}, **Jiyong Chen**^{2*} and **Fei-Long Wei**^{1*}

¹ Department of Orthopedics, Tangdu Hospital, Fourth Military Medical University, Xi'an, China, ² Department of Orthopedics, The First Medical Center, Chinese PLA General Hospital (301 Hospital), Beijing, China, ³ School of Basic Medicine, Fourth Military Medical University, Xi'an, China

Objective: During total knee arthroplasty (TKA), tourniquet may negatively impact post-operative functional recovery. This study aimed at investigating the effects of tourniquet on pain and return to function.

Methods: Pubmed, Embase, and Cochrane Library were comprehensively searched for randomized controlled trials (RCTs) published up to February 15th, 2020. Search terms included; total knee arthroplasty, tourniquet, and randomized controlled trial. RCTs evaluating the efficacies of tourniquet during and after operation were selected. Two reviewers independently extracted the data. Effect estimates with 95% CIs were pooled using the random-effects model. Dichotomous data were calculated as relative risks (RR) with 95% confidence intervals (CI). Mean differences (MD) with 95% CI were used to measure the impact of consecutive results. Primary outcomes were the range of motion (ROM) and visual analog scale (VAS) pain scores.

Results: Thirty-three RCTs involving a total of 2,393 patients were included in this study. The mean age is 65.58 years old. Compared to no tourniquet group, the use of a tourniquet resulted in suppressed ROM on the 3rd post-operative day [MD, −4.67; (95% CI, −8.00 to −1.35)] and the 1st post-operative month [MD, −3.18; (95% CI, −5.92 to −0.44)]. Pain increased significantly when using tourniquets on the third day after surgery [MD, 0.39; (95% CI, −0.19 to 0.59)]. Moreover, tourniquets can reduce intra-operative blood loss [MD, −127.67; (95% CI, −186.83 to −68.50)], shorter operation time [MD, −3.73; (95% CI, −5.98 to −1.48)], lower transfusion rate [RR, 0.85; (95% CI, 0.73–1.00)], higher superficial wound infection rates RR, 2.43; [(5% CI, 1.04–5.67)] and higher all complication rates [RR, 1.98; (95% CI, 1.22–3.22)].

Conclusion: Moderate certainty evidence shows that the use of a tourniquet was associated with an increased risk of higher superficial wound infection rates and all complication rates. Therefore, the findings did not support the routine use of a tourniquet during TKA.

Keywords: total knee arthroplasty, tourniquet, function, pain, elder

INTRODUCTION

Total knee arthroplasty (TKA) is highly effective at relieving joint disease-induced pain and improving joint functions (1–3). However, blood loss during TKA is high, and is estimated to exceed 1,000 ml with 10–38% of patients requiring blood transfusion (4–6). Therefore, to reduce blood loss, tourniquets are routinely used.

Tourniquets, the tourniquet can reduce the overall blood loss and ensure that the surface operation time is clean and bloodless, can reduce total blood loss and create a clean blood-poor surface operation time, thereby achieving a long-term survival rate for cemented TKA components (7, 8). However, clinical applications of tourniquets are associated with some limitations, including delayed quadriceps strength recovery, increased risks of infections, nerve paralysis, and deep vein thrombosis, especially in obese patients (9, 10). Studies (5, 11) have reported that tourniquets can lead to weakened muscles, reduced range of motion (ROM), and increased pain, which may lead to delayed recovery. Li et al. reported that tourniquets can increase the amount of hidden blood loss after surgery (12).

Applications of tourniquets during TKA have been shown to significantly decrease blood loss without exerting adverse effects on early post-operative outcomes (8). Randomized clinical trials (RCT) have shown that the absence of tourniquets does not affect blood loss and bone cement permeability in patients with TKA. Furthermore, less inflammation and better knee functions can be realized without a tourniquet (10). However, there is no consensus regarding the advantages and disadvantages of using tourniquets in TKA. This study aimed at evaluating the effects of tourniquets on functional outcomes, pain and to determine their possible risks during TKA.

METHODS

Study Protocol

This systematic review of RCTs was performed according to the Cochrane Handbook for Systematic Reviews of Interventions (13) and the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (14–17).

Data Sources and Searches

The Cochrane, PROSPERO, Joanna Briggs Institute (JBI), and INPLASY databases were independently searched by two reviewers (J. Z. and T. L.), to avoid duplicates in meta-analysis. Then, we searched electronic databases, including PubMed, Embase and the Cochrane Library (**Supplementary Table 1**). Searches were performed for publications from

database inception to February 15th, 2020. References to relevant comments, editorials, and letters also need to be searched manually.

Study Selection and Data Extraction

Included Studies were based on the PICOS criteria (**Supplementary Table 2**).

Data Extraction

Relevant data was independently collected by two authors (J. Z. and T. L.) based on a well-designed data extraction format that contains the authors' names, publication year, country, participant data, tourniquet pressure, anesthesia method, tourniquet duration, drainage, thrombosis prevention and follow-up.

Outcomes

Primary outcomes included ROM, pain measured at 3 days, 1, 3, 6, and 12 months post-operatively, and the need for blood transfusion. Secondary outcomes included intra-operative blood loss, post-operative blood loss, measured total blood loss, calculated total blood loss (18), operation time, transfusion, superficial wound infection, deep vein thrombosis (DVT), and all complications (including DVT, infection, revision, wound erythema/ecchymosis among others).

Quality and Risk-of-Bias Assessment

The Cochrane Collaboration's risk-of-bias assessment tool (19) was used by two reviewers (J. Z., T. L.) to independently evaluate the included studies for potential bias (**Supplementary Table 3**). Disagreements between the two investigators were resolved by involving a third investigator (F-L. W.). We used the Cochrane risk of bias method to assess bias assessment (20, 21). If there are 4 or more studies per comparison, the funnel asymmetric distribution was used to estimate publication bias (22). Two reviewers (J. Z., T. L.) independently used the GRADE component (23) to categorize the quality and strength of the evidence as high, moderate, low, and very low for the ROM, pain, superficial wound infection rates and all complication rates.

Data Synthesis and Statistical Analysis

We used STATA 16.0 (Stata Corp, College Station, TX, USA) to analyze data. Data pooling was done using a random-effects model (24). Dichotomous data were evaluated by relative risks (RR) with 95% confidence intervals (CI). Mean differences (MD) with 95% CI were used to weigh effect sizes for continuous outcomes. A forest plot was used to assess effect sizes. The weight of the included study depends on the value of the event in the treatment group, the event in the control group, and the size

of the entire sample. $P \leq 0.05$ indicates that the difference is statistically significant. Statistical heterogeneity among summary data were evaluated using the chi-square test and I^2 statistic. If the chi-square test showed $p < 0.10$ and $I^2 > 50\%$, data showed high heterogeneity. A subgroup analysis was conducted based on anesthesia, Tourniquet duration, drainage, thromboprophylaxis. Because these variables are categorical variables, we did not do meta regression.

RESULTS

Studies Retrieved

During our literature search, collation and analysis, no duplicate meta-analysis topics were found in the databases. The PRISMA flow chart of the selection process retrieved a total of 440 results, of which 245 (56.68%) remained after removal of duplicates (**Supplementary Figure 1**). Six relevant studies were added. After title/abstract curation, a total of 193 records were excluded, with 58 articles remaining. Then, the full text was read and 33 eligible RCTs (34 articles) were enrolled for final synthesis.

Study Characteristics

Thirty-three RCTs involving a total of 2,393 patients participated in this meta-analysis (**Supplementary Table 4**) (5, 6, 8, 10, 12, 25–52). The mean age is 65.58 years old. These studies come from North America, Europe, Asia, and Latin America and had been published between 1995 and 2021. Based on our defined outcomes, 12 reported ROM outcomes (5, 6, 8, 10, 12, 35, 44, 46–49, 52); 10 reported pain outcomes (6, 8, 10, 39, 44, 46, 47, 49–51); 14 reported intra-operative blood loss outcomes (5, 6, 10, 12, 28, 30, 32, 37–39, 41, 43, 48); 11 reported post-operative blood loss outcomes (6, 26, 28, 30, 32, 33, 37–40, 48); 9 reported measured total blood loss outcomes (5, 6, 10, 28, 30, 31, 34, 37, 39); 9 reported calculated total blood loss outcomes (8, 30, 32, 39, 41–43, 48, 52); 20 reported operation time outcomes (5, 6, 8, 10, 12, 28, 30, 32, 33, 35, 38, 39, 42–44, 46–48, 51, 52); 16 reported transfusion outcomes (5, 6, 8, 10, 26, 29, 30, 32, 35, 36, 39, 42, 43, 48, 50, 52); 16 reported DVT outcomes (5, 6, 8, 25–27, 32, 33, 35, 37, 48, 51, 52); 8 reported superficial wound infection outcomes (5, 6, 8, 25, 30, 48, 49, 51); while 15 reported the outcomes for all complications (5, 6, 8, 25, 30–33, 35, 39, 42, 44, 48, 49, 51).

Risk of Bias Assessments

Supplementary Figures 2, 3 summarizes the assessment of the risk of bias of selected articles. Four studies were found to have a high risk for randomization sequence generation (10, 37, 38, 50), with 8 not providing this information (25, 26, 28, 30, 31, 33, 36, 43); 5 studies showed a high risk in concealing allocation (25, 26, 31, 33, 38), with 8 not providing this information (12, 27, 28, 36, 37, 39, 50, 51). Due to the nature of intervention, it is not possible to blind participants and therapists in any study. Thirteen of these studies included the objective results of blindly evaluating assessors (5, 6, 8, 32, 41, 42, 45, 46, 48, 49, 52). No study showed a high risk in selective outcome reporting.

Primary Outcomes

ROM

Pooled analysis of 12 studies showed significantly suppressed ROM When a tourniquet is put on the 3rd day after the operation [MD, -4.67 ; (95% CI, -8.00 to -1.35)] and the 1st post-operative month [MD, -3.18 ; (95% CI, -5.92 to -0.44)] (**Figure 1**). However, applications of a tourniquet did not have a significant impact on ROM on the 3rd, 6th and 12th post-operative months (**Figure 1**). More than 50% heterogeneity was found in studies reporting ROM on the 3rd post-operative day, the 1st and 3rd post-operative month (**Figure 1**). **Supplementary Figure 4**, a contour-enhanced funnel plot, showed significant deviations in the publication. Subgroup analysis revealed that anesthesia, tourniquet duration, and drainage did not affect ROM, whereas thromboprophylaxis had effect on ROM on the 3rd post-operative day ($p = 0.00$) (**Supplementary Figure 5**). Subgroup analysis showed that drainage affected ROM on the 1st post-operative month ($p = 0.03$; **Supplementary Figure 6**) while thromboprophylaxis affected ROM on the 3rd post-operative month ($p = 0.00$; **Supplementary Figure 7**). Based on GRADE assessment, moderate-quality evidence suggests that the use of a tourniquet resulted in suppressed ROM on the 3rd post-operative day and the 1st post-operative month.

Pain

Pooled analysis of 10 studies showed that pain was significantly increased when a tourniquet was used on the 3rd post-operative day [MD, 0.46 ; (95% CI, 0.27 – 0.65); **Figure 2**]. Pain was significantly reduced when a tourniquet was applied on the 3rd post-operative day [MD, -1.80 ; (95% CI, 2.78 to -0.82); **Figure 2**]. However, tourniquets had no meaningful impact on pain in the 1st, 3rd, 6th, and 12th post-operative months (**Figure 2**). **Supplementary Figure 8**, a contour-enhanced funnel plot, did reveal significant publication bias. More than 50% heterogeneity was found in studies reporting pain on the 3rd postoperative day and the 1st post-operative month (**Figure 2**). Subgroup analysis showed that anesthesia, tourniquet duration, drainage, and thromboprophylaxis did not affect pain outcomes (**Supplementary Figures 9, 10**). Based on GRADE assessment, moderate-quality evidence suggests that pain was significantly increased when a tourniquet was used on the 3rd post-operative day.

Secondary Outcomes

Blood Loss

Pooled analysis of 14 studies showed that the use of a tourniquet resulted in low intra-operative blood loss [MD, -127.67 ; (95% CI, -186.83 to -68.50); **Supplementary Figure 11**]. Heterogeneity (99.12%) was found in studies reporting on intra-operative blood loss (**Supplementary Figure 11**). **Supplementary Figure 12**, contour-enhanced funnel plot, showed significant deviations in the publication. Pooled analysis revealed that tourniquets had no meaningful impact on post-operative blood loss, measured total blood loss and calculated total blood loss (**Figure 3** and **Supplementary Figure 11**). Contour-enhanced funnel plots (**Supplementary Figures 14, 16, 18**) showed significant

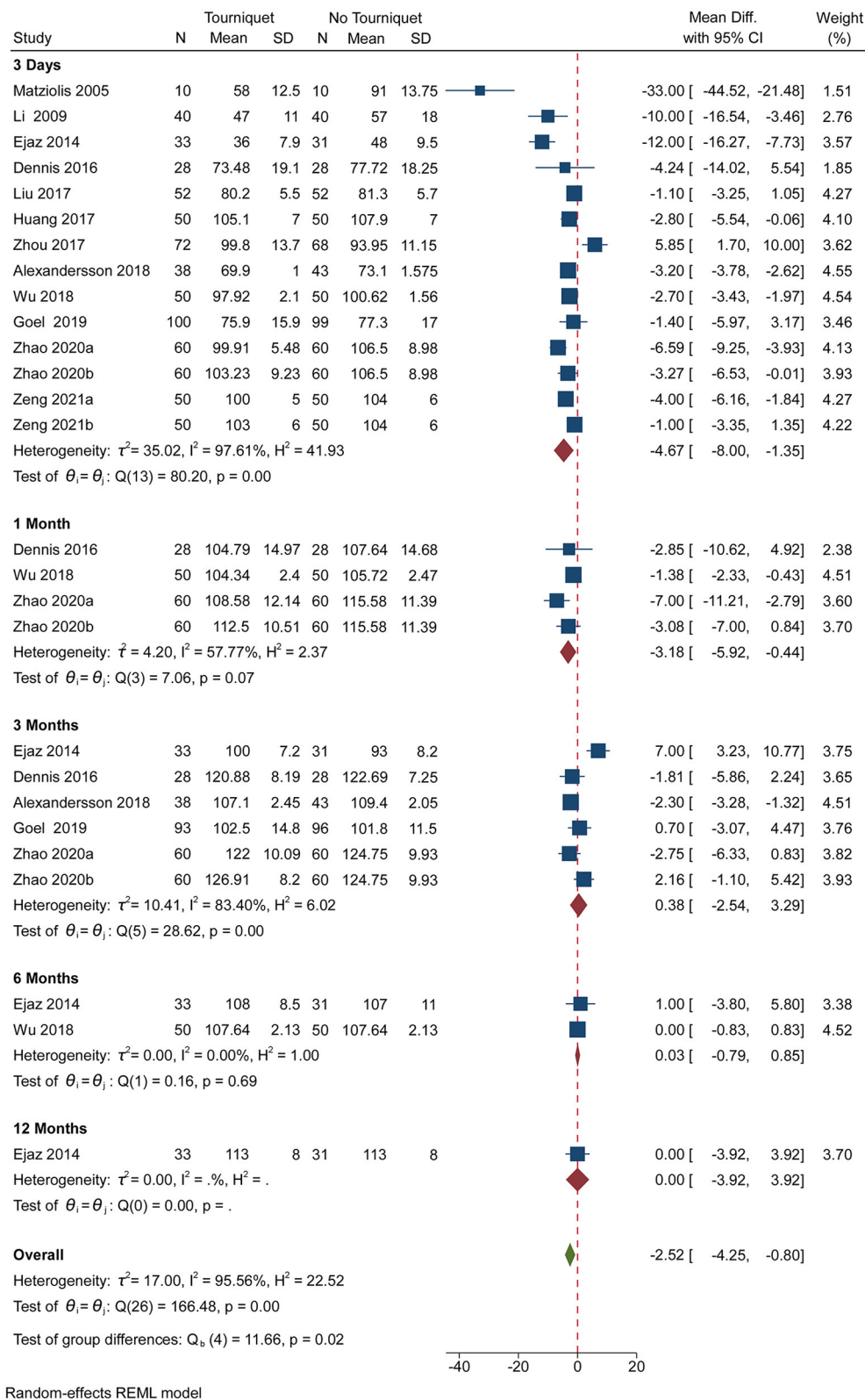


FIGURE 1 | Forest plot comparing ROM outcomes in no tourniquet and tourniquet groups.

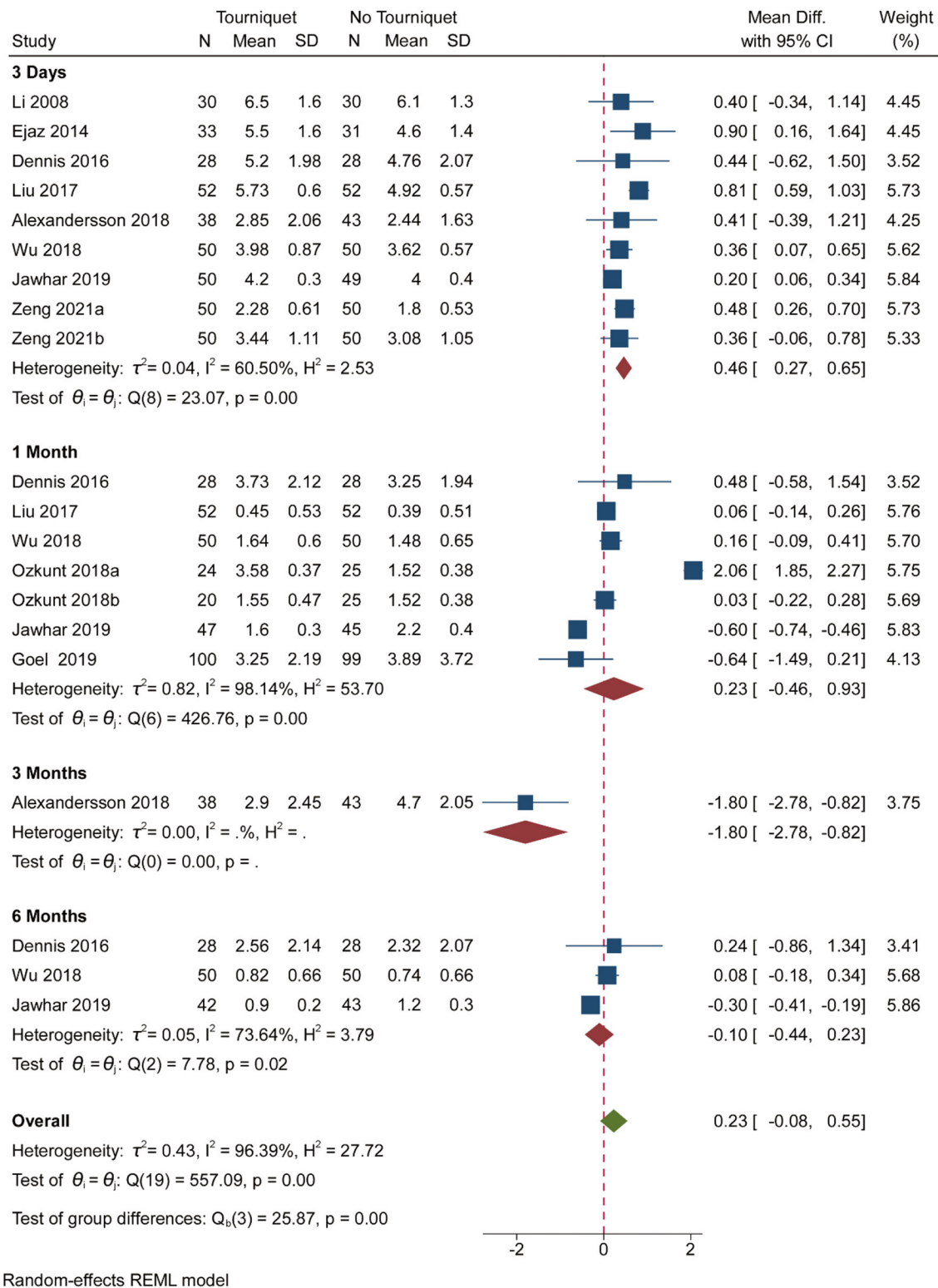
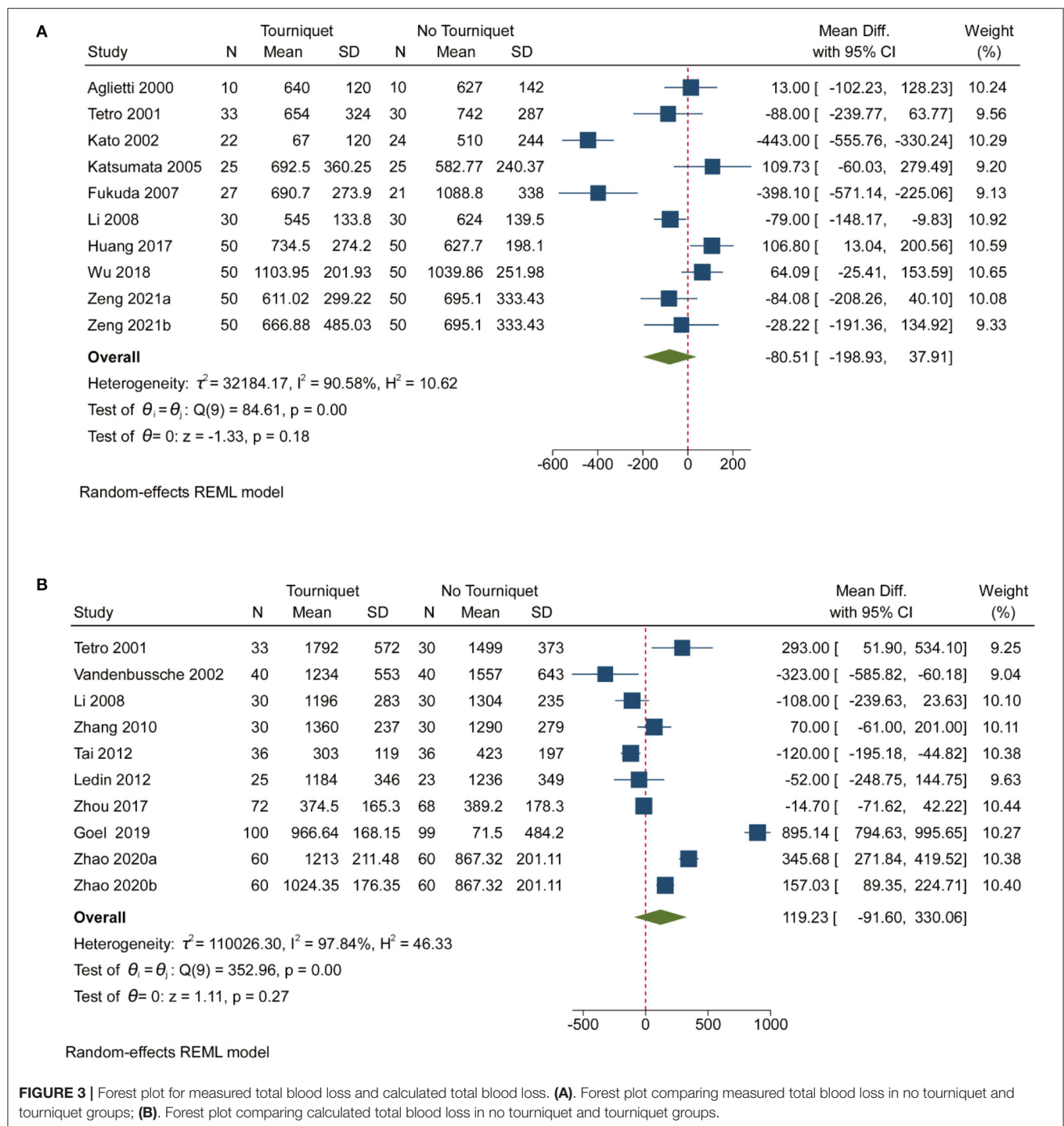


FIGURE 2 | Forest plot comparing pain outcomes in no tourniquet and tourniquet groups.



deviations in the publication. More than 50% heterogeneity was found in studies reporting post-operative blood loss, measured total blood loss and calculated total blood loss (Supplementary Figure 11 and Figure 3). Subgroup analyses showed that thromboprophylaxis affected intra-operative blood loss ($p = 0.00$; Supplementary Figure 13). However, anesthesia, tourniquet duration, drainage, and thromboprophylaxis did not affect post-operative blood loss or measured total blood

loss (Supplementary Figures 15, 17). In addition, anesthesia, tourniquet duration, drainage, and thromboprophylaxis affected the calculated total blood loss ($p = 0.02$, 0.01 , and 0.03 , respectively; Supplementary Figure 19).

Operation Time

Pooled analysis of 20 studies showed that tourniquets were associated with a shorter operation time [MD, -3.73 ; (95%

CI, -5.98 to -1.48); **Supplementary Figure 20**]. **Supplementary Figure 21**, a contour-enhanced funnel plot, showed significant deviations in the publication. An 84.83% heterogeneity was found across studies reporting on operation time (**Supplementary Figure 20**). Subgroup analysis revealed that drainage affected operation time ($p = 0.00$; **Supplementary Figure 22**).

Complications

Pooled analysis of 16 studies showed that tourniquets are associated with low transfusion rates [RR, 0.85; (95% CI, 0.73–1.00); **Figure 4A**]. Less than 25% heterogeneity was found in studies reporting on transfusion (**Figure 4A**). Pooled analysis of 16 studies showed that tourniquets had no meaningful impact on DVT (**Figure 4B**). A 10.43% heterogeneity was found across studies reporting on transfusion (**Figure 4B**). A pooled analysis of 8 studies showed that tourniquets are associated with higher superficial wound infection rates [RR, 2.43; (95% CI, 1.04–5.67); **Figure 5A**]. A 0% heterogeneity was found across studies reporting on superficial wound infection (**Figure 5A**). In addition, pooled analysis of 15 studies showed that tourniquets are associated with higher all complication rates [RR, 1.98; (95% CI, 1.22–3.22); **Figure 5B**]. Less than 50% heterogeneity was found across studies reporting on transfusion (**Figure 5B**). Contour-enhanced funnel plots (**Supplementary Figures 23–26**) did not show significant publication bias. Pooled analysis of 7 studies showed that tourniquets have no association with pulmonary embolism rate [RR, 1.71; (95% CI, 0.49–6.00); **Supplementary Figure 27**]. Contour-enhanced funnel plots (**Supplementary Figure 28**) showed no significant publication bias. Pooled analysis of 7 studies showed that tourniquets have no association with pulmonary embolism rate [RR, 1.71; (95% CI, 0.49–6.00); **Supplementary Figure 27**]. Contour-enhanced funnel plots (**Supplementary Figure 28**) showed no significant publication bias. Based on GRADE assessment, moderate-quality evidence suggests that the use of a tourniquet was with an increased risk of higher superficial wound infection rates and all complication rates.

DISCUSSION

Applications of tourniquets in TKA are not supported by sufficient data. Evidence regarding the effects of tourniquets on perioperative blood loss, post-operative function, and pain is not conclusive. We found that tourniquets are associated with increased post-operative pain and/or diminished short term functional outcomes. However, these effects disappeared after 1 month. Our findings do not support the use of tourniquets during TKA. However, differences in outcomes were small and do not have much clinical significance (53), so interpretation of the conclusion should be cautious.

Guler et al. reported that clinical applications of tourniquets during TKA led to a 20% reduction in quadriceps volume after surgery, when measured against contralateral limb at 1-month of follow-up. There were no differences between limbs on which tourniquets were not applied (54). Dennis et al. reported simultaneous bilateral TKA, in which a tourniquet was used on one knee, and muscle weakness in the tourniquet group lasted

until 3 months after surgery (46). However, Goel et al. showed that there were no clinical differences between patients who had inflated tourniquets and those who did not, by assessing functions of treated limbs (8). We found that tourniquets slow down patients' functional recoveries and increases ischemia-associated pain. Thigh pain is common when tourniquets are used in early post-operative periods (55). Pain is unfavorable and hinders joint function recovery. The ROM is significantly decreased when tourniquets are used in TKA. Our findings are consistent with those of previous trials (5, 6, 10, 52, 56). However, differences in ROM reported in this study were within the error of goniometer, which ranges from 4 to 8 degrees, therefore, these differences might not be clinically relevant.

Total knee arthroplasty is associated with large amounts of perioperative blood loss; reduced bleeding reduces transfusion incidences. Clinical applications of tranexamic acid, hypotension-controlled anesthesia, and tourniquets are widely used in surgery (52, 57). An RCT showed that tourniquets can reduce calculated blood loss during the perioperative period (8). Moreover, it has been reported that applications of tourniquets in TKA increase total blood loss (12, 58). We found that tourniquets do not affect calculated blood loss. However, >50% heterogeneity was found across studies that reported calculated total blood loss. Subgroup analysis showed that anesthesia and thromboprophylaxis affect calculated total blood loss. A previous meta-analysis revealed that early tourniquet release is associated with greater perioperative blood loss, compared to tourniquet release after wound closure (59). The reason for this difference might be because we included more updated RCTs. The results showed that tourniquets are associated with decreased intra-operative blood loss, which can improve the surgical field of vision. Therefore, operation times are shorter when tourniquets are used.

Although there was no difference in calculated total blood loss between the two groups, tourniquets were associated with lower transfusion rates. Mori et al. reported that tourniquets are associated with a greater risk of DVT, following TKA (60). Our study found that there are no differences in DVT between the two groups, consistent with a previous meta-analysis (61). Long-term effects of tourniquets with regarding to post-operative complications have not been clearly established. A matched cohort study showed that increased tourniquet times are associated with increased 30-day readmission rates (62). The longer a tourniquet is used, the higher the risk of wound complications (63). In this study, superficial wound infection rates and all complications were found to be higher in the tourniquet group. Goel et al. found that the total number of complications was high in the no-tourniquet group, however, differences in complication rates were not significant (8). Our results are consistent with those of a previous study (61).

STRENGTH AND LIMITATIONS

This study has some strengths, first, this meta-analysis was performed by a professional team including a Cochrane member. Second, the methods were inclusive and transparent, including

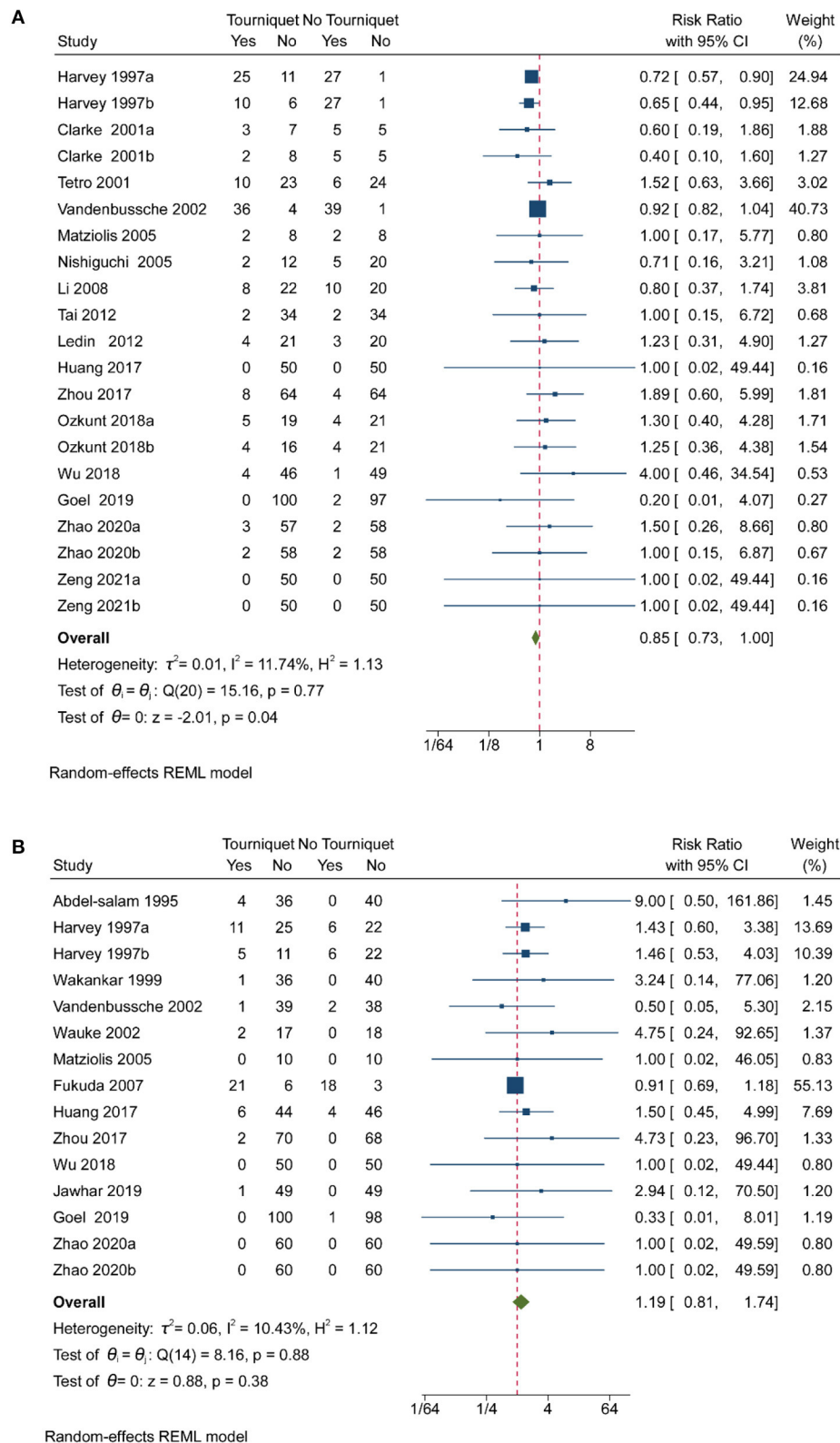


FIGURE 4 | Forest plot for transfusion rate and DVT. **(A)** Forest plot comparing transfusion rates between no tourniquet and tourniquet groups; **(B)** Forest plot comparing DVT outcomes between no tourniquet and tourniquet groups.

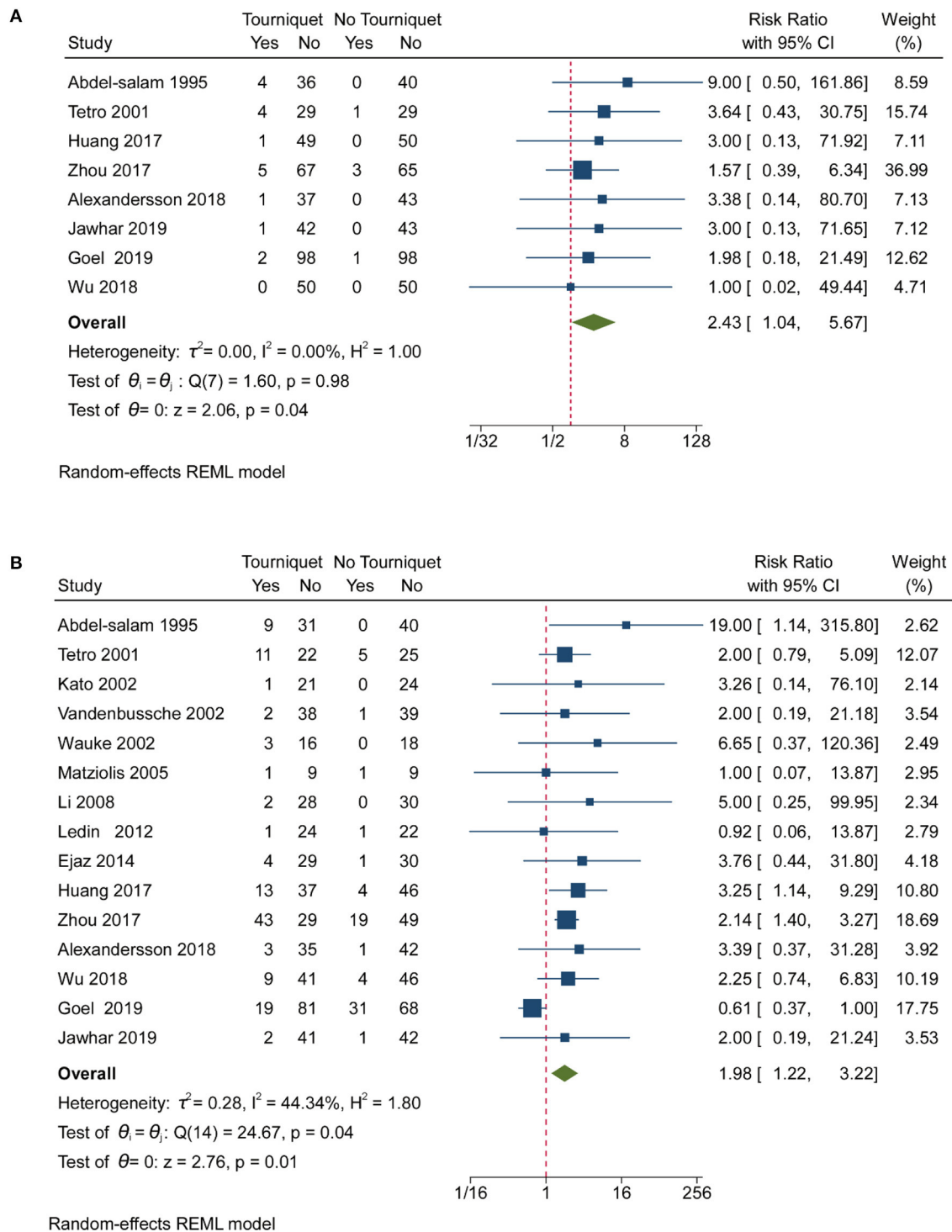


FIGURE 5 | Forest plot for superficial wound infection and all complication rates. **(A)** Forest plot comparing superficial wound infection rates between the no tourniquet and tourniquet groups; **(B)** Forest plot comparing all complication rates between the no tourniquet and tourniquet groups.

all software and website sources. Third, analyses were refined on Patient, Intervention, Control, Outcomes, and Study design (PICOS principle). In addition, the study included 12 outcomes to comprehensively evaluate the effects of tourniquets.

However, it is associated with some limitations. First, PubMed, Embase, and Cochrane Library were searched whereas other databases such as Web of Science, was not. PubMed, Embase, and Cochrane Library include almost all databases and a

retrieval strategy was formulated (64). Second, many studies did not clarify the duration of tourniquet use. In addition, high heterogeneity of blood loss is a disadvantage that affects result reliability. Different surgical techniques and different measurement methods may lead to this heterogeneity.

CONCLUSIONS

This meta-analysis provides insights into evidence-based medicine currently approved by the Cochrane Collaboration (65). Our findings do not support routine use of tourniquets during TKA, as inflating the tourniquet was associated with more pain, slower functional recovery and more complications. However, this conclusion should be interpreted cautiously, considering the small differences in outcomes.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

F-LW and JC: had full access to all the data in this study and they take responsibility for data integrity and accuracy of analysis. JC, F-LW, JZ, TL, XD, ZZ, and QG: concept and design. JC, F-LW, JZ, TL, XD, ZZ, QG, YZ, JS, and SN: acquisition, analysis, and interpretation of data. JZ, F-LW, and JC: drafting of the manuscript. TL,

JZ, and F-LW: statistical analysis. JC, F-LW, JZ, TL, XD, ZZ, and QG: administrative, technical, or material support. JC, F-LW, JZ, and TL: supervision. All authors: critical revision of the manuscript for important intellectual content. All authors contributed to the article and approved the submitted version.

FUNDING

This study was supported by Tangdu Hospital Seed Talent Program (F-LW) and Natural Science Basic Research Plan in Shaanxi Province of China (No. 2019JM-265). The funding body had no role in the design of the study, data collection, analysis, interpretation, or in writing the manuscript.

ACKNOWLEDGMENTS

This study was supported by Tangdu Hospital Seed Talent Program and Natural Science Basic Research Plan in Shaanxi Province of China. We thank Tangdu Hospital, Fourth Military Medical University for supporting our work and Home for Researchers (www.home-for-researchers.com) for a language polishing service.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpubh.2022.825408/full#supplementary-material>

REFERENCES

- Wu Y, Zeng Y, Bao X, Xiong H, Hu Q, Li M, et al. Comparison of mini-subvastus approach versus medial parapatellar approach in primary total knee arthroplasty. *Int J Surg*. (2018) 57:15–21. doi: 10.1016/j.ijsu.2018.07.007
- Chen Z, Shen Z, Ye X, Xu Y, Liu J, Shi X, et al. Acupuncture for rehabilitation after total knee arthroplasty: a systematic review and meta-analysis of randomized controlled trials. *Front Med*. (2020) 7:602564. doi: 10.3389/fmed.2020.602564
- Peng L, Wang K, Zeng Y, Wu Y, Si H, Shen B. Effect of neuromuscular electrical stimulation after total knee arthroplasty: a systematic review and meta-analysis of randomized controlled trials. *Front Med*. (2021) 8:779019. doi: 10.3389/fmed.2021.779019
- Park JH, Rasouli MR, Mortazavi SM, Tokarski AT, Maltenfort MG, Parvizi J. Predictors of perioperative blood loss in total joint arthroplasty. *J Bone Joint Surg Am Vol*. (2013) 95:1777–83. doi: 10.2106/JBJS.L.01335
- Huang Z, Xie X, Li L, Huang Q, Ma J, Shen B, et al. Intravenous and topical tranexamic acid alone are superior to tourniquet use for primary total knee arthroplasty: a prospective, randomized controlled trial [comparative study; journal article; randomized controlled trial]. *J Bone Joint Surg Am Vol*. (2017) 99:2053–61. doi: 10.2106/JBJS.16.01525
- Wu Y, Lu X, Ma Y, Zeng Y, Xiong H, Bao X, et al. Efficacy and safety of limb position on blood loss and range of motion after total knee arthroplasty without tourniquet: a randomized clinical trial [journal article; randomized controlled trial]. *Int J Surg*. (2018) 60:182–7. doi: 10.1016/j.ijsu.2018.11.008
- Cai DF, Fan QH, Zhong HH, Peng S, Song H. The effects of tourniquet use on blood loss in primary total knee arthroplasty for patients with osteoarthritis: a meta-analysis. *J Orthop Surg Res*. (2019) 14:348. doi: 10.1186/s13018-019-1422-4
- Goel R, Rondon AJ, Sydnor K, Blevins K, O'Malley M, Purtill JJ, et al. Tourniquet use does not affect functional outcomes or pain after total knee arthroplasty: a prospective, double-blinded, randomized controlled trial. *J Bone Joint Surg Am Vol*. (2019) 101:1821–8. doi: 10.2106/JBJS.19.00146
- Kerkhoffs GM, Servien E, Dunn W, Dahm D, Bramer JA, Haverkamp D. The influence of obesity on the complication rate and outcome of total knee arthroplasty: a meta-analysis and systematic literature review. *J Bone Joint Surg Am Vol*. (2012) 94:1839–44. doi: 10.2106/JBJS.K.00820
- Zeng Y, Li Y, Si H, Wu Y, Li M, Liu Y, et al. Effects of tourniquet use on clinical outcomes and cement penetration in TKA when tranexamic acid administrated: a randomized controlled trial. *BMC Musculoskel Disord*. (2021) 22:126. doi: 10.1186/s12891-021-03968-5
- Harsten A, Bandholm T, Kehlet H, Toksvig-Larsen S. Tourniquet versus no tourniquet on knee-extension strength early after fast-track total knee arthroplasty: a randomized controlled trial. *Knee*. (2015) 22:126–30. doi: 10.1016/j.knee.2014.12.010
- Li B, Wen Y, Wu H, Qian Q, Lin X, Zhao H. The effect of tourniquet use on hidden blood loss in total knee arthroplasty [Journal Article; Randomized Controlled Trial]. *Int Orthop*. (2009) 33:1263–8. doi: 10.1007/s00264-008-0647-3
- Higgins JPT, GS, eds. *Cochrane Handbook for Systematic Reviews of Interventions, Version 5.1.0*. (2011). Available online at: <http://handbook-5-1.cochrane.org/> (accessed March 27, 2019).
- Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses

- of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ*. (2009) 339:b2700. doi: 10.1136/bmj.b2700
15. Wei FL, Zhou CP, Liu R, Zhu KL, Du MR, Gao HR, et al. Management for lumbar spinal stenosis: a network meta-analysis and systematic review. *Int J Surg*. (2021) 85:19–28. doi: 10.1016/j.ijsu.2020.11.014
 16. Zhang F, Wang K, Du P, Yang W, He Y, Li T, et al. Risk of stroke in cancer survivors: a meta-analysis of population-based cohort studies. *Neurology*. (2021) 96:e513–26. doi: 10.1212/WNL.00000000000011264
 17. Li T, Providencia R, Mu N, Yin Y, Chen M, Wang Y, et al. Association of metformin monotherapy or combined therapy with cardiovascular risks in patients with type 2 diabetes mellitus. *Cardiovasc Diabetol*. (2021) 20:30. doi: 10.1186/s12933-020-01202-5
 18. Gross JB. Estimating allowable blood loss: corrected for dilution. *Anesthesiology*. (1983) 58:277–80. doi: 10.1097/0000542-198303000-00016
 19. Higgins JP, Altman DG, Gotzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ*. (2011) 343:d5928. doi: 10.1136/bmj.d5928
 20. Wei FL, Zhou CP, Zhu KL, Du MR, Liu Y, Heng W, et al. Comparison of different operative approaches for lumbar disc herniation: a network meta-analysis and systematic review. *Pain Physician*. (2021) 24:E381–92. doi: 10.36076/ppj.2021.24.E381
 21. Ma LL, Wang YY, Yang ZH, Huang D, Weng H, Zeng XT. Methodological quality (risk of bias) assessment tools for primary and secondary medical studies: what are they and which is better? *Military Med Res*. (2020) 7:7. doi: 10.1186/s40779-020-00238-8
 22. Sterne JA, Sutton AJ, Ioannidis JP, Terrin N, Jones DR, Lau J, et al. Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials. *BMJ*. (2011) 343:d4002. doi: 10.1136/bmj.d4002
 23. Meader N, King K, Llewellyn A, Norman G, Brown J, Rodgers M, et al. A checklist designed to aid consistency and reproducibility of GRADE assessments: development and pilot validation. *Syst Rev*. (2014) 3:82. doi: 10.1186/2046-4053-3-82
 24. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials*. (1986) 7:177–88. doi: 10.1016/0197-2456(86)90046-2
 25. Abdel-Salam A, Eyres KS. Effects of tourniquet during total knee arthroplasty. A prospective randomised study. *J Bone Joint Surg Br Vol*. (1995) 77:250–3. doi: 10.1302/0301-620X.77B2.7706340
 26. Harvey EJ, Leclerc J, Brooks CE, Burke DL. Effect of tourniquet use on blood loss and incidence of deep vein thrombosis in total knee arthroplasty. *J Arthroplasty*. (1997) 12:291–6. doi: 10.1016/S0883-5403(97)90025-5
 27. Wakankar HM, Nicholl JE, Koka R, D'Arcy JC. The tourniquet in total knee arthroplasty. A prospective, randomised study [Article]. *J Bone Joint Surg Br Vol*. (1999) 81:30–3. doi: 10.1302/0301-620X.81B1.0810030
 28. Aglietti P, Baldini A, Vena LM, Abbate R, Fedi S, Falciani M. Effect of tourniquet use on activation of coagulation in total knee replacement [Clinical Trial; Journal Article; Randomized Controlled Trial]. *Clin Orthop Relat Res*. (2000) 169–77. doi: 10.1097/00003086-200002000-00021
 29. Clarke MT, Longstaff L, Edwards D, Rushton N. Tourniquet-induced wound hypoxia after total knee replacement [Clinical Trial; Comparative Study; Journal Article; Randomized Controlled Trial; Research Support, Non-U.S. Gov't]. *J Bone Joint Surg Br Vol*. (2001) 83:40–4. doi: 10.1302/0301-620X.83B1.0830040
 30. Tetro AM, Rudan JF. The effects of a pneumatic tourniquet on blood loss in total knee arthroplasty [Clinical Trial; Journal Article; Randomized Controlled Trial]. *Can J Surg*. (2001) 44:33–8.
 31. Kato N, Nakanishi K, Yoshino S, Ogawa R. Abnormal echogenic findings detected by transesophageal echocardiography and cardiorespiratory impairment during total knee arthroplasty with tourniquet. *Anesthesiology*. (2002) 97:1123–8. doi: 10.1097/0000542-200211000-00014
 32. Vandenbussche E, Duranthon LD, Couturier M, Pidhorz L, Augereau B. The effect of tourniquet use in total knee arthroplasty [Clinical Trial; Journal Article; Randomized Controlled Trial]. *Int Orthop*. (2002) 26:306–9. doi: 10.1007/s00264-002-0360-6
 33. Wauke K, Nagashima M, Kato N, Ogawa R, Yoshino S. Comparative study between thromboembolism and total knee arthroplasty with or without tourniquet in rheumatoid arthritis patients. *Arch Orthop Trauma Surg*. (2002) 122:442–6. doi: 10.1007/s00402-002-0404-9
 34. Katsumata S, Nagashima M, Kato K, Tachihara A, Wauke K, Saito S, et al. Changes in coagulation-fibrinolysis marker and neutrophil elastase following the use of tourniquet during total knee arthroplasty and the influence of neutrophil elastase on thromboembolism. *Acta Anaesthesiol Scand*. (2005) 49:510–6. doi: 10.1111/j.1399-6576.2005.00621.x
 35. Matziolis G, Drahn T, Schröder JH, Krockner D, Tuischer J, Perka C. Endothelin-1 is secreted after total knee arthroplasty regardless of the use of a tourniquet. *J Orthop Res*. (2005) 23:392–6. doi: 10.1016/j.orthres.2004.08.021
 36. Nishiguchi M, Takamura N, Abe Y, Kono M, Shindo H, Aoyagi K. Pilot study on the use of tourniquet: a risk factor for pulmonary thromboembolism after total knee arthroplasty? *Thromb Res*. (2005) 115:271–6. doi: 10.1016/j.thromres.2004.08.018
 37. Fukuda A, Hasegawa M, Kato K, Shi D, Sudo A, Uchida A. Effect of tourniquet application on deep vein thrombosis after total knee arthroplasty. *Arch Orthop Trauma Surg*. (2007) 127:671–5. doi: 10.1007/s00402-006-0244-0
 38. Kageyama K, Nakajima Y, Shibasaki M, Hashimoto S, Mizobe T. Increased platelet, leukocyte, and endothelial cell activity are associated with increased coagulability in patients after total knee arthroplasty. *J Thromb Haemost*. (2007) 5:738–45. doi: 10.1111/j.1538-7836.2007.02443.x
 39. Li B, Qian QR, Wu HS, Zhao H, Lin XB, Zhu J, et al. The use of a pneumatic tourniquet in total knee arthroplasty: a prospective, randomized study [English Abstract; Journal Article; Randomized Controlled Trial]. *Zhonghua Wai Ke Za Zhi*. (2008) 46:1054–7. doi: 10.3321/j.issn:0529-5815.2008.14.005
 40. Yavarikia A, Amjad GG, Davoudpour K. The influence of tourniquet use and timing of its release on blood loss in total knee Arthroplasty. *Pak J Biol Sci*. (2010) 13:249–52. doi: 10.3923/pjbs.2010.249.252
 41. Zhang FJ, Xiao Y, Liu YB, Tian X, Gao ZG. Clinical effects of applying a tourniquet in total knee arthroplasty on blood loss [Journal Article; Randomized Controlled Trial]. *Chin Med J*. (2010) 123:3030–3. doi: 10.3760/cma.j.issn.0366-6999.2010.21.015
 42. Ledin H, Aspenberg P, Good L. Tourniquet use in total knee replacement does not improve fixation, but appears to reduce final range of motion [Journal Article; Randomized Controlled Trial; Research Support, Non-U.S. Gov't]. *Acta Orthop*. (2012) 83:499–503. doi: 10.3109/17453674.2012.727078
 43. Tai TW, Chang CW, Lai KA, Lin CJ, Yang CY. Effects of tourniquet use on blood loss and soft-tissue damage in total knee arthroplasty: a randomized controlled trial [Journal Article; Randomized Controlled Trial]. *J Bone Joint Surg Am Vol*. (2012) 94:2209–15. doi: 10.2106/JBJS.K.00813
 44. Ejaz A, Laursen AC, Kappel A, Laursen MB, Jakobsen T, Rasmussen S, et al. Faster recovery without the use of a tourniquet in total knee arthroplasty [Journal Article; Randomized Controlled Trial]. *Acta Orthop*. (2014) 85:422–6. doi: 10.3109/17453674.2014.931197
 45. Liu D, Graham D, Gillies K, Gillies RM. Effects of tourniquet use on quadriceps function and pain in total knee arthroplasty. *Knee Surg Relat Res*. (2014) 26:207–13. doi: 10.5792/ksrr.2014.26.4.207
 46. Dennis DA, Kittelson AJ, Yang CC, Miner TM, Kim RH, Stevens-Lapsley JE. Does Tourniquet use in TKA affect recovery of lower extremity strength and function? A randomized trial [Journal Article; Randomized Controlled Trial]. *Clin Orthop Relat Res*. (2016) 474:69–77. doi: 10.1007/s11999-015-4393-8
 47. Liu PL, Li DQ, Zhang YK, Lu QS, Ma L, Bao XZ, et al. Effects of Unilateral Tourniquet used in patients undergoing simultaneous bilateral total knee arthroplasty [Journal Article; Randomized Controlled Trial]. *Orthop Surg*. (2017) 9:180–5. doi: 10.1111/os.12329
 48. Zhou K, Ling T, Wang H, Zhou Z, Shen B, Yang J, et al. Influence of tourniquet use in primary total knee arthroplasty with drainage: a prospective randomised controlled trial [Journal Article; Randomized Controlled Trial]. *J Orthop Surg Res*. (2017) 12:172. doi: 10.1186/s13018-017-0683-z
 49. Alexandersson M, Wang EY, Eriksson S. A small difference in recovery between total knee arthroplasty with and without tourniquet use the first 3 months after surgery: a randomized controlled study [Journal Article; Randomized Controlled Trial]. *Knee Surg Sports Traumatol Arthrosc*. (2018) 27:1035–42. doi: 10.1007/s00167-018-5196-8
 50. Ozkunt O, Sariyilmaz K, Gemalmaz HC, Dikici F. The effect of tourniquet usage on cement penetration in total knee arthroplasty: a prospective randomized study of 3 methods. *Medicine*. (2018) 97:e9668. doi: 10.1097/MD.00000000000009668
 51. Jawhar A, Skeirek D, Stetzelberger V, Kollowa K, Obertacke U. No effect of tourniquet in primary total knee arthroplasty on muscle strength, functional

- outcome, patient satisfaction and health status: a randomized clinical trial [Journal Article; Randomized Controlled Trial]. *Knee Surg Sports Traumatol Arthrosc.* (2020) 28:1045–54. doi: 10.1007/s00167-019-05646-5
52. Zhao HY, Yeersheng R, Kang XW, Xia YY, Kang PD, Wang WJ. The effect of tourniquet uses on total blood loss, early function, and pain after primary total knee arthroplasty a prospective, randomized controlled trial [Article]. *Bone Joint Res.* (2020) 9:322–32. doi: 10.1302/2046-3758.96.BJR-2019-0180.R3
 53. Danoff JR, Goel R, Sutton R, Maltenfort MG, Austin MS. How much pain is significant? Defining the minimal clinically important difference for the visual analog scale for pain after total joint arthroplasty. *J Arthroplasty.* (2018) 33:S71–5.e2. doi: 10.1016/j.arth.2018.02.029
 54. Guler O, Mahirogullari M, Isyar M, Piskin A, Yalcin S, Mutlu S, Sahin B. Comparison of quadriceps muscle volume after unilateral total knee arthroplasty with and without tourniquet use. *Knee Surg Sports Traumatol Arthrosc.* (2016) 24:2595–605. doi: 10.1007/s00167-015-3872-5
 55. Worland RL, Arredondo J, Angles F, Lopez-Jimenez F, Jessup DE. Thigh pain following tourniquet application in simultaneous bilateral total knee replacement arthroplasty. *J Arthroplasty.* (1997) 12:848–52. doi: 10.1016/S0883-5403(97)90153-4
 56. Ajnin S, Fernandes R. Reduced length of stay and faster recovery after total knee arthroplasty without the use of tourniquet. *J Clin Orthop Trauma.* (2020) 11:129–32. doi: 10.1016/j.jcot.2019.08.016
 57. Nielsen CS, Jans Ø, Ørsnes T, Foss NB, Troelsen A, Husted H. Combined intra-articular and intravenous tranexamic acid reduces blood loss in total knee arthroplasty: a randomized, double-blind, placebo-controlled trial. *J Bone Joint Surg Am Vol.* (2016) 98:835–41. doi: 10.2106/JBJS.15.00810
 58. Schnettler T, Papillon N, Rees H. Use of a Tourniquet in total knee arthroplasty causes a paradoxical increase in total blood loss. *J Bone Joint Surg Am Vol.* (2017) 99:1331–6. doi: 10.2106/JBJS.16.00750
 59. Rama KR, Apsingi S, Poovali S, Jetty A. Timing of tourniquet release in knee arthroplasty. Meta-analysis of randomized, controlled trials. *J Bone Joint Surg Am Vol.* (2007) 89:699–705. doi: 10.2106/00004623-200704000-00001
 60. Mori N, Kimura S, Onodera T, Iwasaki N, Nakagawa I, Masuda T. Use of a pneumatic tourniquet in total knee arthroplasty increases the risk of distal deep vein thrombosis: a prospective, randomized study. *Knee.* (2016) 23:887–9. doi: 10.1016/j.knee.2016.02.007
 61. Liu Y, Si H, Zeng Y, Li M, Xie H, Shen B. More pain and slower functional recovery when a tourniquet is used during total knee arthroplasty. *Knee Surg Sports Traumatol Arthrosc.* (2020) 28:1842–60. doi: 10.1007/s00167-019-05617-w
 62. Ricciardi BF, Oi KK, Daines SB, Lee YY, Joseph AD, Westrich GH. Patient and perioperative variables affecting 30-day readmission for surgical complications after hip and knee arthroplasties: a matched cohort study. *J Arthroplasty.* (2017) 32:1074–9. doi: 10.1016/j.arth.2016.10.019
 63. Tie K, Hu D, Qi Y, Wang H, Chen L. Effects of Tourniquet release on total knee arthroplasty. *Orthopedics.* (2016) 39:e642–50. doi: 10.3928/01477447-2016-0606-03
 64. Drolet M, Bénard É, Pérez N, Brisson M. Population-level impact and herd effects following the introduction of human papillomavirus vaccination programmes: updated systematic review and meta-analysis. *Lancet.* (2019) 394:497–509. doi: 10.1016/S0140-6736(19)30298-3
 65. Packer M. Are meta-analyses a form of medical fake news? Thoughts about how they should contribute to medical science and practice. *Circulation.* (2017) 136:2097–9. doi: 10.1161/CIRCULATIONAHA.117.030209

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2022 Zhao, Dong, Zhang, Gao, Zhang, Song, Niu, Li, Chen and Wei. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Sense of Coherence as a Mediator in the Association Between Empathy and Moods in Healthcare Professionals: The Moderating Effect of Age

OPEN ACCESS

Edited by:

Wenjie Duan,

East China University of Science
and Technology, China

Reviewed by:

Abdullah Atli,

İnönü University, Turkey

Timo Lajunen,

Norwegian University of Science
and Technology, Norway

Ewa Wilczek Ruzyczka,

Andrzej Frycz Modrzewski Krakow
University, Poland

*Correspondence:

Junji Ohnishi

johnishi@tokyo-kasei.ac.jp

† Deceased

Specialty section:

This article was submitted to

Positive Psychology,

a section of the journal

Frontiers in Psychology

Received: 02 January 2022

Accepted: 31 March 2022

Published: 25 April 2022

Citation:

Hori M, Yoshikawa E, Hayama D, Sakamoto S, Okada T, Sakai Y, Fujiwara H, Takayanagi K, Murakami K and Ohnishi J (2022) Sense of Coherence as a Mediator in the Association Between Empathy and Moods in Healthcare Professionals: The Moderating Effect of Age. *Front. Psychol.* 13:847381. doi: 10.3389/fpsyg.2022.847381

Miyo Hori¹, Eisho Yoshikawa^{2,3}, Daichi Hayama⁴, Shigeko Sakamoto¹, Tsuneo Okada⁵, Yoshinori Sakai⁶, Hideomi Fujiwara⁷, Kazue Takayanagi⁸, Kazuo Murakami^{1†} and Junji Ohnishi^{1,9*}

¹ Foundation for Advancement of International Science, Tsukuba, Japan, ² Department of Medical Psychology, Nippon Medical School, Tokyo, Japan, ³ Department of Neuropsychology, Nippon Medical School, Tokyo, Japan, ⁴ Faculty of Commerce, Chuo Gakuin University, Chiba, Japan, ⁵ Department of Rehabilitation, Tsuchiura Kyodo General Hospital, Tsuchiura, Japan, ⁶ Department of Gastroenterology, Tsuchiura Kyodo General Hospital, Tsuchiura, Japan, ⁷ Tsuchiura Kyodo General Hospital, Tsuchiura, Japan, ⁸ Japan Society of Healing Environment, Tokyo, Japan, ⁹ Department of Food and Nutrition, Tokyo Kasei University, Tokyo, Japan

While empathy is considered a critical determinant of the quality of medical care, growing evidence suggests it may be associated with both one's own positive and negative moods among healthcare professionals. Meanwhile, sense of coherence (SOC) plays an essential role in the improvement of both psychological and physical health. Reportedly, individual SOC reaches full stability after around age 30. The aim of this study was first to evaluate the mediatory role of SOC on the association between empathy and individual moods among 114 healthcare professionals in a general hospital, and then to examine the moderating effect of age on this association. Participants completed a range of self-report demographic questionnaires, Empathy Process Scale (EPS), the 13-item Antonovsky's SOC, and Profile of Mood States (POMS). Findings showed that SOC mediated the relations between empathy (EPS) and both POMS-Vigor (POMS-V: self-vigor mood) and POMS-Depression (POMS-D: self-depression mood). Notably, moderated mediation analysis revealed that there was a significant interaction (age \times SOC) on self-vigor mood (POMS-V) in healthcare professionals. The indirect effect of empathy (EPS) on self-vigor mood (POMS-V) through SOC was significant at over mean age "32.83." Although there was no significant interaction with age regarding the indirect effect of empathy (EPS) on self-depression mood (POMS-D), in the sub-category level analysis of empathy (EPS), we found a significant interaction item [age \times empathy for other's negative affect (EPS-N)] on SOC. This indirect effect was also significant at over mean age "32.83." Taken, together, the current study highlighted the significant mediator of SOC on that empathy amplifies self-vigor mood and

attenuates self-depression mood as a protective factor among the Japanese healthcare professionals. Some components of these processes may depend on the moderating role of age, indicating that we may need to consider the SOC development with age for more effective empathy performance interventions among healthcare professionals.

Keywords: sense of coherence (SOC), empathy, moods, moderated mediation analysis, healthcare professional, age

INTRODUCTION

The role of empathy in healthcare professionals, as it relates to therapeutic relationships and quality of care in medical hospitals, has been widely discussed (Chaitoff et al., 2017; Wilkinson et al., 2017; Wang et al., 2018; Menezes et al., 2021; Abdulkader et al., 2022). Evidence suggests that clinicians' empathy is associated with strong communication with their patients, higher patient satisfaction, better psychosocial adjustment, lower levels of psychological distress, and enhanced ability to obtain patient information (Leloirain et al., 2012; Boissy et al., 2016). Although definitions of empathy are inconsistent, empathy is generally conceptualized as a multi-faceted construct composed of cognitive and affective components. Cognitive empathy involves taking the perspective of others by attempting to understand and mentally visualize another's point of view and affective states (Davis, 1983; de Waal, 2008; Tibi-Elhanany and Shamay-Tsoory, 2011). Another aspect of cognitive empathy is called empathic accuracy and is the ability to intuit the feelings of others based on their actions and affects (Ickes et al., 1990). Affective empathy is feeling and sharing the affect that another person experiences (Davis et al., 1994), and is also known as empathic concern.

Several lines of evidence have demonstrated that depression is correlated with low cognitive accuracy and empathy, the latter of which is indicated by poor perspective taking—poor ability to perceive or understand a situation from another's point of view (Schreiter et al., 2013). Burnout was regarded as difficult to distinguish from depression (Papathanasiou, 2015), and there was significant empirical evidence of a negative relationship between empathy (both cognitive and affective empathy) and burnout of healthcare professionals (Wilkinson et al., 2017). Furthermore, a neuroimaging study demonstrated that medical professionals' burnout was associated with reduced brain activity related to empathy (Tei et al., 2014).

On the other hand, empathy can prevent depression in healthcare professionals (Halpern, 2003; Zenasni et al., 2012; Lamothe et al., 2014). Lamothe demonstrated that the interaction of empathic processes might serve a protective role against burnout among healthcare professionals (Lamothe et al., 2014). According to Halpern, empathy helps healthcare professionals appreciate the personal meaning of patients' words and maintains their attention on what is significant (Halpern, 2003). Such processes facilitate trust and disclosure, and can be directly therapeutic by enhancing the meaningfulness and satisfaction derived from a career in healthcare. These processes result in prevention of depression and distressing symptoms and promote the personal well-being of healthcare professionals.

A growing number of studies emphasize that daily affective states and moods directly impact on various aspects of people from mental processing (e.g., depression, anxiety) to the social information processing—the way of thinking, judgment, decision-making and interpersonal behavior on the interaction of cognitive and motivational mechanisms (Beedie et al., 2005; Martin and Clore, 2013; Desmet, 2015; Forgas, 2017). Therefore, healthcare professionals also deal with their own emotional states and traits on a daily clinical basis.

Mood and emotion are both monitoring systems that serve related, but different functions in protecting and increasing our own well-being. Although the terms of mood and emotion are used interchangeably, a clear distinction between mood and emotion has been proposed (Martin and Clore, 2013; Desmet, 2015; Forgas, 2017; Bulang et al., 2020; Herz et al., 2020). The key difference is that mood focuses on monitoring the internal state, whereas emotion focuses on monitoring the external stimuli and environment. Some specific events such as opportunities (positive emotion) or threats (negative emotion) can evoke emotions. Because these events generally require our immediate attention, the emotion interrupts "ongoing thought and behavior" with emotion-related action tendencies that empower one to capitalize on the opportunity or neutralize the threat. By contrast, mood is not a response to external stimuli and influences to regulate the balance between one's overall personal resources and one's life challenges, rather than interrupting out ongoing thought and behavior.

The salutogenic theory, proposed by Antonovsky, focuses on the individual's health-promoting resources (Antonovsky, 1979, 1987, 1996). These resources include personal physical capacities, psychological traits, knowledge, immunity, reliability of others, social support, and reward. In this theory, SOC is defined as the ability to comprehend situations in their entirety, and the capacity to use available health-promoting resources, but not as a particular personality trait or coping style (Antonovsky, 1996; Eriksson, 2022). SOC is composed of three components: comprehensibility, manageability, and meaningfulness (Moksness, 2021; Eriksson, 2022). Research has demonstrated that SOC is increased by a therapeutic approach and decreased by traumatic events (Leys et al., 2018; Mc Gee et al., 2018). A meta-analysis including an examination of informal caregivers demonstrated that SOC was an important determinant of caregiver well-being, and might protect caregivers from high levels of psychological distress and burden (del-Pino-Casado et al., 2019). Such evidence demonstrates that SOC plays a role in the prevention of depression.

When seeking to understand the relationship between empathy and SOC, it is necessary to consider the moderating role

of age. According to Antonovsky (Antonovsky, 1987), younger individuals' SOC is not yet fully developed, and is therefore more sensitive to change and disruption. So far it has been suggested that an individual's SOC is built up during childhood and adolescence, and stabilizes around at age 30 (Antonovsky, 1987; Eriksson and Lindström, 2005; Dziuba et al., 2021). Although SOC may be more stable among people over 30 years old than among younger adults, recent studies have notably revealed that SOC at baseline rather develops after age of 30 years throughout individuals' adult life (Feldt et al., 2007a; Nilsson et al., 2010; Dziuba et al., 2021). Furthermore, an fMRI neuroimaging study demonstrated that the neural bases of empathy change across age groups from adolescence to old age (Riva et al., 2018). Therefore, we hypothesize that age will moderate the association between individual's empathy and self-moods through SOC mediation.

In this study, we paid more attention predominantly to a "cognitive" attribute of empathy in the context of medical settings, because a clinically-situated empathy is conceptually different from the general empathy in various social situation (Hojat et al., 2009; Michalec and Hafferty, 2021) and involves an "understanding" of the kind and quality of patients' experiences. Cognitively defined empathy leads to personal growth, career satisfaction, and optimal clinical outcomes (Hojat et al., 2009), while developing SOC improves our ability to thrive in high-stimulus work environments with potential threats against our own well-being (Dames, 2022).

Notably, it is important to consider the difference between empathic process for other's positive and negative affects (Hayama et al., 2008; Sawada and Hayama, 2012). Westman et al. (2013) demonstrated that empathy was associated with crossover of positive affect, but not negative affect, when stimulated by the presentation of an affective story script. Neuroimaging studies showed that neural processing of empathy might differ across the positive and negative effects of others (Balconi and Vanutelli, 2017). Moreover, positive mood states are reported to play an important role in the prevention of depressive mood (Fredrickson et al., 2008; Gruber et al., 2013; Santos et al., 2013). Unlike the known correlates of depressive mood, outcomes associated with positive mood are favorable, including friendship development (Waugh and Fredrickson, 2006), marital satisfaction (Harker and Keltner, 2001), and physical health (Richman et al., 2005).

Therefore, the aims of this study were to test the following three hypotheses:

Hypothesis 1: Empathy correlates with self-vigor or self-depression mood in healthcare professionals.

Hypothesis 2: Empathy correlates with self-vigor or self-depression mood through SOC mediation.

Hypothesis 3: Age moderates the SOC mediation on the relation between empathy and self-moods.

Firstly, we tested these hypotheses by applying one's own positive and negative moods in healthcare professionals. Secondly, the hypotheses were tested by applying the subcategory of empathy (cognitive empathy, affective empathy for other's

negative emotions, and affective empathy for other's positive emotions) to explore the difference between one's own positive and negative mood among healthcare professionals.

These goals will be important to identify elements to fine-tune one's own well-being with a clinically-situated empathy, and to provide useful indications for designing the intervention of empathy skill with SOC development among health professionals.

MATERIALS AND METHODS

Participants

Tschiura Kyodo General Hospital is an 800-bed general hospital that serves as a central medical care facility for Ibaraki prefecture. Participants were recruited at the workshop portion of a hospital-wide training program "Smile Sun Project" for healthcare professionals (Takayanagi et al., 2012). We collected all data from the participants as a pre-training survey before attending the specific training program. Therefore, all participants were treatment-naïve of the training program. Healthcare professionals ($n = 132$) provided written informed consent to participate in the study. All participants were Japanese. Of these 132 potential participants, full data with no missing responses to items related to the scales used in this study were obtained for 114 participants. Of the 114 participants, 36 (31.6%) were men. Mean age was 32.8 years (SD 8.85 range = 21–60). The average age of male participants was 35.57 years (SD 13.14, range = 21–60 years), and that of female participants was 30.64 years (SD 7.31, range = 21–52 years). Participants consisted of nurses ($n = 47$; 41.2%), physical therapists ($n = 28$; 24.6%), medical doctors ($n = 17$; 14.9%), medical clerks ($n = 8$; 7.0%), radiologic technologists ($n = 5$; 4.4%), pharmacists ($n = 4$; 3.5%), medical technologists ($n = 2$; 1.8%), medical social workers ($n = 2$; 1.8%), and a clinical psychologist ($n = 1$; 0.9%).

Measures

Empathy Process Scale

Empathy was evaluated according to the Empathy Process Scale (EPS), which was recently developed by Hayama et al. (2008) based on the Interpersonal Reactivity Index proposed by Davis (1983). This Japanese 30-item questionnaire was designed with six sub-dimension scores to assess both the cognitive and emotional aspects of empathy (Sawada and Hayama, 2012; Ohnishi et al., 2017). This scale focuses on more detailed emotional aspects than that developed by Davis. The emotional aspects of empathy include "Sharing positive emotions with others," "Good feeling for others' positive emotions," "Sharing negative emotions with others," and "Sympathy for others' negative emotions." The cognitive aspects of empathy include "Perspective taking" and "Sensibility about others' emotions." The self-reported responses were provided on a 5-point Likert-type scale with the anchors of 1 = Strongly disagree and 5 = Strongly agree. All six subscales consisted of five items with scores ranging from 5 to 25. In this study we defined three categories of empathy scale: (1) the cognitive aspects of empathy as EPS-C (Empathy Process Scale for Cognition) representing

“Perspective taking” and “Sensibility about others’ emotions”; (2) empathy for other’s positive affects as EPS-P (Empathy Process Scale for other’s Positive affect) representing “Sharing positive emotions with others” and “Good feeling for others’ positive emotions”; (3) empathy for other’s negative affects as EPS-N (Empathy Process Scale for other’s Negative affects) representing “Sharing negative emotions with others,” and “Sympathy for others’ negative emotions.” The internal consistency of the Empathy Process Scale used in this study was demonstrated with a Cronbach’s α of 0.814.

Sense of Coherence

Permission to use Sense of coherence (SOC) questionnaire has been granted through the Society for Theory and Research on Salutogenesis¹. SOC was assessed with a 13-item abbreviated Japanese version of the 29-item Antonovsky’s Orientation to Life Questionnaire (Tsuno et al., 2017). Respondents were asked to rate their level of agreement with each of the items on a 7-point scale. SOC-13 measures the three key aspects of SOC: meaningfulness (4 items), comprehensibility (5 items), and manageability (4 items). The total SOC score is the sum of these items and ranges from 13 to 91. Its sub-dimensions range from 5 to 35 (comprehensibility) and 4–28 (manageability and meaningfulness). The internal consistency of the SOC-13 scale used in this study was demonstrated with a Cronbach’s α of 0.848.

Profile of Mood States

Situational mood was assessed *via* the Profile of Mood States (POMS) short Japanese version (Yokoyama et al., 1990; McNair et al., 1992; Yokoyama, 1994). This short version consists of 30 items that evaluate six emotional subscales: tension-anxiety (5 items), depression-dejection (5 items), anger-hostility (5 items), vigor (5 items), fatigue (5 items), and confusion (5 items). Participants were asked to assess their mood during the past week on a 5-point scale ranging from 0 (never) to 4 (very much) for each item. POMS-Depression (POMS-D) assessed depressive mood. POMS-Vigor (POMS-V) assessed vigorous mood. T-scores were used to assess participants’ mood states (McNair et al., 1992). A T-score conversion table was used to convert the raw score to the T-score. The average T-score for Japanese individuals is 50 points (Yokoyama, 1994). The internal consistency of the POMS scale used in this study was demonstrated with a Cronbach’s α of 0.831.

Statistical Analysis

Analyses were performed using SPSS, version 25 (SPSS Inc., Chicago) and PROCESS 3.2 (Hayes, 2018); with alpha levels set at $p < 0.05$. A Kolmogorov–Smirnov test suggested that all variables except “sharing negative affects with others ($p = 0.061$)” in EPS were not normally distributed. Therefore, Spearman’s rank correlation coefficient (r) was used for bivariate correlation analysis to examine the intercorrelation among age, sex, depression mood state, vigor mood state, SOC, EPS, and subscale as univariate analysis. Regarding the violation of normal distribution in regression analysis, previous studies involving

simulations indicated that linear regression analyses of large samples are valid for any distribution, and are only invalid when the sample size is quite small (Lumley et al., 2002; Hayes, 2018). We therefore analyzed raw data this study. Levene’s test suggested heteroscedasticity, indicating the potential for results to be distorted. However, research involving simulations suggests that minor violations of the homoscedasticity assumption are not a major cause for concern (Hayes, 2018). Therefore, we chose the HC3 heteroscedasticity-consistent standard error estimator, one of the options within the PROCESS macro in SPSS (Hayes and Cai, 2007).

Mediation analysis: **Figure 1A** illustrates the hypothesized mediation model whereby empathy (EPS, and EPS subcategories) affected self-moods (POMS-V and POMS-D) *via* SOC. These mediation analyses were conducted using Model 4 of the PROCESS macro (Hayes and Cai, 2007; Hayes, 2018). This approach tests the regression coefficients for the effects of an independent variable (EPS: empathy) on a dependent variable (POMS: self-mood) were calculated in Step 1 as total effect: the sum of the direct (c') and indirect ($a*b$) effects, an independent variable on a mediator (SOC) in Step 2 (path a), and a mediator

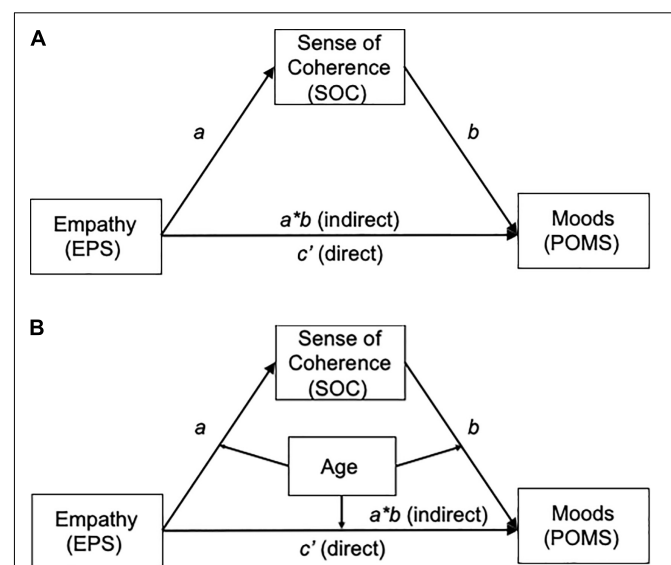


FIGURE 1 | (A) Schematic model of sense of coherence (SOC) as a mediator between empathy (EPS) and self-moods (POMS): the proposed Model 4 adapted from Hayes (2018). X, independent variable; Y, dependent variable; M, mediator. The path a , X (EPS) to M (SOC); the path b , from M (SOC) to Y (POMS). The path c' means the “direct” effect of X (EPS) on Y (POMS) and the path $a*b$ means “indirect” effect of X on Y through M. The total effect of X (EPS) on Y (POMS) means the sum of the direct effect (c') and the indirect effect ($a*b$). EPS, empathy process scale; SOC, sense of coherence; POMS, profile of mood state. **(B)** Schematic model of age as a moderator of the mediation model: the proposed Model 59 adapted from Hayes (2018). X, independent variable; Y, dependent variable; M, mediator; Mo, moderator. The path a , X (EPS) to M (SOC); the path b , from M (SOC) to Y (POMS). The path c' means the “direct” effect of X (EPS) on Y (POMS) and the path $a*b$ means “indirect” effect of X on Y through M. The total effect of X (EPS) on Y (POMS) means the sum of the direct effect (c') and the indirect effect ($a*b$). All pathways are moderated by Mo (age). EPS, Empathy process scale; SOC, Sense of coherence; POMS: Profile of mood state.

¹<https://www.stars-society.org>

on a dependent variable controlling for the independent variable in Step 3 (path *b* and the “direct” effect path *c'*). Then, the sizes of the indirect effects of the mediators were estimated using a bias-corrected bootstrapping method with 5,000 replications, resulting in bootstrap 95% confidence intervals (CIs). An indirect mediation effect was deemed significant when the bootstrap 95% CI excluded zero (equivalent to 0.05 levels). These mediation analyses were conducted using Model 4 of the PROCESS macro (Hayes and Cai, 2007; Hayes, 2018).

Moderated mediation analysis: Figure 1B illustrates the hypothesized moderated mediation model whereby empathy (EPS, and EPS subcategories) affected mood (POMS-V and POMS-D) via SOC, and each association was moderated by age. Model 59 of the PROCESS macro was used for the moderation analysis (Steps 4 and 5) to test whether the indirect paths were moderated by age (Hayes and Cai, 2007). We utilized the simple slopes method to visually represent the moderation when significant interaction associations were detected. These interactions were illustrated by depicting the regression lines of the relation at low (mean – 1 SD), medium (mean), and high scores (mean + 1 SD) of the moderator variable (age). Next, we conducted a *post hoc* analysis using the Johnson–Neyman technique (Preacher et al., 2006; Hayes, 2018) to identify the regions within the range of the moderator variable where the association between variables on the dependent variable was or was not statistically significant. We also analyzed the sub-categories of empathy (EPS-C, EPS-N, and EPS-P). Likewise, moderated mediation indexes were deemed significant if the 95% CI excluded zero (equivalent to 0.05 levels).

RESULTS

Descriptive Statistics

Descriptive statistics and correlations for the measured variables are presented in Table 1. Results indicated that empathy score

(EPS), SOC, and self-vigor mood (POMS-V) were positively interrelated. In addition, both empathy (EPS) and SOC were negatively associated with self-depression mood (POMS-D). We observed significant associations with each measure of three empathy (EPS) sub-categories: the cognitive aspects of empathy (EPS-C), empathy for other's negative affects (EPS-N), and empathy for other's positive affects (EPS-P). SOC was positively associated with both the cognitive aspects of empathy (EPS-C) and empathy for other's positive affects (EPS-P). Self-depression mood (POMS-D) was negatively associated with empathy for other's positive affects (EPS-P). Self-vigor mood (POMS-V) was positively associated with both empathy for other's negative affects (EPS-N) and empathy for other's positive affects (EPS-P).

Empathy on Self-Vigor Mood Through Sense of Coherence

Mediation Analysis

Figure 2 and Table 2 present the mediation effect of SOC on the association between empathy (EPS) and self-vigor mood (POMS-V). As shown in Supplementary Table 1, empathy (EPS) was positively associated with self-vigor mood (POMS-V) (Step 1: total effect $B = 0.19$, $SE = 0.0502$, $t = 3.764$, $p = 0.0003$) and SOC

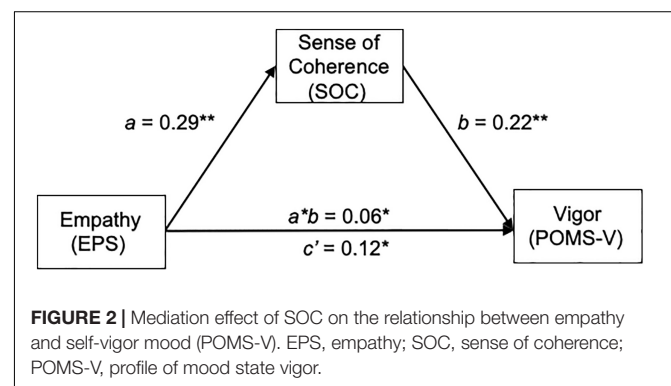


TABLE 1 | Means, standard deviations and correlations among the study variables.

	Age	SOC	POMS-D	POMS-V	EPS	EPS-C	EPS-N	EPS-P
Age								
SOC	0.13							
POMS-D	–0.08	–0.60**						
POMS-V	0.11	0.37**	–0.16					
EPS	–0.05	0.30**	–0.21*	0.31**				
EPS-C	–0.13	0.22*	–0.14	0.18	0.84**			
EPS-N	0.08	0.17	–0.10	0.31**	0.82**	0.53**		
EPS-P	–0.05	0.39**	–0.34**	0.32**	0.84**	0.56**	0.58**	
Means	32.83	54.84	53.91	46.82	113.41	38.12	36.39	38.89
SD	8.86	12.68	12.49	8.81	14.82	5.68	5.52	6.13

SOC, sense of coherence; POMS-D, profile of mood state depression-dejection; POMS-V, profile of mood state vigor; EPS, empathy process scale; EPS-C, empathy process scale for cognition; EPS-N, empathy process scale for other's negative affects; EPS-P, empathy process scale for other's positive affects; SD, standard deviation.

** $p < 0.01$, * $p < 0.05$, $N = 114$.

TABLE 2 | Indirect effect of SOC on the association between empathy (EPS) and depressive (POMS-D) and positive mood (POMS-V).

		B	BootSE	BootLLCI	BootULCI
POMS-V	EPS	0.06	0.03	0.02	0.12
	EPS-C	0.15	0.07	0.03	0.29
	EPS-N	0.11	0.06	0.01	0.23
	EPS-P	0.19	0.07	0.05	0.33
POMS-D	EPS	–0.22	0.06	–0.34	–0.11
	EPS-C	–0.46	0.17	–0.79	–0.12
	EPS-N	–0.33	0.14	–0.62	–0.05
	EPS-P	–0.59	0.13	–0.86	–0.34

B, regression coefficient; SE, standard error; LLCI, lower limit of confidential interval; ULCI, upper limit of confidential interval.

When the bootstrap 95% CI did not include zero, the indirect association was taken to be significant at the 0.05 level.

POMS-D, profile of mood state depression-dejection; POMS-V, profile of mood state vigor; EPS, empathy process scale; EPS-C, empathy process scale for cognition; EPS-N, empathy process scale for other's negative affects; EPS-P, empathy process scale for other's positive affects.

(Step 2: path a $B = 0.29$, $SE = 0.0687$, $t = 4.2634$, $p < 0.001$). Furthermore, both empathy (EPS) and SOC positively predicted self-vigor mood (POMS-V) with significance (Step 3: the direct effect c' $B = 0.1245$, $SE = 0.0519$, $t = 2.398$, $p = 0.0182$, and the path b $B = 0.2202$, $SE = 0.067$, $t = 3.3006$, $p = 0.0013$, respectively). Analysis from bias-corrected bootstrapping with 5,000 samples confirmed a significant positive-indirect effect of empathy (EPS) on the self-vigor mood (POMS-V) through SOC [the indirect effect $a*b$ $B = 0.06$, $BootSE = 0.03$, 95%CI (0.02, 0.12)], as shown in **Table 2**.

Moderated Mediation Analysis

We investigated whether age moderated the mediation effect of SOC on the association between empathy (EPS) and self-vigor mood (POMS-V). SOC was predicted neither by EPS (Step 4: $B = -0.1538$, $SE = 0.2789$, $t = -0.5513$, $p = 0.5825$, **Supplementary Table 1**) nor the interaction effect of empathy (EPS) and age (Step 4: $B = 0.0129$, $SE = 0.0075$, $t = -0.5513$, $p = 0.0915$, **Supplementary Table 1**). Notably, the self-vigor mood (POMS-V) in healthcare professionals was significantly predicted by the interaction effect of SOC and age (Step 5, $B = 0.013$, $SE = 0.0064$, $t = 2.0179$, $p = 0.0461$, **Supplementary Table 1**).

Result of the Johnson–Neyman method indicated that there was a significant positive association between SOC and POMS-V when age exceeded 31.48, but there was no significant association between them in ages under 31.48. Regarding the conditional indirect effect of EPS on POMS-V thorough SOC, bootstrap results indicated no significant indirect effect at mean age -1 SD “23.97” [$B = 0.009$, $BootSE = 0.020$, 95%CI (−0.031, 0.055)], and a significant indirect effect of EPS on POMS-V through SOC score at mean age “32.83” [$B = 0.046$, $BootSE = 0.024$, 95% CI (0.004, 0.096)] and at mean age $+1$ SD “41.69” [$B = 0.110$, $BootSE = 0.039$, 95% CI (0.037, 0.193)].

Empathy on Self-Depression Mood Through Sense of Coherence Mediation Analysis

Figure 3 and **Table 2** present the mediation effect of SOC on the association between empathy (EPS) and self-depression mood (POMS-D). As shown in **Supplementary Table 2**, empathy (EPS)

was significantly associated with self-depression mood (POMS-D) (Step 1: total effect $B = -0.19$, $SE = 0.078$, $t = -2.4665$, $p = 0.0152$) and SOC (Step 2: path a $B = 0.29$, $SE = 0.0687$, $t = 4.2634$, $p < 0.001$). Furthermore, SOC negatively predicted self-depression mood (POMS-D) with significance (Step 3: path b $B = -0.75$, $SE = 0.0815$, $t = -9.212$, $p < 0.001$), whereas the direct effect of empathy (EPS) on self-depression mood (POMS-D) was non-significant (Step 3: the direct effect c' $B = 0.03$, $SE = 0.0634$, $p = 0.4352$), indicating full mediation. Analysis from bias-corrected bootstrapping with 5,000 samples confirmed significant negative-indirect effects of empathy (EPS) on self-depression mood (POMS-D) through SOC [the indirect effect $a*b$ $B = -0.220$, $BootSE = 0.06$, 95%CI (−0.34, −0.11)] in **Table 2**.

Moderated Mediation Analysis

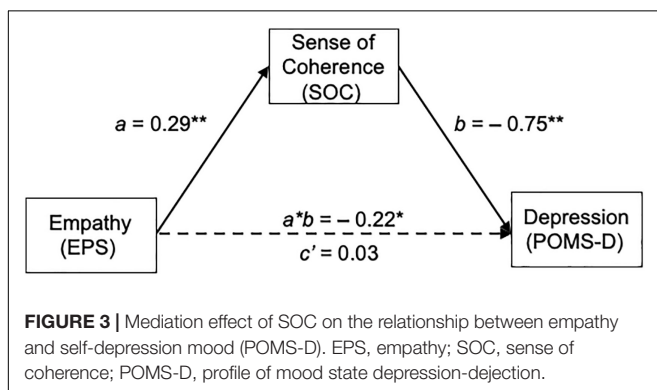
We investigated whether age moderated the mediation effect of SOC on the association between empathy (EPS) and self-depression mood (POMS-D). As shown in **Supplementary Table 2**, there was no significant interaction in [empathy (EPS) \times age] on SOC or (SOC \times age) on the POMS-D.

Sub-Category of Empathy on Depressive Mood Through Sense of Coherence Mediation Analysis

In this study we defined three sub-categories of empathy scale as the cognitive aspects of empathy (EPS-C), empathy for other's negative affects (EPS-N), and empathy for other's positive affects (EPS-P). Therefore, we examined how each sub-category of empathy (EPS-C, EPS-N, and EPS-P) may predict depressive mood in healthcare professionals mediated by SOC. EPS-P was negatively associated with self-depression mood (POMS-D) (step 1: total effect in **Supplementary Table 4**), but neither EPS-C nor EPS-N was associated with POMS-D (step 1: total effect in **Supplementary Tables 3, 5**). All three sub-categories of EPS were positively associated with SOC (Step 2: path a , in **Supplementary Tables 3–5**). The association between SOC and self-depression mood (POMS-D) was significant after adjusting all EPS three sub-categories (Step 3: path b in **Supplementary Tables 3–5**). Analysis from bias-corrected bootstrapping with 5,000 samples confirmed a negative indirect effect of all EPS three sub-categories on both moods through SOC with significant in **Table 2**.

Moderated Mediation Analysis

Among three sub-categories of empathy, there was a significant interaction of (EPS-N \times age) on SOC (step 4 and 5 in **Supplementary Table 5**). The result of the Johnson–Neyman method indicated that there was a significant positive association between SOC and self-depression mood (POMS-D) in ages greater than 33.0 years, while there was no significant association between them ages less than 33.0. Regarding conditional indirect effects of EPS-N on POMS-D mediated by SOC, there was significant indirect effect at mean age “32.83” [$B = -0.277$, $BootSE = 0.141$, 95%CI (−0.566, −0.0103)] and at mean age $+1$ SD “41.69” [$B = -0.626$, $BootSE = 0.0197$, 95%CI (−1.068, −0.291)], but non-significant effect of EPS-N on POMS-D thorough SOC



at mean age -1 SD “23.97” [$B = 0.125$, BootSE 0.226, 95%CI (-0.307 , 0.597)].

DISCUSSION

We tested the moderated mediation model of SOC between empathy and self-mood states among healthcare professionals in a general hospital. Firstly, the current study identified that higher levels of empathy were linked to higher SOC, which was in turn positively related to self-vigor mood of healthcare professionals. This SOC-mediated relation was moderated by age. The moderated mediation model significantly explained approximately 30% ($R^2 = 0.29$ for the SOC mediation and $R^2 = 0.35$ for the SOC \times Age moderation) of self-vigor mood. These results supported our three moderated-mediational hypotheses. Secondly, this SOC-mediated pattern was also observed regarding self-depression mood reduction among healthcare professionals. By contrast, higher empathy was linked to higher SOC, which was then related to lower levels of self-depression mood. This model significantly explained approximately 47% ($R^2 = 0.47$ for the SOC mediation) of self-depression mood, although a moderative effect of age did not occur through this mediation. These results supported our mediational hypotheses 1 and 2, but not moderation hypothesis 3. Thirdly, regarding the empathy for other's negative affections (EPS-N: the subcategories of empathy), age might function as a moderator on the SOC-mediated association between ESP-N and self-depression mood. Collectively, empathy in healthcare professionals might promote self-vigor and might serve a preventative role against self-depression mood mediated through SOC. Some parts of the process depended on age.

Interestingly, the boundary between significant and insignificant associations was correlated with the age of around 30 years—the same as has been identified as the age at which development of an individual's SOC is more stable. The current results notably suggest that SOC may not interfere with self-vigor mood until SOC is fully established. In other words, it might be difficult for younger healthcare professionals who have less clinical experience and are less skilled in using empathy as a resource in their healthcare context, which makes it difficult to increase self-vigor mood from SOC. Age may co-vary with the accumulation of various life experience, including clinical experience. Therefore, it might be speculated that developing SOC *via* empathy for other's affections in medical care is related to an experience accumulated with age, and in turn regulates to increase self-vigor mood.

Sense of coherence is an individual's way of thinking, being, and acting on a one's view of life and ability to respond to stressful environments with promoting health and well-being (Krok, 2020; Eriksson, 2022). Developing SOC will lead people to identify one's internal and external resources during one's life stage. Further, thinking and understanding why and how resources work will allow one for more flexible use of resources and define what goals should be pursued. Therefore, SOC is closely related with the individual's perception of

one's ability to behave through cognitive (*Comprehensibility* of SOC) and motivational (*Meaningfulness* of SOC) processes (Moksness, 2021; Shorey and Lopez, 2021). These concepts of SOC seem to be parallel with the concept of mindfulness, that has currently been proposed as another concept for the implementation of healthcare professionals' well-being (Grevenstein et al., 2018; Dames, 2022). Both focus on the meta-cognitive development, emphasizing a sharpened awareness of present phenomena, free of insecure attachments, constant practice of moving from subjective thinking mind to the objective sensing mind. Meta-cognition is thinking about one's thinking and having a meta-cognition habit of mind is essential for healthcare professionals. Developing skills in meta-cognition may also benefit for SOC growing among health professionals (Eichbaum, 2014; Medina et al., 2017; Versteeg et al., 2021).

Similarly, empathy promotes comprehension of the personal meanings of patients' distress in the process of providing healthcare (Halpern, 2003). This understanding may promote high quality of care as well as result in improved self-management among healthcare professionals. Empathy may make providing healthcare more meaningful and enhance the provider's satisfaction. In turn, this meaningfulness in their daily work may promote self-vigor mood states.

We should discuss the potential alternative relationship among empathy, SOC, and self-vigor mood or self-depression mood, because causal relationships between these factors could not be determined due to the cross-sectional nature of the study design. First, previous reports suggested that SOC was correlated with the Big Five personality traits, and at least some components of SOC might reflect the interplay of these fundamental Big Five traits as the predictor of psychological well-being (Feldt et al., 2007b; Hochwälder, 2012; Kase et al., 2018; Leys et al., 2018; Mc Gee et al., 2018). However, based on Antonovsky's salutogenic theory, SOC concept has been emphasized to focus on entire person and salutary factors rather than a personality trait or a coping strategy (Antonovsky, 1996). The accumulating evidences indicated that SOC independently predicted mental health related to factors other than the Big Five personality traits (Grevenstein and Bluemke, 2015; Grevenstein et al., 2018). Second, it is also possible that SOC is associated with both self-vigor mood and self-depression mood mediated through empathy. However, the findings of the current study do not seem to support such mediation models due to the absence of significant indirect association in such mediation models (data not shown). Third, it is plausible that self-depression mood may affect empathy. Schreiter et al. (2013) proposed that depression promoted empathic stress, which was evoked by imagining how someone would react when presented with another person's stressful situation, resulting in decreased empathy. Cognitive distortion, such an interpretation bias of depression, might affect cognitive empathy (Wisco and Nolen-Hoeksema, 2010). On the other hand, positive emotions may also affect empathy. Waugh and Fredrickson (2006) demonstrated that positive affects predicted a complex understanding of one's roommate, which carried implications for the role of positive affects in the formation of new relationships between

college students. These processes suggested that positive affects promote empathy. Although we measured trait empathy, not context-induced state empathy, we cannot dismiss the possibility that these possible associations of self-vigor mood and self-depression mood affected the measurement of empathy in the current study.

The results of the present study implied differences between self-vigor mood and self-depression mood through empathy. Empathy for others' positive emotions (EPS-P) affected the self-depression mood of healthcare professionals of any age through SOC. Meanwhile, we observed no significant effect of empathy for others' negative emotions (EPS-N) on the self-depression mood of younger healthcare professionals (<24 years old). Empathy was suggested to be associated with a crossover of positive affects, but not negative affects, in a study involving participants who were young army trainees with an age of 18 or 19 years (Westman et al., 2013). There are intervention programs for healthcare professionals to improve empathic behaviors, and a systematic review suggested that they bring about significant improvement, although the type of intervention that would be effective remains unclear (Kiosses et al., 2016).

This study thereby makes an original contribution to the literature: as an empathy-organizing model we integrated the individual empathy skill and SOC growth with age to fine-tune one's own emotional regulation among healthcare professionals, which may increase vigor mood and dampens depression mood for leading to beneficial consequences of well-being states.

Limitations

This study had several limitations beyond those already mentioned. First, the moderation analysis was based on the assumption of the temporal precedence of the moderators of empathy and sense of coherence (and mood state) (Kraemer et al., 2008). Although the significant moderating association of age is consistent with this view, our correlational methodology does not rule out a different temporal sequence. Second, all of the information was self-reported, and non-differential misclassification may be inevitable and could attenuate the observed associations. Third, all participants were Japanese, and were of varied vocations and levels of training (i.e., medical doctor, nurse, and others), rather than members of a single medical discipline. Additionally, results may be distorted by the sampling method. Restricting the sample to healthcare professionals from a single institute in one Japanese prefecture may pose a risk to the validity of the obtained data by leaving open the possibility that the participants are not representative of healthcare professionals more generally. Finally, residual confounding by uncontrolled or unmeasured factors may have distorted the results of the analysis.

CONCLUSION

The results of the current study suggested that empathy in healthcare professionals might promote self-vigor mood,

and might serve a protective role against self-depression mood mediated through SOC. However, among younger healthcare professionals, SOC might not mediate the association between empathy and self-vigor mood, and the association between empathy for other's negative affects and self-vigor/depression moods.

Collectively, the current study indicated the importance of individual differences such as the growth level of SOC among healthcare professionals. It can potentially contribute to the intervention design and implementation to regulate the empathy skills, especially for keeping psychological well-being with considering the individual age-related SOC developing. Further longitudinal studies, including examinations of interventions for the clinically-situated empathy and SOC development, are needed to elucidate causality of the association among empathy, SOC, and self-vigor/depression moods.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Tsuchiura Kyodo General Hospital. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MH, SS, TO, YS, HF, KT, KM, and JO contributed to conception and design of the study. SS organized the database. EY and DH performed the statistical analysis. JO and EY wrote the first draft of the manuscript. MH wrote sections of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

FUNDING

This study was supported by Mind and Gene Institute of Foundation for Advancement of International Science, Grant-in-Aid for Scientific Research (B)s 17H02171 and 23300249. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.847381/full#supplementary-material>

REFERENCES

- Abdulkader, R. S., Venugopal, D., Jeyashree, K., Zayer, Z. A., Kanan, S., and Jebitha, R. (2022). The intricate relationship between client perceptions of physician empathy and physician self-assessment: lessons for reforming clinical practice. *J. Patient Exp.* 9, 1–10. doi: 10.1177/23743735221077537
- Antonovsky, A. (1979). *Health, Stress and Coping*. San Francisco, CA: Jossey-Bass.
- Antonovsky, A. (1987). *Unraveling the Mystery of Health—How People Manage Stress and Stay Well*. San Francisco, CA: Jossey-Bass.
- Antonovsky, A. (1996). The salutogenic model as a theory to guide health promotion. *Health Promot. Intl.* 11, 11–18. doi: 10.1093/heapro/11.1.11
- Balconi, M., and Vanutelli, E. (2017). Empathy in negative and positive interpersonal interactions. What is the relationship between central (EEG, fNIRS) and peripheral (autonomic) neurophysiological responses? *Adv. Cogn. Psychol.* 13, 105–120. doi: 10.5709/acp-0211-0
- Beedie, C., Terry, P., and Lane, A. (2005). Distinctions between emotion and mood. *Cogn. Emot.* 19, 847–878. doi: 10.1080/02699930541000057
- Boissy, A., Windover, A. K., Bokar, D., Karafa, M., Neuendorf, K., Frankel, R. M., et al. (2016). Communication skills training for physicians improves patient satisfaction. *J. Gen. Intern. Med.* 31, 755–761. doi: 10.1007/s11606-016-3597-2
- Bulgang, A. F., Weng, N. G., Mountstephens, J., and Teo, J. (2020). A review of recent approaches for emotion classification using electrocardiography and electrodermography signals. *Inform. Med. Unlocked* 20:100363. doi: 10.1016/j.imu.202.100363
- Chaitoff, A., Sun, B., Windover, A., Bokar, D., Featherall, J., Rothberg, M. B., et al. (2017). Associations between physician empathy, physician characteristics, and standardized measures of patient experience. *Acad. Med.* 92, 1464–1471. doi: 10.1097/ACM.0000000000001671
- Dames, S. (2022). *Root Strength: A Health and Care Professionals' Guide to Minimizing Stress and Maximizing Thriving (eBook)*. Amsterdam: Elsevier Inc.
- Davis, M. H. (1983). Measuring individual differences in empathy: evidence for a multidimensional approach. *J. Pers. Soc. Psychol.* 44, 113–126. doi: 10.1037/0022-3514.44.1.113
- Davis, M. H., Luce, C., and Kraus, S. J. (1994). The heritability of characteristics associated with dispositional empathy. *J. Pers.* 62, 369–391. doi: 10.1111/j.1467-6494.1994.tb00302.x
- de Waal, F. B. (2008). Putting the altruism back into altruism: the evolution of empathy. *Annu. Rev. Psychol.* 59, 279–300. doi: 10.1146/annurev.psych.59.103006.093625
- del-Pino-Casado, R., Espinosa-Medina, A., López-Martínez, C., and Orgeta, V. (2019). Sense of coherence, burden and mental health in caregiving: a systematic review and meta-analysis. *J. Affect. Disord.* 242, 14–21. doi: 10.1016/j.jad.2018.08.002
- Desmet, P. M. (2015). Design for mood: twenty activity-based opportunities to design for mood regulation. *Int. J. Design.* 9, 1–19.
- Dziuba, A., Krell-Roesch, J., Schmidt, S. C. E., Bos, K., and Woll, A. (2021). Association between sense of coherence and health outcomes at 10 and 20 years follow-up: a population-based longitudinal study in Germany. *Front. Pub. Health* 9:739394. doi: 10.3389/fpubh.2021.739394
- Eichbaum, Q. (2014). Thinking about thinking and emotion: the metacognitive approach to the medical humanities that integrates the humanities with the basic and clinical sciences. *Perm. J.* 18, 64–75. doi: 10.7812/TPP/14-027
- Eriksson, M. (2022). “The sense of coherence: the concept and its relationship to health,” in *The Handbook of Salutogenesis*, second Edn, eds M. B. Mittelmark, G. F. Bauer, L. Vaandrager, J. M. Pelikan, S. Sagy, M. Eriksson, et al. (Cham: Springer), 61–68.
- Eriksson, M., and Lindström, B. (2005). Validity of Antonovsky's sense of coherence scale: a systematic review. *J. Epidemiol. Commun. Health* 59, 460–466. doi: 10.1136/jech.2003.018085
- Feldt, T., Lintula, H., Suominen, S., Koskenvuo, M., Vahtera, J., and Kivimäki, M. (2007a). Structural validity and temporal stability of the 13-item sense of coherence scale: prospective evidence from the population-based HeSSup study. *Qual. Life Res.* 16, 483–493. doi: 10.1007/s11136-006-9130-z
- Feldt, T., Metsapelto, R.-L., Kinnunen, U., and Pulkkinen, L. (2007b). Sense of coherence and five-factor approach to personality. *Eur. Psychol.* 12:165. doi: 10.1027/1016-9040.12.3.165
- Forgas, J. P. (2017). “Mood effects on cognition: affective influences on the content and process of information processing and behavior,” in *Emotions and Affect in Human Factors and Human-Computer Interaction*, ed. M. Jeon (London: Elsevier), 89–122.
- Fredrickson, B. L., Cohn, M. A., Coffey, K. A., Pek, J., and Finkel, S. M. (2008). Open hearts build lives: positive emotions, induced through loving-kindness meditation, build consequential personal resources. *J. Pers. Soc. Psychol.* 95, 1045–1062. doi: 10.1037/a0013262
- Grevenstein, D., Aguilar-Raab, C., and Bluemke, M. (2018). Mindful and resilient? incremental validity of sense of coherence over mindfulness and Big Five personality factors for quality of life outcomes. *J. Happiness Stud.* 19, 1883–1902. doi: 10.1007/s10902-017-9901-y
- Grevenstein, D., and Bluemke, M. (2015). Can the Big Five explain the criterion validity of sense of coherence for mental health, life satisfaction, and personal distress? *Pers. Individ. Dif.* 77, 106–111. doi: 10.1016/j.paid.2014.12.053
- Gruber, J., Kogan, A., Quoidbach, J., and Mauss, I. B. (2013). Happiness is best kept stable: positive emotion variability is associated with poorer psychological health. *Emotion.* 13, 1–6. doi: 10.1037/a0030262
- Halpern, J. (2003). What is clinical empathy? *J. Gen. Intern. Med.* 18, 670–674. doi: 10.1046/j.1525-1497.2003.21017.x
- Harker, L., and Keltner, D. (2001). Expressions of positive emotion in women's college yearbook pictures and their relationship to personality and life outcomes across adulthood. *J. Pers. Soc. Psychol.* 80, 112–124.
- Hayama, D., Uemura, M., Hagiwara, T., Ohuchi, A., Oikawa, C., Suzuki, T., et al. (2008). Development of an empathic process scale. *Tsukuba Psychol. Res.* 36, 47–56.
- Hayes, A. F. (2018). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 2nd Edn. New York, NY: Guilford Press.
- Hayes, A. F., and Cai, L. (2007). Using heteroskedasticity-consistent standard error estimators in OLS regression: an introduction and software implementation. *Behav. Res. Methods* 39, 709–722. doi: 10.3758/BF03192961
- Herz, N., Baror, S., and Bar, M. (2020). Overarching states of mind. *Trend Cogn. Sci.* 24, 184–199. doi: 10.1016/j.tics.2019.12.015
- Hochwälder, J. (2012). The contribution of the big five personality factors to sense of coherence. *Pers. Individ. Dif.* 53, 591–596.
- Hojat, M., Vergare, M. J., and Maxwell, K. (2009). The devil is in the third year: a longitudinal study of erosion of empathy in medical school. *Acad. Med.* 84, 1182–1191. doi: 10.1097/ACM.0b013e3181b17e55
- Ickes, W., Stinson, L., Bissonnette, V., and Garcia, S. (1990). Naturalistic social cognition: empathic accuracy in mixed-sex dyads. *J. Pers. Soc. Psychol.* 59, 730–742.
- Kase, T., Ueno, Y., and Oishi, K. (2018). The overlap of sense of coherence and the big five personality traits: a confirmatory study. *Health Psychol. Open* 5, 1–4. doi: 10.1177/2055102918810654
- Kiosses, V. N., Karathanos, V. T., and Tatsioni, A. (2016). Empathy promoting interventions for health professionals: a systematic review of RCTs. *J. Compassionate Health Care* 3:7. doi: 10.1186/s40639-016-0024-9
- Kraemer, H. C., Kiernan, M., Essex, M., and Kupfer, D. J. (2008). How and why criteria defining moderators and mediators differ between the Baron & Kenny and MacArthur approaches. *Health Psychol.* 27, S101–S108. doi: 10.1037/0278-6133.27.2(Suppl.).S101
- Krok, D. (2020). Sense of coherence and psychological well-being among coronary heart disease patients: a moderated mediation model of affect and meaning in life. *Curr. Psychol.* [Epub ahead of print]. doi: 10.1007/s12144-020-00982-z
- Lamothe, M., Boujut, E., Zenasni, F., and Sultan, S. (2014). To be or not to be empathic: the combined role of empathic concern and perspective taking in understanding burnout in general practice. *BMC Fam. Pract.* 15:15. doi: 10.1186/1471-2296-15-15
- Leloirain, S., Brédart, A., Dolbeault, S., and Sultan, S. (2012). A systematic review of the associations between empathy measures and patient outcomes in cancer care. *Psychooncology.* 21, 1255–1264. doi: 10.1002/pon.2115
- Lays, C., Arnal, C., Wollast, R., Rolin, H., Kotsou, I., and Fossion, P. (2018). Perspectives on resilience: personality trait or skill? *Eur. J. Trauma Dissociation* 4:100074. doi: 10.1016/j.ejtd.2018.07.002
- Lumley, T., Diehr, P., Emerson, S., and Chen, L. (2002). The importance of the normality assumption in large public health data sets. *Annu. Rev. Public Health* 23, 151–169. doi: 10.1146/annurev.publhealth.23.100901.140546
- Martin, J., and Clore, G. L. (2013). *Theories of Mood and Cognition. A User's Guidebook*. Hoboken, NJ: Taylor and Francis.

- Mc Gee, S. L., Hölte, J., Maercker, A., and Thoma, M. V. (2018). Sense of coherence and stress-related resilience: investigating the mediating and moderating mechanisms in the development of resilience following stress or adversity. *Front. Psychiatry* 9:378. doi: 10.3389/fpsy.2018.00378
- McNair, D. M., Lorr, M., and Droppleman, L. F. (1992). *Edits Manual for the Profile of Mood States*. San Diego, CA: Educational and Industrial Service.
- Medina, M. S., Castleberry, A. N., and Persky, A. M. (2017). Strategies for improvement learner metacognition in health professional education. *Am. J. Pharm. Educ.* 81, 1–14. doi: 10.5688/ajpe81478
- Menezes, P., Guraya, S. Y., and Guraya, S. S. (2021). A systematic review of educational interventions and their impact on empathy and compassion of undergraduate medical students. *Front. Med.* 8:758377. doi: 10.3389/fmed.2021.758377
- Michalec, B., and Hafferty, F. W. (2021). Challenging the clinically-situated emotion-deficient version of empathy within medicine and medical education research. *Soc. Theory Health* 21, 1–19. doi: 10.1057/s41285-021-00174-0
- Mokness, U. K. (2021). "Sense of coherence," in *Health Promotion in Health Care-Vital Theories and Reserch*, eds G. Haugan and M. Wriksson (Cham: Springer), 35–46.
- Nilsson, K. W., Leppert, J., Simonsson, B., and Starrin, B. (2010). Sense of coherence and psychological well-being: improvement with age. *J. Epidemiol. Commun. Health* 64, 347–352. doi: 10.1136/jech.2008.081174
- Ohnishi, J., Ayuzawa, S., Nakamura, S., Sakamoto, S., Hori, M., Sasaoka, T., et al. (2017). Distinct transcriptional and metabolic profiles associated with empathy in Buddhist priests: a pilot study. *Hum. Genomics* 11:21. doi: 10.1186/s40246-017-0117-3
- Papathanasiou, I. V. (2015). Work-related mental consequences: implications of burnout on mental health status among health care providers. *Acta Inform. Med.* 23, 22–28. doi: 10.5455/aim.2015.23.22-28
- Preacher, K. J., Curran, P. J., and Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. *J. Educ. Behav. Statist.* 31, 437–448. doi: 10.3102/10769986031004437
- Richman, L. S., Kubzansky, L., Maselko, J., Kawachi, I., Choo, P., and Bauer, M. (2005). Positive emotion and health: going beyond the negative. *Health Psychol.* 24, 422–429. doi: 10.1037/0278-6133.24.4.422
- Riva, F., Tschernegg, M., Chiesa, P. A., Wagner, I. C., Kronbichler, M., Lamm, C., et al. (2018). Age-related differences in the neural correlates of empathy for pleasant and unpleasant touch in a female sample. *Neurobiol. Aging* 65, 7–17. doi: 10.1016/j.neurobiolaging.2017.12.028
- Santos, V., Paes, F., Pereira, V., Arias-Carrión, O., Silva, A. C., Carta, M. G., et al. (2013). The role of positive emotion and contributions of positive psychology in depression treatment: systematic review. *Clin. Pract. Epidemiol. Ment. Health* 9, 221–237. doi: 10.2174/1745017901309010221
- Sawada, M., and Hayama, D. (2012). Dispositional vengeance and anger on schadenfreude. *Psychol. Rep.* 111, 322–334. doi: 10.2466/16.07.21.PR0.111.4.322-334
- Schreier, S., Pijnenborg, G. H., and Aan Het Rot, M. (2013). Empathy in adults with clinical or subclinical depressive symptoms. *J. Affect. Disord.* 150, 1–16. doi: 10.1016/j.jad.2013.03.009
- Shorey, S., and Lopez, V. (2021). "Self-efficacy in a nursing education," in *Health Promotion in Health Care-Vital Theories and Reserch*, eds G. Haugan and M. Wriksson (Cham: Springer), 145–158.
- Takayanagi, K., Shimura, T., Iwabuchi, K., Fujiwara, H., Ohnishi, J., Ishii, K., et al. (2012). Laughter education for implementation of the smile-sun method to promote natural healing in public and healthcare facilities. *Jpn. Hosp.* 31, 57–61.
- Tei, S., Becker, C., Kawada, R., Fujino, J., Jankowski, K. F., Sugihara, G., et al. (2014). Can we predict burnout severity from empathy-related brain activity? *Transl. Psychiatry* 4:e393. doi: 10.1038/tp.2014.34
- Tibi-Elhanany, Y., and Shamay-Tsoory, S. G. (2011). Social cognition in social anxiety: first evidence for increased empathic abilities. *Isr. J. Psychiatry Relat. Sci.* 48, 98–106.
- Tsuno, Y. S., Togari, T., and Yamazaki, Y. (2017). "Perspectives on salutogenesis of scholars writing in Japanese," in *The Handbbok of Salutogenesis*, ed. M. B. Mittelmark (Cham: Springer).
- Versteeg, M., Bressers, G., Wijnen-Meijer, M., Ommering, B. W. C., de Beaufort, A. J., and Steendijk, P. (2021). What wer you thinking? medical students' metacognition and perceptions of self-regulated learning. *Teach. Learn. Med.* 33, 473–482. doi: 10.1080/10401334.2021.1889559
- Wang, H., Kline, J. A., Jackson, B. E., Laureano-Phillips, J., Robinson, R. D., Cowden, C. D., et al. (2018). Association between emergency physician self-reported empathy and patient satisfaction. *PLoS One* 13:e0204113. doi: 10.1371/journal.pone.0204113
- Waugh, C. E., and Fredrickson, B. L. (2006). Nice to know you: positive emotions, self-other overlap, and complex understanding in the formation of a new relationship. *J. Posit Psychol.* 1, 93–106. doi: 10.1080/17439760500510569
- Westman, M., Shadach, E., and Keinan, G. (2013). The crossover of positive and negative emotions: the role of state empathy. *Inter. J. Stress Manag.* 20, 116–133. doi: 10.1037/a0033205
- Wilkinson, H., Whittington, R., Perry, L., and Eames, C. (2017). Examining the relationship between burnout and empathy in healthcare professionals: a systematic review. *Burnout Res.* 6, 18–29. doi: 10.1016/j.burn.2017.06.003
- Wisco, B. E., and Nolen-Hoeksema, S. (2010). Interpretation bias and depressive symptoms: the role of self-relevance. *Behav. Res. Ther.* 48, 1113–1122. doi: 10.1016/j.brat.2010.08.004
- Yokoyama, K. (1994). *A Guide Book of Japanese Version of POMS (Profile of Mood State)*. Tokyo: Kaneko Shobo.
- Yokoyama, K., Araki, S., Kawakami, N., and Takeshita, T. (1990). Production of the Japanese edition of profile of mood states (POMS): assessment of reliability and validity. *Nihon Koshu Eisei Zasshi* 37, 913–918.
- Zenasni, F., Boujut, E., Woerner, A., and Sultan, S. (2012). Burnout and empathy in primary care: three hypotheses. *Br. J. Gen. Pract.* 62, 346–347. doi: 10.3399/bjgp12X652193

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2022 Hori, Yoshikawa, Hayama, Sakamoto, Okada, Sakai, Fujiwara, Takayanagi, Murakami and Ohnishi. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Clinical Efficacy and Safety of Surgical Treatments in Patients With Pure Cervical Radiculopathy

Quan-You Gao^{1,2,3†}, Fei-Long Wei^{2†}, Kai-Long Zhu^{2†}, Cheng-Pei Zhou², Hu Zhang⁴, Wen-Xing Cui⁵, Tian Li^{4*}, Ji-Xian Qian^{2*} and Ding-Jun Hao^{3*}

¹ Health Science Center of Xi'an Jiaotong University, Xi'an, China, ² Department of Orthopedics, Tangdu Hospital, Fourth Military Medical University, Xi'an, China, ³ Department of Spine Surgery, Honghui Hospital, Xi'an Jiao Tong University, Xi'an, China, ⁴ School of Basic Medicine, Fourth Military Medical University, Xi'an, China, ⁵ Department of Neurosurgery, Tangdu Hospital, Fourth Military Medical University, Xi'an, China

OPEN ACCESS

Edited by:

Guannan Bai,
Zhejiang University School of
Medicine, China

Reviewed by:

Bo Li,
Sun Yat-Sen Memorial Hospital, China
Lun Li,
Shanghai Cancer Center, Fudan
University, China

*Correspondence:

Ding-Jun Hao
haodjingjun@126.com
Ji-Xian Qian
pasmiss2012@163.com
Tian Li
fmmult@foxmail.com

[†]These authors have contributed
equally to this work

Specialty section:

This article was submitted to
Public Mental Health,
a section of the journal
Frontiers in Public Health

Received: 08 March 2022

Accepted: 21 June 2022

Published: 14 July 2022

Citation:

Gao Q-Y, Wei F-L, Zhu K-L, Zhou C-P,
Zhang H, Cui W-X, Li T, Qian J-X and
Hao D-J (2022) Clinical Efficacy and
Safety of Surgical Treatments in
Patients With Pure Cervical
Radiculopathy.
Front. Public Health 10:892042.
doi: 10.3389/fpubh.2022.892042

Background: Traditionally paired meta-analysis revealed inconsistencies in the safety and effectiveness of surgical interventions. We conducted a network meta-analysis to assess various treatments' clinical efficacy and safety for pure cervical radiculopathy.

Methods: The Embase, PubMed, and Cochrane Library databases were searched for randomized controlled trials (RCTs) comparing different treatment options for patients with pure cervical radiculopathy from inception until October 23, 2021. The primary outcomes were postoperative success rates, postoperative complication rates, and postoperative reoperation rates. The pooled data were subjected to a random-effects consistency model. The protocol was published in PROSPERO (CRD42021284819).

Results: This study included 23 RCTs ($n = 1,844$) that evaluated various treatments for patients with pure cervical radiculopathy. There were no statistical differences between treatments in the consistency model in terms of major clinical effectiveness and safety outcomes. Postoperative success rates were higher for anterior cervical foraminotomy (ACF: probability 38%), posterior cervical foraminotomy (PCF: 24%), and anterior cervical discectomy with fusion and additional plating (ACDFP: 21%). Postoperative complication rates ranked from high to low as follows: cervical disc replacement (CDR: probability 32%), physiotherapy (25%), ACF (25%). Autologous bone graft (ABG) had better relief from arm pain (probability 71%) and neck disability (71%). Among the seven surgical interventions with a statistical difference, anterior cervical discectomy with allograft bone graft plus plating (ABGP) had the shortest surgery time.

Conclusions: According to current results, all surgical interventions can achieve satisfactory results, and there are no statistically significant differences. As a result, based on their strengths and patient-related factors, surgeons can exercise discretion in determining the appropriate surgical intervention for pure cervical radiculopathy.

Systematic Review Registration: CRD42021284819.

Keywords: cervical radiculopathy, surgical treatments, spine surgery, efficacy, safety

INTRODUCTION

Cervical radiculopathy is an aging-related disease that typically manifests as neck and shoulder pain (1). The age-adjusted incidence of cervical radiculopathy is 83 per 100,000 people, with men having a slightly higher incidence than women (2). Cervical radiculopathy could be attributed to cervical disks degeneration, cervical disc herniation, osteophytosis of the vertebral bodies, hypertrophy of the facets and laminal arches, ligamentous and segmental instability, and other factors that cause nerve root compression. The most common causes of cervical radiculopathy are degenerative changes in the intervertebral disks and osteophytosis of the vertebral bodies (3, 4). Cervical radiculopathy has a significant impact on the quality of life of the elderly.

Conservative treatment is the first option to treat myelopathy or severe muscle weakness (5). Conservative treatments commonly used include immobilization, anti-inflammatory drugs, physical therapy, and cervical traction. Cervical radiculopathy is a self-limiting disease. Non-surgical treatments relieve symptoms of cervical radiculopathy in more than half of patients (5, 6). Surgical treatments are recommended for patients not responding to conservative treatment (1).

Some meta-analyses compared the effectiveness of surgical treatments for cervical radiculopathy. However, many studies failed to differentiate between patients with myelopathy and those with nerve root symptoms, resulting in unreliable research findings (7–11). Three recent systematic reviews assessed the surgical management of cervical radiculopathy (12–14). Two of these studies only compared two or three types of surgeries (12, 13). Another study performed a paired meta-analysis and did not comprehensively assess the surgical methods used (14). No comprehensive comparison has been conducted to determine which surgery is most beneficial for patients. As a result, evidence-based recommendations are critical to guide clinical practice. To address the limitations of traditionally paired meta-analysis, we developed this network meta-analysis, which can collect data from clinical trials of at least two interventions simultaneously by including direct and indirect information and strengthening inferences on relative efficacy. We presented a comprehensive network meta-analysis comparing the safety and effectiveness of various interventions to provide evidence-based guidance for physicians and patients.

METHODS

Data Sources and Search Strategy

This was a meta-analysis of randomized clinical trials (RCTs) conducted according to the Cochrane Handbook for Systematic Reviews of Interventions and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (15) and Assessing the methodological quality of systematic reviews (AMSTAR) guidelines (16). The Embase, PubMed, and Cochrane Library databases were searched with no language limitations from inception to October 23, 2021. The search strategy is described in detail in **Supplementary Table 1**. Following the

preliminary screening of titles and abstracts, two independent reviewers assessed related publications. The protocol of this study was published and registered in PROSPERO (CRD42021284819).

Selection Criteria and Study Design

The studies were screened according to the PICOS (population, intervention, comparison, outcome, study design) criteria. The selection criteria are detailed in **Supplementary Table 2**.

Data Extraction and Outcomes

We extracted data from the included articles, including investigator characteristics, surgical methods, participant characteristics, and main results. Two authors independently worked on this section. The primary outcomes were postoperative success rates, postoperative complication rates, and postoperative reoperation rates. The secondary outcomes included postoperative work status, arm and neck pain scores, the neck disability index (NDI), and surgery time.

Quality and Risk of Bias Assessment

The Cochrane Collaboration risk-of-bias assessment tool (17) was used by two reviewers to evaluate the included studies for potential bias independently. Disagreements between the two investigators were resolved by bringing in a third investigator. The overall risk of bias is calculated and classified as “high risk,” “low risk,” or “unclear risk.” The tool to assess the risk of bias has been described in detail in **Supplementary Table 3**.

Data Synthesis and Statistical Analysis

Firstly, a random-effects model was used for pairwise analysis to pool relative risks (RRs) or mean difference (MD) and 95% confidence intervals (CIs) (18). $P < 0.05$ was considered significant. Forest plots and I^2 were used to explore sources of heterogeneity (19). Secondly, the network geometry was generated using Stata version 16.0 (Stata Corp). Then a Bayesian network meta-analysis was performed using Markov chain Monte Carlo methods in WinBUGS version 1.4.3 (MRC Biostatistics Unit, Cambridge, United Kingdom) (20) using a random-effects consistency model (21). Each surgical intervention's safest and most effective probability was ranked first, followed by second, third, etc., based on the average difference and the risk ratio. As the stability of the results is crucial for network meta-analysis, we used various methods to assess the inconsistency of the results.

The consistency and inconsistency models are compared, and the inconsistency is initially estimated roughly. The entire network on detailed comparisons (nodes) was tested by node splitting analysis; $P < 0.05$ manifested a significant inconsistency. The indirect results (network meta-analysis results) were then compared with the pairwise direct results (meta-analysis results) to determine the source of the inconsistency. The intervertebral spacer was used to conduct a sensitivity analysis of anterior cervical discectomy and fusion (ACDF) (Zero-P and the other).

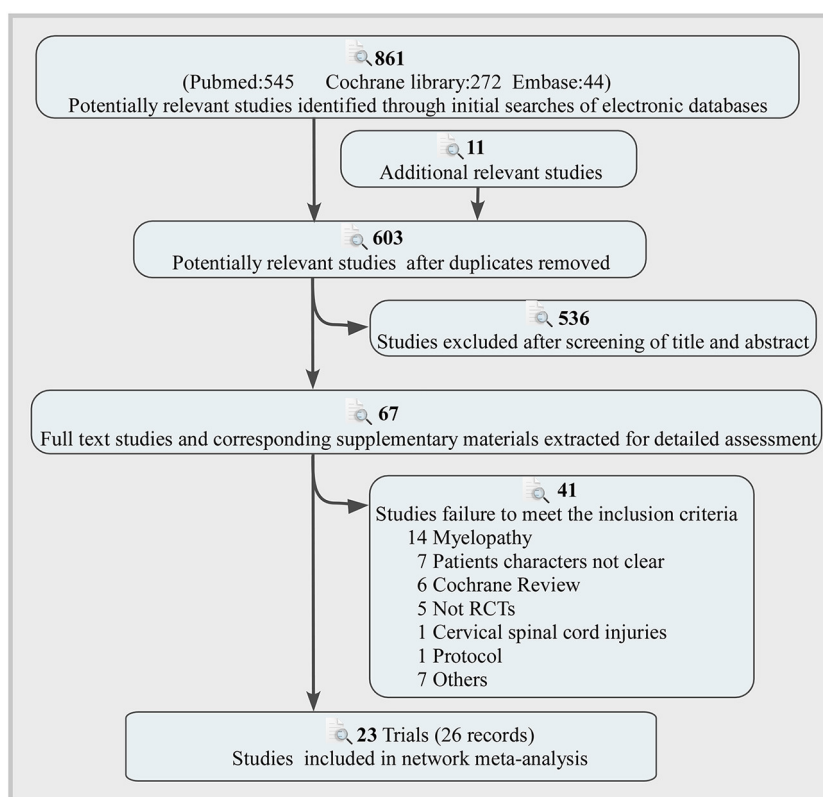


FIGURE 1 | Literature search and screening process.

RESULTS

A Systematic Review and Qualitative Assessment

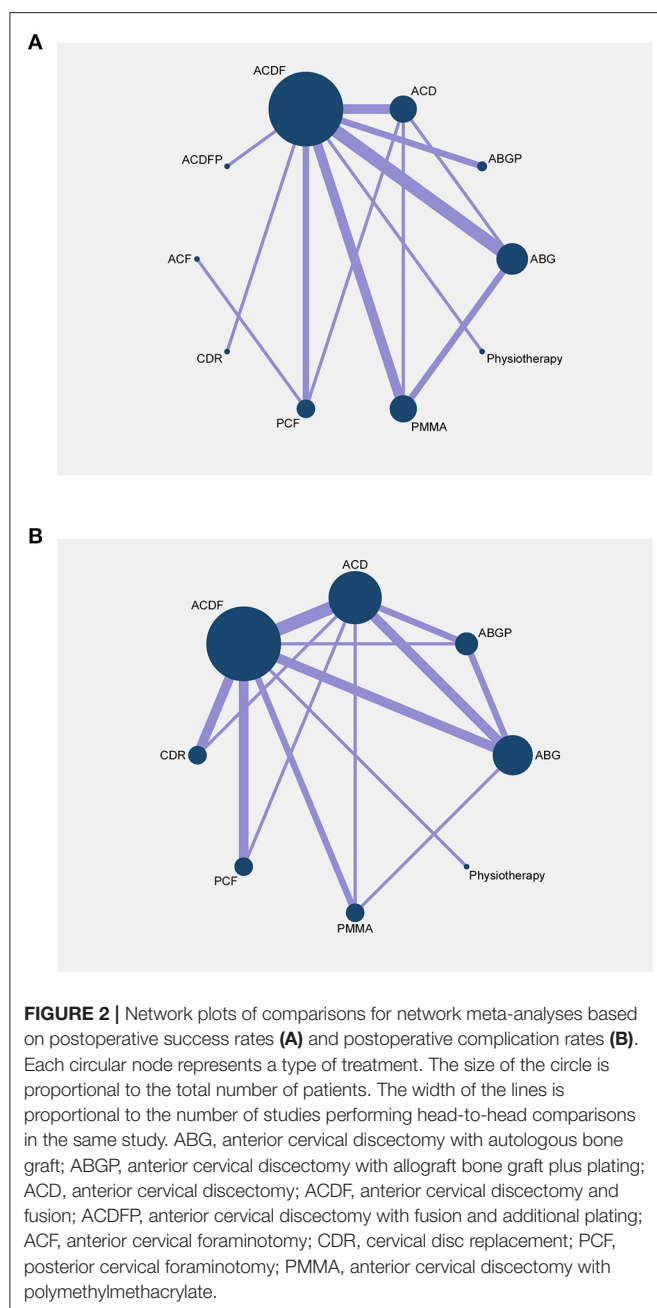
The flow of the selection process and the reasons for exclusion are depicted in **Figure 1**. These electronic searches yielded 861 potentially relevant studies, of which 67 potentially relevant articles were thoroughly evaluated. Finally, 23 trials (26 records) including 1,844 participants were included in the final analysis (22–44). Ten interventions were performed that had anterior cervical discectomy with autologous bone graft (ABG), anterior cervical discectomy with allograft bone graft plus plating (ABGP), anterior cervical discectomy (ACD), ACDF, anterior cervical discectomy with fusion and additional plating (ACDFP), anterior cervical foraminotomy (ACF), cervical disc replacement (CDR), posterior cervical foraminotomy (PCF), anterior cervical discectomy with polymethylmethacrylate (PMMA) and physiotherapy. Most of these studies (69.6%) were conducted in Europe. The characteristics of the included trials and participants are shown in **Supplementary Table 4**. Two studies showed high risk for generating the randomization sequence (30, 34). Two studies showed high risk in concealing allocation (30, 34). Ten studies showed high risk in blinding of participants and personnel (26, 29, 30, 32, 34–36, 41). Two studies showed high risk in blinding of outcome assessment (37, 40). One study showed high risk in incomplete outcome data (32).

Four studies showed high risk in selective outcome reporting (26, 27, 29, 37). **Supplementary Figures 1, 2** summarize the risk of bias assessment.

Primary Outcomes

Postoperative Success Rates

Fourteen RCTs with 1,053 participants compared the differences in postoperative success rates under various interventions (**Figure 2A**) (22, 24, 26, 28, 29, 31–35, 37–39, 42, 43). There were no statistical differences in the postoperative success rates of various interventions, including physical therapy (**Figure 3A**). The results from consistency model fit well-with the results from inconsistency model; node splitting analyses revealed no significant inconsistency (all $P > 0.05$; **Supplementary Table 5**). Direct results were detailed in **Supplementary Figures 3–7**. **Figure 4** shows the direct and indirect results of comparing different interventions. The direct results were identical to the corresponding indirect results regarding significance and tendency. **Figure 3B** depicted the probability distribution of postoperative success rates for each intervention arranged in ten possible positions. Postoperative success rates ranking from high to low were as follows: ACF (probability 38%), PCF (24%), ACDFP (21%), CDR (7%), ABGP (4%), physiotherapy (3%), PMMA (2%), ACDF (1%), ACD (0%), and ABG (0%). The probabilities are detailed in **Supplementary Table 6**.



Postoperative Complication Rates

Fifteen RCTs with 1,470 participants compared the differences in postoperative complication rates under different interventions (Figure 2B) (22, 24, 26, 28, 29, 31–35, 37–39, 42, 43). There were no statistical differences in postoperative complication rates between interventions, including physiotherapy (Figure 3A). The results obtained using the consistency model fit well-with the inconsistency model; Node splitting analyzes did not show significant inconsistency (all $P > 0.05$; Supplementary Table 7). The direct results were detailed in Supplementary Figures 8–15. Figure 4 shows

the direct and indirect results of comparing different interventions. The direct results were prominently consistent with the corresponding indirect results insignificance and tendency. Figure 3B showed the distribution of postoperative complication rates probability for each intervention arranged in nine possible positions. Postoperative complication rates ranging from high to low was as follows: CDR (probability 32%), physiotherapy (25%), ACF (25%), ACD (9%), PMMA (5%), PCF (3%), ACDG (1%), ABG (0%), and ABGP (0%). The probabilities are detailed in Supplementary Table 8.

Postoperative Reoperation Rates

Fourteen RCTs with 1,449 participants compared the differences in postoperative complication rates under various interventions (Supplementary Figure 16) (24, 26, 28, 32–35, 37–39, 42–44). No statistical differences were found in postoperative reoperation rates of different interventions, including physical therapy (Figure 5A). The results obtained using the consistency model fit well-with the inconsistency model; Node splitting analyzes did not show significant inconsistency (all $P > 0.05$; Supplementary Table 9). Direct results were detailed in Supplementary Figures 17–24. Figure 6 shows the direct and indirect results of comparing different interventions. The direct results were prominently consistent with the corresponding indirect results insignificance and tendency. Figure 5B depicted the probability distribution of postoperative reoperation rates for each intervention arranged in nine possible positions. Postoperative reoperation rates ranging from high to low were as follows: CDR (probability 32%), physiotherapy (25%), ACF (25%), ACD (9%), PMMA (5%), PCF (3%), ACDG (1%), ABG (0%) and ABGP (0%). The probabilities are detailed in Supplementary Table 10.

Secondary Outcomes

Postoperative Work Status

Eight RCTs with 493 participants compared differences in postoperative work status under different interventions (Supplementary Figure 25) (23, 24, 26, 28, 33, 37, 43). There were no statistical differences in postoperative work status between interventions, including physical therapy (Figure 5A). The results obtained using the consistency model fit well-with the inconsistency model; Node splitting analyzes did not show significant inconsistency (all $P > 0.05$; Supplementary Table 11). Direct results were detailed in Supplementary Figures 26–28. Figure 6 shows the direct and indirect results of comparing different interventions. The direct results were prominently consistent with the corresponding indirect results insignificance and tendency. Figure 5B depicted the postoperative work status probability distribution for each intervention, which was arranged into nine possible positions. Postoperative work status ranking from high to low was as follows: PMMA (probability 34%), ACDG (20%), ACF (19%), ABGP (10%), PCF (9%), CDR (4%), ACD (2%), ACDG (2%), and ABG (0%). The probabilities are detailed in Supplementary Table 12.

A

Postoperative success rate				Comparison	Postoperative complication rate				
ABG	0.93 (0.09, 9.88)	0.06 (0.01, 0.39)	0.09 (0.02, 0.50)		0.08 (0.00, 10.75)	0.04 (0.00, 0.54)	0.14 (0.01, 2.34)	0.15 (0.01, 2.02)	0.09 (0.00, 14.27)
0.80 (0.05, 8.65)	ABGP	0.07 (0.01, 0.62)	0.10 (0.01, 0.95)		0.09 (0.00, 13.12)	0.04 (0.00, 0.81)	0.15 (0.01, 3.47)	0.16 (0.01, 3.55)	0.10 (0.00, 19.92)
1.54 (0.33, 7.66)	1.96 (0.17, 32.12)	ACD	1.48 (0.31, 7.25)		1.25 (0.01, 142.21)	0.57 (0.05, 6.98)	2.15 (0.16, 29.68)	2.31 (0.17, 32.65)	1.43 (0.01, 237.81)
0.50 (0.13, 1.40)	0.61 (0.07, 5.41)	0.33 (0.07, 1.04)	ACDF		0.84 (0.01, 90.22)	0.38 (0.04, 3.55)	1.45 (0.13, 16.26)	1.57 (0.14, 17.94)	0.97 (0.01, 127.25)
0.32 (0.02, 5.21)	0.42 (0.02, 12.93)	0.21 (0.01, 3.37)	0.68 (0.06, 9.02)	ACDFP					
0.23 (0.00, 18.93)	0.26 (0.00, 38.47)	0.15 (0.00, 11.69)	0.45 (0.00, 38.97)	0.67 (0.00, 97.93)	ACF	0.45 (0.00, 87.25)	1.70 (0.03, 98.55)	1.83 (0.01, 356.54)	1.14 (0.00, 1124.60)
0.59 (0.04, 5.56)	0.71 (0.04, 15.30)	0.38 (0.03, 3.81)	1.20 (0.14, 10.18)	1.74 (0.06, 42.37)	2.72 (0.02, 418.85)	CDR	3.82 (0.15, 97.51)	4.13 (0.16, 107.70)	2.61 (0.01, 547.07)
0.23 (0.01, 2.05)	0.27 (0.01, 5.65)	0.14 (0.01, 1.35)	0.46 (0.04, 3.59)	0.66 (0.02, 15.50)	0.98 (0.02, 62.53)	0.39 (0.02, 7.21)	PCF	1.09 (0.04, 30.37)	0.68 (0.00, 155.49)
0.69 (0.17, 3.40)	0.87 (0.09, 15.22)	0.44 (0.09, 2.52)	1.39 (0.42, 7.28)	2.10 (0.14, 39.82)	3.01 (0.04, 475.94)	1.15 (0.12, 20.24)	2.99 (0.33, 58.02)	PMMA	0.62 (0.00, 138.45)
0.97 (0.07, 9.10)	1.28 (0.06, 24.19)	0.63 (0.04, 6.26)	2.00 (0.24, 15.68)	2.91 (0.11, 69.78)	4.50 (0.03, 661.43)	1.72 (0.08, 32.30)	4.33 (0.23, 106.31)	1.42 (0.08, 13.92)	Physiotherapy

B

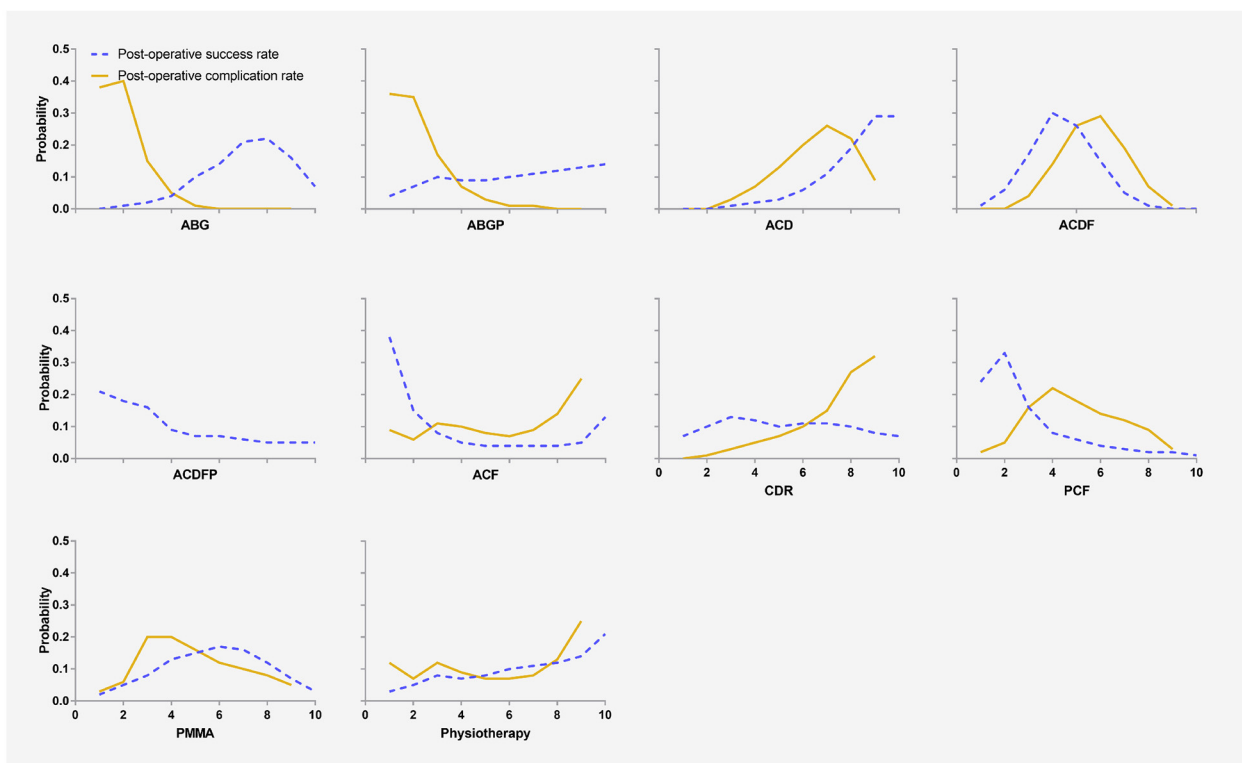


FIGURE 3 | Network plots of comparisons (A) and rank probability (B) for post-operative success rates and postoperative complication rates based on network meta-analyses. Each cell profile (A) contains the pooled RR and 95% CI; significant results are bold. The ranking curves (B) indicate the probability of the highest postoperative success rates and postoperative complication rates, the second-lowest, the third-lowest, etc. ABG, anterior cervical discectomy with autologous bone graft; ABGP, anterior cervical discectomy with allograft bone graft plus plating; ACD, anterior cervical discectomy; ACDF, anterior cervical discectomy and fusion; ACDFP, anterior cervical discectomy with fusion and additional plating; ACF, anterior cervical foraminotomy; CDR, cervical disc replacement; PCF, posterior cervical foraminotomy; PMMA, anterior cervical discectomy with polymethylmethacrylate.

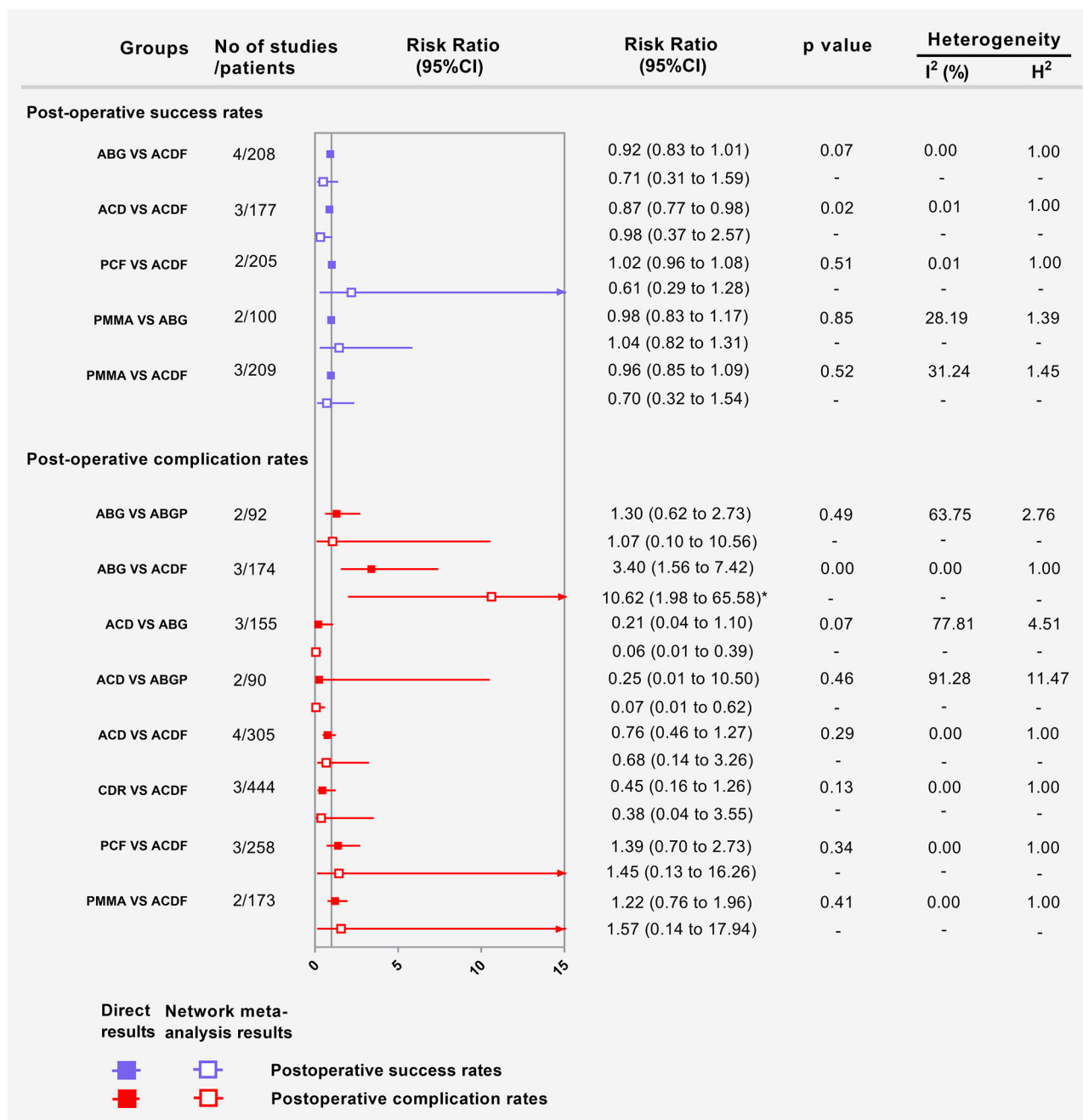


FIGURE 4 | Forest plots showing the direct and indirect results of postoperative success rates and postoperative complication rates of head-to-head comparisons. ABG, anterior cervical discectomy with autologous bone graft; ABGP, anterior cervical discectomy with allograft bone graft plus plating; ACD, anterior cervical discectomy; ACDF, anterior cervical discectomy and fusion; CDR, cervical disc replacement; PCF, posterior cervical foraminotomy; PMMA, anterior cervical discectomy with polymethylmethacrylate. *Values in brackets are 95% CI.

Scores for Arm and Neck Pain

Eight RCTs with a sum of 562 participants compared the differences in arm pain scores under different interventions (Supplementary Figure 29) (23, 27, 29, 38, 42–44). Eight RCTs (627 participants) compared the differences in neck pain scores under different interventions (Supplementary Figure 30)

(23, 27, 35, 38, 40, 42–44). No statistical differences were found in scores for arm and neck pain of different interventions (Figure 7A). The results obtained using the consistency model fit well with the inconsistency model; Node splitting analyzes did not show significant inconsistency (all $P > 0.05$; Supplementary Tables 13, 15). Direct results were detailed

A

Postoperative reoperation rate				Comparison	Postoperative work status				
ABG	2.09 (0.18, 31.44)	2.08 (0.35, 11.56)	2.48 (0.39, 20.59)	3.54 (0.18, 99.09)	2.57 (0.06, 203.15)	1.43 (0.10, 29.40)	2.71 (0.15, 78.16)	5.60 (0.37, 190.15)	
1.42 (0.20, 11.50)	ABGP	0.98 (0.06, 13.04)	1.16 (0.06, 23.73)	1.61 (0.04, 84.21)	1.30 (0.01, 129.17)	0.68 (0.02, 26.31)	1.30 (0.03, 53.88)	2.68 (0.08, 160.65)	
1.10 (0.27, 4.44)	0.77 (0.10, 4.83)	ACD	1.17 (0.33, 5.79)	1.70 (0.12, 33.73)	1.28 (0.04, 64.84)	0.67 (0.07, 10.15)	1.35 (0.11, 23.70)	2.60 (0.19, 86.84)	
1.12 (0.27, 4.63)	0.78 (0.10, 5.29)	1.01 (0.42, 2.56)	ACDF	1.46 (0.12, 17.46)	1.07 (0.02, 57.68)	0.59 (0.08, 4.57)	1.13 (0.08, 18.29)	2.18 (0.13, 71.39)	
			ACDFP	0.73 (0.01, 67.71)	0.40 (0.02, 10.04)	0.76 (0.02, 26.19)	1.56 (0.03, 98.24)		
0.71 (0.02, 24.46)	0.50 (0.01, 21.05)	0.65 (0.03, 18.23)	0.64 (0.03, 16.96)		ACF	0.54 (0.01, 39.51)	1.07 (0.07, 14.81)	2.12 (0.02, 293.44)	
0.72 (0.13, 4.05)	0.50 (0.05, 4.37)	0.65 (0.19, 2.43)	0.65 (0.22, 1.89)		1.01 (0.03, 25.99)	CDR	1.94 (0.07, 64.96)	3.82 (0.11, 199.29)	
0.77 (0.11, 5.09)	0.53 (0.05, 5.43)	0.70 (0.15, 3.30)	0.68 (0.16, 2.74)		1.08 (0.06, 18.04)	1.07 (0.18, 6.01)	PCF	1.99 (0.04, 133.65)	
2.26 (0.15, 74.02)	1.61 (0.07, 69.34)	2.05 (0.15, 65.22)	2.03 (0.14, 65.12)		3.34 (0.05, 291.45)	3.17 (0.18, 107.39)	2.97 (0.14, 117.92)	PMMA	
0.11 (0.00, 2.41)	0.08 (0.00, 2.15)	0.11 (0.00, 1.76)	0.10 (0.00, 1.37)		0.15 (0.00, 9.56)	0.16 (0.00, 2.70)	0.15 (0.00, 3.02)	0.05 (0.00, 2.23)	Physiotherapy

B

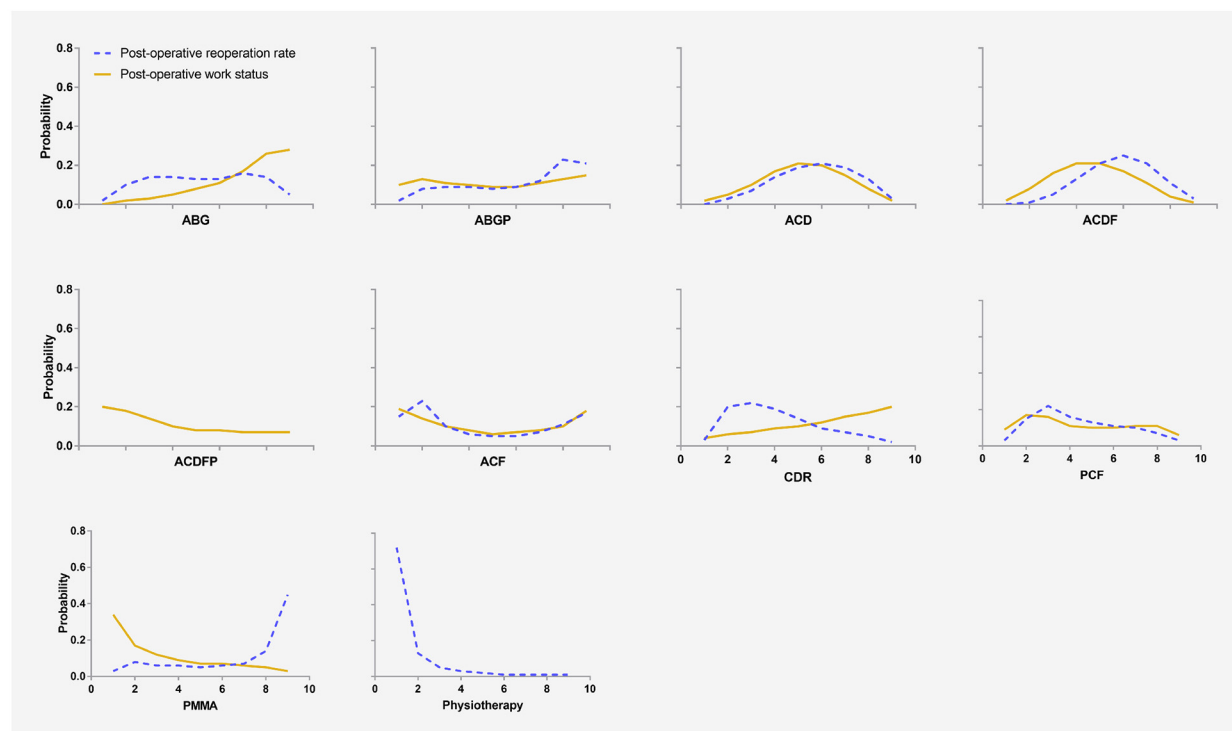


FIGURE 5 | Network plots of comparisons **(A)** and rank probability **(B)** for postoperative reoperation rates and postoperative work status-based network meta-analyses. Each cell profile **(A)** contains the pooled RR and 95% CI; significant results are bold. Ranking curves **(B)** indicate the probability of the highest postoperative reoperation rates and postoperative work status, the second-lowest, the third-lowest, etc. ABG, anterior cervical discectomy with autologous bone graft; ABGP, anterior cervical discectomy with allograft bone graft plus plating; ACD, anterior cervical discectomy; ACDF, anterior cervical discectomy and fusion; ACDFP, anterior cervical discectomy with fusion and additional plating; ACF, anterior cervical foraminotomy; CDR, cervical disc replacement; PCF, posterior cervical foraminotomy; PMMA, anterior cervical discectomy with polymethylmethacrylate.

in **Supplementary Figures 31–36**. **Supplementary Figure 37** shows the direct and indirect results of comparing different interventions. The direct results were prominently consistent

with the corresponding indirect results insignificance and tendency. **Figure 7B** showed the distribution of arm and neck pain probability scores for each intervention arranged in seven

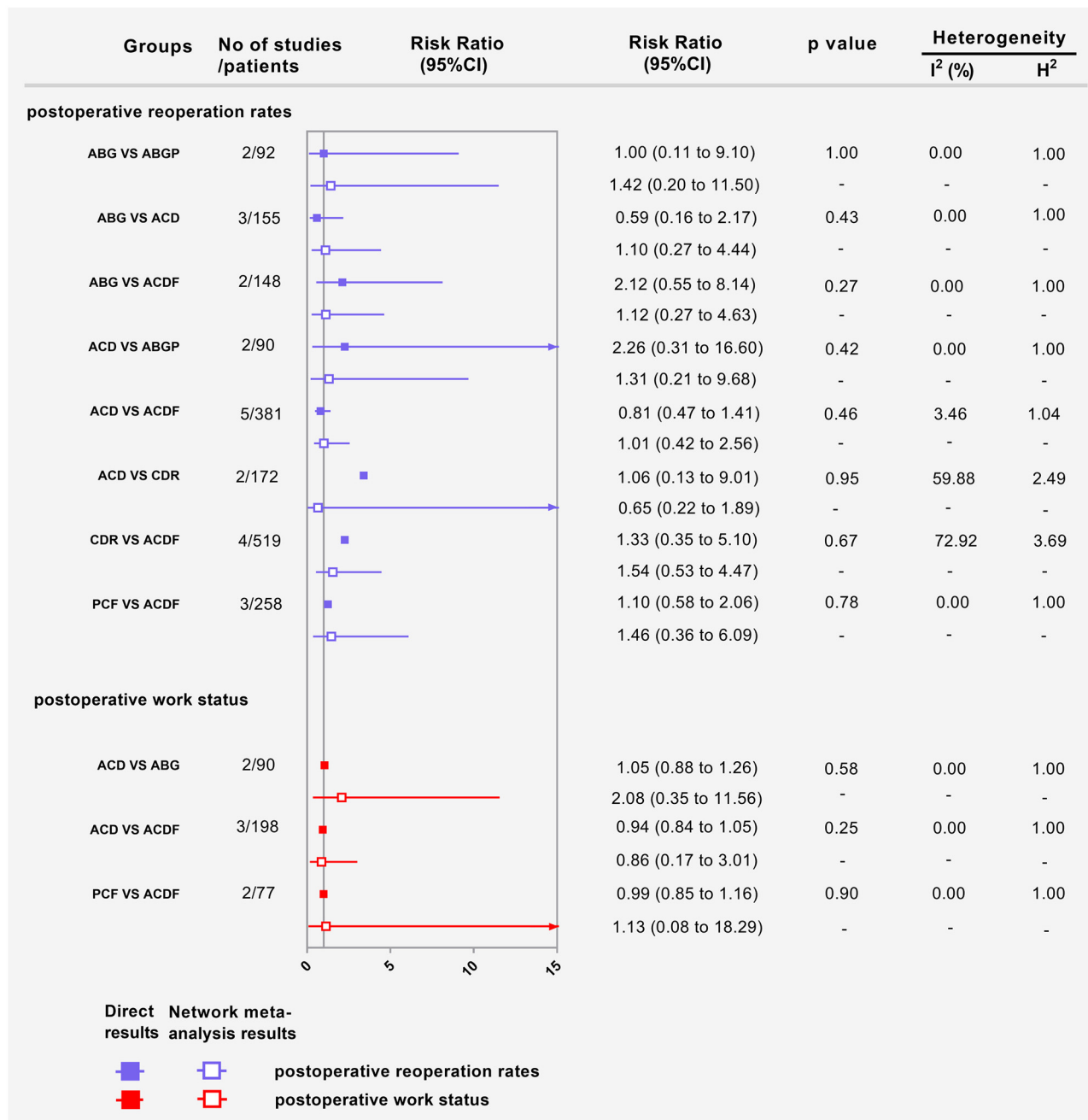


FIGURE 6 | Forest plots showing the direct and indirect results of post-operative reoperation rates and postoperative work status of head-to-head comparisons. ABG, anterior cervical discectomy with autologous bone graft; ABGP, anterior cervical discectomy with allograft bone graft plus plating; ACD, anterior cervical discectomy; ACDF, anterior cervical discectomy and fusion; CDR, cervical disc replacement; PCF, posterior cervical foraminotomy.

possible positions. Scores for arm pain ranging from low to high were as follows: ABGP (probability 71%), ACDFP (15%), ABG (5%), Physiotherapy (5%), CDR (3%), ACD (1%), and ACDF (0%). The probabilities are detailed in **Supplementary Table 14**.

The scores for neck pain ranging from low to high was as follows: ABG (probability 46%), ABGP (45%), ACDFP (4%), ACD (3%), ACDF (1%), CDR (1%), and physiotherapy (1%). The probabilities are detailed in **Supplementary Table 16**.

A

Scores for Arm Pain		Comparison	Scores for Neck Pain			
ABG	-0.14 (-7.82, 7.51)	1.67 (-5.03, 8.37)	1.61 (-4.93, 8.19)	1.44 (-5.15, 8.10)	1.74 (-4.88, 8.40)	2.69 (-4.13, 9.63)
2.26 (-2.61, 6.53)	ABGP	1.79 (-1.85, 5.71)	1.76 (-1.71, 5.42)	1.59 (-1.98, 5.40)	1.87 (-1.75, 5.66)	2.84 (-1.13, 6.98)
0.20 (-3.20, 1.99)	-2.14 (-6.32, 2.11)	ACD	-0.06 (-1.22, 1.19)	-0.23 (-1.62, 1.26)	0.08 (-1.16, 1.23)	1.02 (-1.16, 3.32)
0.47 (-2.59, 1.86)	-1.90 (-5.91, 2.19)	0.28 (-1.24, 1.67)	ACDF	-0.17 (-1.16, 0.85)	0.15 (-0.87, 0.97)	1.07 (-0.79, 2.99)
0.97 (-2.37, 2.99)	-1.38 (-5.57, 3.01)	0.73 (-1.29, 3.17)	0.41 (-0.87, 2.36)	ACDFP	0.33 (-0.89, 1.30)	1.25 (-0.89, 3.39)
0.46 (-2.86, 2.20)	-1.89 (-6.05, 2.30)	0.26 (-1.03, 1.48)	-0.02 (-1.26, 1.28)	-0.48 (-2.77, 1.40)	CDR	0.93 (-1.07, 3.18)
0.28 (-3.87, 2.47)	-2.08 (-6.75, 2.43)	0.07 (-2.65, 2.67)	-0.23 (-2.50, 1.98)	-0.65 (-3.75, 1.84)	-0.20 (-2.87, 2.34)	Physiotherapy

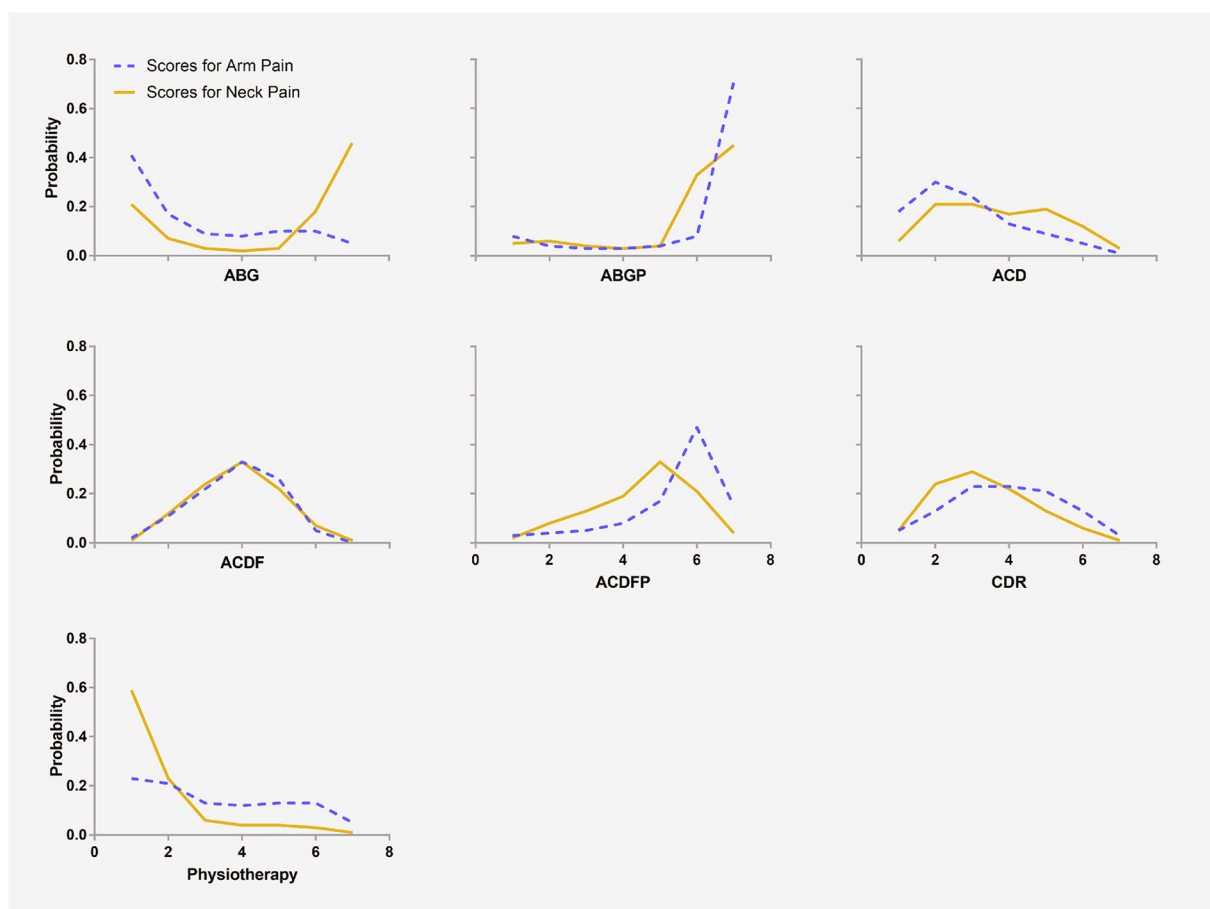
B

FIGURE 7 | Network plots of comparisons **(A)** and rank probability **(B)** for arm and neck pain scores based on network meta-analyses. Each cell profile **(A)** contains the pooled RR and 95% CI; significant results are bold. The ranking curves **(B)** indicate the probability of the highest rate of scores for arm and neck pain, the second-lowest, the third-lowest, etc. ABG, anterior cervical discectomy with autologous bone graft; ABGP, anterior cervical discectomy with allograft bone graft plus plating; ACD, anterior cervical discectomy; ACDF, anterior cervical discectomy and fusion; ACDFP, anterior cervical discectomy with fusion and additional plating; CDR, cervical disc replacement.

Neck Disability Index (NDI)

Six RCTs (575 participants) compared the differences in neck disability index under different interventions (**Supplementary Figure 38**) (32, 35, 38, 42–44). No statistical differences were found in the neck disability index of different interventions (**Figure 8A**). The results obtained using the consistency model fit well-with the inconsistency model. The direct results were detailed in **Supplementary Figures 39–41**. **Supplementary Figure 42** showed the direct and indirect results of comparing different interventions. The direct results were prominently consistent with the corresponding indirect results insignificance and tendency. **Figure 8B** showed the distribution of the probability of neck disability index for each intervention organized in six possible positions. The neck disability index ranging from low to high was as follows: ABG (probability 71%), ABGP (19%), physiotherapy (7%), ACD (2%), ACDF (1%), and CDR (1%). The probabilities are detailed in **Supplementary Table 17**.

Surgery Time

Nine RCTs with 820 participants compared the differences in surgery time under different interventions (**Supplementary Figure 43**) (26, 31, 32, 35, 36, 39–41, 44). In terms of surgery time (**Figure 8A**), ABGP (MD, −68.02; [95% CI, −93.46 to −42.60]), ACD (MD, −22.07; [95% CI, −39.21 to −5.85]), ACDF (MD, −22.55; [95% CI, −34.81 to −9.98]), and ACDFP (MD, −23.34; [95% CI, −42.31 to −2.37]) were with shorter surgery time compared with ABG in the consistency model. ACD (MD, 46.07; [95% CI, 19.12 to 71.53]), ACDF (MD, 45.47; [95% CI, 23.15 to 67.67]), ACDFP (MD, 44.57; [95% CI, 18.69 to 72.78]), CDR (MD, 65.50; [95% CI, 38.50 to 92.42]), and PMMA (MD, 59.43; [95% CI, 33.78 to 84.30]) had a longer surgery time compared with ABGP in the consistency model. ACD (MD, −19.36; [95% CI, −38.28 to −0.91]) and ACDF (MD, −19.88; [95% CI, −35.99 to −3.74]) were with shorter surgery time compared with CDR in the consistency model. Furthermore, ACDF (MD, −13.85; [95% CI, −26.11 to −1.24]) were with shorter surgery time compared with PMMA in the consistency model. The results obtained using the consistency model fit well-with the results using the inconsistency model; Node splitting analyzes did not show significant inconsistency (all $P > 0.05$; **Supplementary Table 18**). Direct results were detailed in **Supplementary Figures 44–49**. **Supplementary Figure 42** showed the direct and indirect results of the comparison of different interventions. The direct results were prominently consistent with the corresponding indirect results in significance and tendency. **Figure 8B** showed the distribution of the probability of surgery time for each intervention organized into seven possible positions. Among the seven surgical interventions, ABGP had the shortest surgery time. The probabilities are detailed in the **Supplementary Table 19**.

DISCUSSION

One of the most common reasons for spinal surgery is cervical radiculopathy. However, the evidence on the most effective surgical technique is conflicting. As a result, we conducted a comprehensive network meta-analysis to compare the safety and

efficacy of various interventions. This network meta-analysis included 23 RCTs involving 1,844 cervical radiculopathy without myelopathy treated with ten different types of interventions. In summary, we did not find statistically significant differences in the safety and efficacy of ten various interventions. ABGP achieved the shortest surgery time.

For the treatment of cervical radiculopathy, the anterior approach is the most commonly used surgical option. ACDF, reported in 1958 (45), is a mature and effective treatment that removes all diseased intervertebral disks, including compressed disc material and osteophytes from the anterior spinal cord canal and the nerve root foramen. Segmental fixation after fusion has been established to cause additional biomechanical stress and degeneration of adjacent segments, which usually results in symptoms (46, 47). We found no statistical difference in postoperative complications or reoperation rates between ACDF and other treatments in our study, which is consistent with the findings of most studies (14, 42, 44). The ideal fusion substrate is still debatable. The autologous bone graft is still a popular fusion substrate (36). The ABGP operation time was found to be the shortest in our study, but autogenous bone grafting may cause iliac discomfort.

Total disc replacement, like fusion, aims to remove the entire disc and restore the segment's stability. Total disc replacement, unlike fusion, allows the surgically treated disc to move (48). This continuous movement at the surgical treatment level may protect adjacent moving segments (49). However, the current study did not find that the reoperation rate of CDR is lower than that of ACDF, which is consistent with the findings of the previous study (14).

With the popularity of minimally invasive techniques in recent years, the minimally invasive posterior cervical foraminal incision (MI-PCF) has become a popular alternative treatment option. Based on a solid body of evidence, MI-PCF is a successful alternative surgery to reduce problems such as false joints, adjacent segment diseases, and anterior-related complications. MI-PCF does not necessitate the patient giving up a cervical spine motion segment, and it has a lower complication rate, a lower cost, and a faster return to movement (50, 51). Based on the findings of this study, PCF, similar to other interventions, produced satisfactory results, with no statistical difference in postoperative success rates, post-operative complication rates, or postoperative working status, which is consistent with previous study findings (52).

Strengths and Limitations

This study is the first network meta-analysis that provides an evidence-based comparative evaluation of all surgical interventions for cervical radiculopathy. We have used an innovative method of comparing indirect results (network meta-analysis results) and pairwise direct results (meta-analysis results) to investigate the source of heterogeneity. Our research does, however, have limitations. The sample sizes in the studies were insufficient, which reduced the reliability of the results. The prognostic indicators were reported at various time points, resulting in heterogeneity. Furthermore, the surgical level of different surgeons may contribute to heterogeneity. In addition, although all RCTs included patients with pure

A

Neck Disability Index (NDI)		Comparison		Surgery time			
ABG	-68.02 (-93.46, -42.60)	-22.07 (-39.21, -5.85)	-22.55 (-34.81, -9.98)	-23.34 (-42.31, -2.37)	-2.65 (-22.23, 17.14)	-8.66 (-23.09, 5.49)	
-3.02 (-12.42, 6.19)	ABGP	46.07 (19.12, 71.53)	45.47 (23.15, 67.67)	44.57 (18.69, 72.78)	65.50 (38.50, 92.42)	59.43 (33.78, 84.30)	
-7.72 (-16.38, 1.45)	-4.64 (-12.98, 4.34)	ACD	-0.53 (-14.51, 14.18)	-1.38 (-21.44, 21.64)	19.36 (0.91, 38.28)	13.35 (-3.09, 30.42)	
-5.04 (-11.75, 1.63)	-2.08 (-8.44, 4.63)	2.65 (-3.47, 8.28)	ACDF	-0.82 (-15.59, 16.14)	19.88 (3.74, 35.99)	13.85 (1.24, 26.11)	
				ACDFP	20.69 (-2.63, 42.44)	14.71 (-6.36, 33.83)	
-7.87 (-14.92, 0.84)	-4.87 (-11.57, 3.68)	-0.02 (-5.82, 6.15)	-2.96 (-6.22, 2.20)		CDR	-5.98 (-25.82, 13.82)	
					-	PMMA	
-10.35 (-24.48, 4.55)	-7.14 (-21.77, 7.55)	-2.57 (-18.02, 12.25)	-5.25 (-19.14, 8.05)		2.58 (-16.10, 11.25)		Physiotherapy

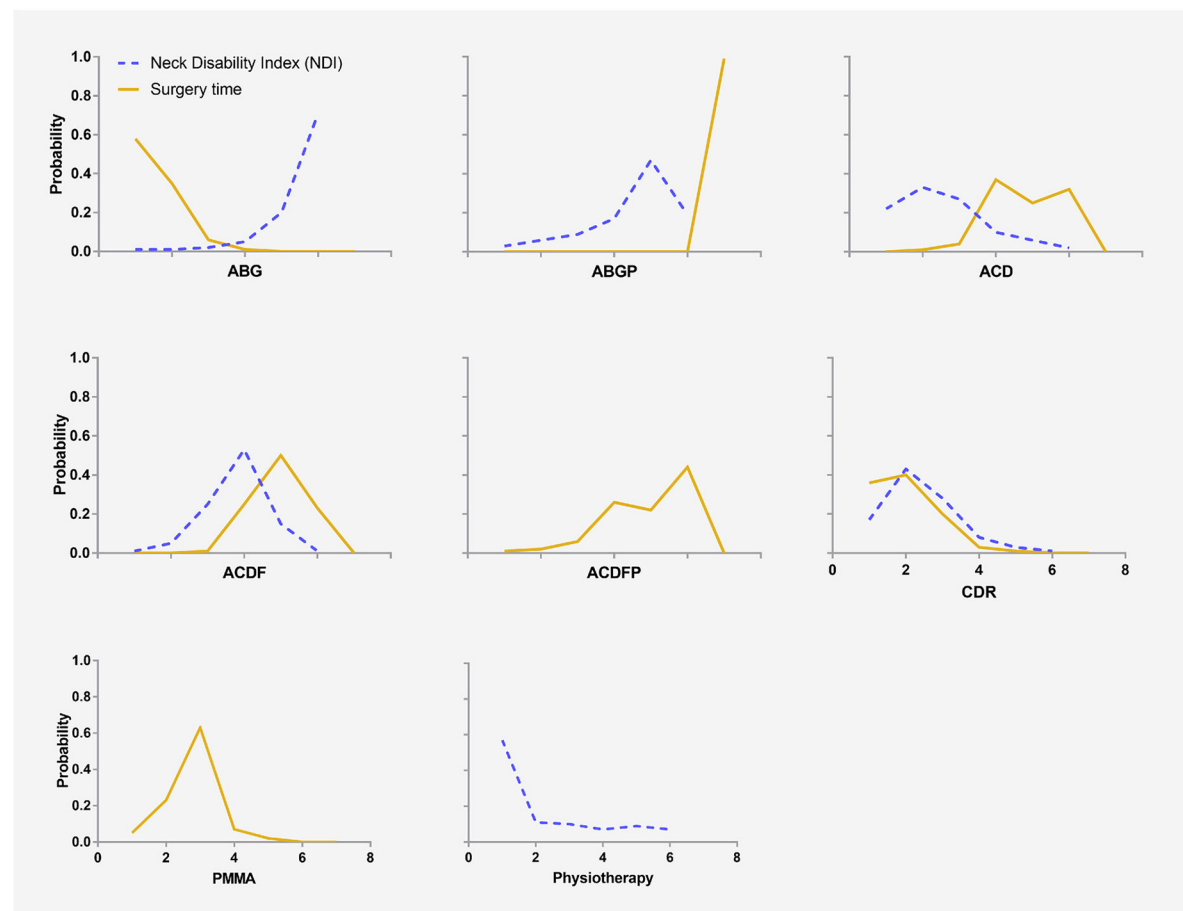
B

FIGURE 8 | Network plots of comparisons **(A)** and rank probability **(B)** for neck disability index (NDI) and surgery time-based network meta-analyses. Each cell profile **(A)** contains the pooled RR and 95% CI; significant results are bold. The ranking curves **(B)** indicate the probability of the highest rate of scores for arm and neck pain, the second-lowest, the third-lowest, etc. ABG, anterior cervical discectomy with autologous bone graft; ABGP, anterior cervical discectomy with allograft bone graft plus plating; ACD, anterior cervical discectomy; ACDF, anterior cervical discectomy and fusion; ACDFP, anterior cervical discectomy with fusion and additional plating; CDR, cervical disc replacement; PMMA, anterior cervical discectomy with polymethylmethacrylate.

cervical radiculopathy, most of the included studies did not report the localization of the degenerative disease (e.g., central, paracentral, foraminal). This is an important factor in the surgeon's decision-making process, as some surgical techniques have specific contraindications.

CONCLUSIONS

The best surgical treatment for cervical radiculopathy has been a source of controversy. Numerous factors influence the choice of surgery, in addition to clinical outcomes and surgical safety. All surgical interventions, in general, can produce satisfactory results, and there is no statistical difference. Consequently, surgeons can select the appropriate surgical interventions based on their strengths and the particular characteristics of patients with pure cervical radiculopathy.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

Concept and design: DJ-H, J-XQ, Q-YG, F-LW, and TL. Acquisition, analysis, and interpretation of data: F-LW, Q-YG,

K-LZ, HZ, W-XC, TL, J-XQ, and D-JH. Drafting of the manuscript: Q-YG, F-LW, and K-LZ. Statistical analysis: F-LW, TL, and Q-YG. Administrative, technical, or material support: J-XQ, D-JH, TL, F-LW, and Q-YG. Supervision: J-XQ, D-JH, Q-YG, and TL. Critical revision of the manuscript for important intellectual content: All authors.

FUNDING

This work was supported by grants from the National Natural Science Foundation of China (No. 81871818) and Tangdu Hospital Seed Talent Program (F-LW). The funding body had no role in the design of the study, data collection, analysis, interpretation or in writing the manuscript.

ACKNOWLEDGMENTS

We would like to thank Home for Researchers (www.home-for-researchers.com) for a language polishing service, and Le Qun Shan and Jian Zhao for their help with this study.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpubh.2022.892042/full#supplementary-material>

REFERENCES

- He A, Xie D, Qu B, Cai X, Kong Q, Yang L, Chen X, Jia L. Comparison between cervical disc arthroplasty and conservative treatment for patients with single level cervical radiculopathy at C5/6. *Int J Surgery*. (2018) 54(Pt A):124–128. doi: 10.1016/j.ijsu.2018.01.033
- Radhakrishnan K, Litchy WJ, O'Fallon WM, Kurland LT. Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990. *Brain J Neurol*. (1994) 117(Pt 2):325–35. doi: 10.1093/brain/117.2.325
- Lestini WF, Wiesel SW. The pathogenesis of cervical spondylosis. *Clin Orthop Relat Res*. (1989) (239):69–93.
- Wu PF, Li YW, Wang B, Jiang B, Tu ZM, Lv GH. Posterior cervical foraminotomy via full-endoscopic versus microendoscopic approach for radiculopathy: a systematic review and meta-analysis. *Pain Physician*. (2019) 22:41–52.
- Woods BI, Hilibrand AS. Cervical radiculopathy: epidemiology, etiology, diagnosis, and treatment. *J Spinal Disord Tech*. (2015) 28:E251–9. doi: 10.1097/bsd.0000000000000284
- Carette S, Fehlings MG. Clinical practice. Cervical radiculopathy. *N Eng J Med*. (2005) 353:392–9. doi: 10.1056/NEJMcP043887
- Zhu Y, Zhang B, Liu H, Wu Y, Zhu Q. Cervical disc arthroplasty versus anterior cervical discectomy and fusion for incidence of symptomatic adjacent segment disease: a meta-analysis of prospective randomized controlled trials. *Spine*. (2016) 41:1493–502. doi: 10.1097/brs.0000000000001537
- Ren C, Song Y, Xue Y, Yang X. Mid-to long-term outcomes after cervical disc arthroplasty compared with anterior discectomy and fusion: a systematic review and meta-analysis of randomized controlled trials. *Eur Spine J*. (2014) 23:1115–23. doi: 10.1007/s00586-014-3220-3
- Gao F, Mao T, Sun W, Guo W, Wang Y, Li Z, et al. An updated meta-analysis comparing artificial cervical disc arthroplasty (CDA) vs. anterior cervical discectomy and fusion (ACDF) for the treatment of cervical degenerative disc disease (CDDD). *Spine*. (2015) 40:1816–23. doi: 10.1097/brs.0000000000001138
- Zhong ZM, Zhu SY, Zhuang JS, Wu Q, Chen JT. Reoperation after cervical disc arthroplasty vs. anterior cervical discectomy and fusion: a meta-analysis. *Clin Orthop Relat Res*. (2016) 474:1307–16. doi: 10.1007/s11999-016-4707-5
- Findlay C, Ayis S, Demetriades AK. Total disc replacement versus anterior cervical discectomy and fusion: a systematic review with meta-analysis of data from a total of 3160 patients across 14 randomized controlled trials with both short- and medium- to long-term outcomes. *Bone Joint J*. (2018) 100-b(8):991–1001. doi: 10.1302/0301-620x.100b8.Bjj-2018-0120.R1
- Gutman G, Rosenzweig DH, Golan JD. Surgical treatment of cervical radiculopathy: meta-analysis of randomized controlled trials. *Spine*. (2018) 43:E365–e372. doi: 10.1097/brs.0000000000002324
- Liu WJ, Hu L, Chou PH, Wang JW, Kan WS. Comparison of anterior cervical discectomy and fusion versus posterior cervical foraminotomy in the treatment of cervical radiculopathy: a systematic review. *Orthop Surg*. (2016) 8:425–31. doi: 10.1111/os.12285
- Broekema AEH, Groen RJM, Simões de Souza NF, Smidt N, Reneman ME, Soer R, Kuijlen JMA. Surgical interventions for cervical radiculopathy without myelopathy: a systematic review and meta-analysis. *J Bone Joint Surg Am Vol*. (2020) 102:2182–96. doi: 10.2106/jbjs.20.00324
- Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Int J Surg*. (2021) 88:105906. doi: 10.1016/j.ijsu.2021.105906
- Wei FL, Zhou CP, Liu R, Zhu KL, Du MR, Gao HR, et al. Management for lumbar spinal stenosis: a network meta-analysis and systematic review. *Int J Surg*. (2021) 85:19–28. doi: 10.1016/j.ijsu.2020.11.014
- Higgins JP, Altman DG, Gotzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane collaboration's tool for assessing risk of bias in randomised trials. *BMJ (Clinical research ed)*. (2011) 343:d5928. doi: 10.1136/bmj.d5928

18. Zhao J, Dong X, Zhang Z, Gao Q, Zhang Y, Song J, et al. Association of Use of tourniquets during total knee arthroplasty in the elderly patients with post-operative pain and return to function. *Front Public Health*. (2022) 10:825408. doi: 10.3389/fpubh.2022.825408
19. Wei FL, Zhou CP, Zhu KL, Du MR, Liu Y, Heng W, et al. Comparison of different operative approaches for lumbar disc herniation: a network meta-analysis and systematic review. *Pain Physician*. (2021) 24:E381–e392.
20. AJ S, KR A. Bayesian methods in meta-analysis and evidence synthesis. *Stat Methods Med Res*. (2001) 10:277–303. doi: 10.1177/096228020101000404
21. Dias S, Welton NJ, Caldwell DM, Ades AE. Checking consistency in mixed treatment comparison meta-analysis. *Stat Med*. (2010) 29:932–44. doi: 10.1002/sim.3767
22. Savolainen S, Rinne J, Hernesniemi J. A prospective randomized study of anterior single-level cervical disc operations with long-term follow-up: surgical fusion is unnecessary clinical trial; comparative study. journal article; randomized controlled trial. *Neurosurgery*. (1998) 43:51–5. doi: 10.1097/00006123-199807000-00032
23. Zoëga B RH, Lind B. Anterior cervical discectomy and fusion with or without plate fixation. A prospective and randomized study. *Neuro-Orthopedics*. (2000) 28:39–51.
24. Wirth FP, Dowd GC, Sanders HF, Wirth C. Cervical discectomy. A prospective analysis of three operative techniques [clinical trial; journal article; randomized controlled trial]. *Surg Neurol*. (2000) 53:340–6. doi: 10.1016/s0090-3019(00)00201-9
25. Persson LC, Lilja A. Pain, coping, emotional state and physical function in patients with chronic radicular neck pain. A comparison between patients treated with surgery, physiotherapy or neck collar—a blinded, prospective randomized study. *Disabil Rehabil*. (2001) 23:325–35. doi: 10.1080/09638280010005567
26. Bärlocher CB, Barth A, Krauss JK, Binggeli R, Seiler RW. Comparative evaluation of microdiscectomy only, autograft fusion, polymethylmethacrylate interposition, and threaded titanium cage fusion for treatment of single-level cervical disc disease: a prospective randomized study in 125 patients [comparative study; journal article; randomized controlled trial]. *Neurosurg Focus*. (2002) 12:E4. doi: 10.3171/foc.2002.12.1.5
27. Nabhan A, Ahlhelm F, Pitzen T, Steudel WI, Jung J, Shariat K, et al. Disc replacement using pro-disc C vs. fusion: a prospective randomised and controlled radiographic and clinical study [journal article; randomized controlled trial]. *Eu Spine J*. (2006) 16:423–30. doi: 10.1007/s00586-006-0226-5
28. Xie JC, Hurlbert RJ. Discectomy versus discectomy with fusion versus discectomy with fusion and instrumentation: a prospective randomized study. *Neurosurgery*. (2007) 61:107–16. doi: 10.1227/01.neu.0000279730.44016.da
29. Lind BI, Zoëga B, Rosén H. Autograft versus interbody fusion cage without plate fixation in the cervical spine: a randomized clinical study using radiostereometry. *Eur Spine J*. (2007) 16:1251–6. doi: 10.1007/s00586-007-0337-7
30. Okenoglu T, Cosar M, Ozer AF, Iplikcioglu C, Sasani M, Canbulat N, et al. Anterior cervical microdiscectomy with or without fusion. *J Spinal Disord Tech*. (2007) 20:361–8. doi: 10.1097/BSD.0b013e31802f80c8
31. Schröder J, Grosse-Dresselhaus F, Schul C, Wassmann H, PMMA. versus titanium cage after anterior cervical discectomy - a prospective randomized trial. *Zentralbl Neurochir*. (2007) 68:2–7. doi: 10.1055/s-2006-942184
32. Fernández-Fairen M, Sala P, Dufoño M, Jr., Ballester J, Murcia A, Merzthal L. Anterior cervical fusion with tantalum implant: a prospective randomized controlled study. *Spine*. (2008) 33:465–72. doi: 10.1097/BRS.0b013e3181657f49
33. Hauerberg J, Kosteljanetz M, Bøge-Rasmussen T, Dons K, Gideon P, Springborg JB, Wagner A. Anterior cervical discectomy with or without fusion with ray titanium cage: a prospective randomized clinical study. *Spine*. (2008) 33:458–64. doi: 10.1097/BRS.0b013e3181657dac
34. Ruetten S, Komp M, Merk H, Godolias G. Full-endoscopic cervical posterior foraminotomy for the operation of lateral disc herniations using 59-mm endoscopes: a prospective, randomized, controlled study. *Spine*. (2008) 33:940–8. doi: 10.1097/BRS.0b013e31816c8b67
35. Löfgren H, Engquist M, Hoffmann P, Sigstedt B, Vavruch L. Clinical and radiological evaluation of Trabecular Metal and the Smith-Robinson technique in anterior cervical fusion for degenerative disease: a prospective, randomized, controlled study with 2-year follow-up. *Eur Spine J*. (2010) 19:464–73. doi: 10.1007/s00586-009-1161-z
36. Orief T, Ramadan I, Seddik Z, Kamal M, Rahmany M, Takayasu M. Comparative evaluation of bone-filled Polymethylmethacrylate implant, autograft fusion, and Polyetheretherketone cervical cage fusion for the treatment of single-level cervical disc disease. *Asian J Neurosurg*. (2010) 5:46–56.
37. Ebrahim KS E-SA, Darwish A, Faiza A, Ma'moun E. Anterior or posterior foraminotomy for unilateral cervical radiculopathy. *Pan Arab J Neurosurg*. (2011) 15:34–46.
38. Engquist M, Löfgren H, Öberg B, Holtz A, Peolsson A, Söderlund A, et al. Surgery versus nonsurgical treatment of cervical radiculopathy: a prospective, randomized study comparing surgery plus physiotherapy with physiotherapy alone with a 2-year follow-up. *Spine*. (2013) 38:1715–22. doi: 10.1097/BRS.0b013e31829ff095
39. Zigler JE, Delamarter R, Murrey D, Spivak J, Janssen M. ProDisc-C and anterior cervical discectomy and fusion as surgical treatment for single-level cervical symptomatic degenerative disc disease: 5-year results of a food and drug administration study. *Spine*. (2013) 38:203–9. doi: 10.1097/BRS.0b013e318278eb38
40. Nemoto O, Kitada A, Naitou S, Tachibana A, Ito Y, Fujikawa A. Stand-alone anchored cage versus cage with plating for single-level anterior cervical discectomy and fusion: a prospective, randomized, controlled study with a 2-year follow-up [comparative study; journal article; randomized controlled trial]. *Eu J Ortho Surg Traumatol: Orthopedie Traumatol*. (2015) 25(Suppl 1):S127–34. doi: 10.1007/s00590-014-1547-4
41. Li Y, Hao D, He B, Wang X, Yan L. The efficiency of zero-profile implant in anterior cervical discectomy fusion: a prospective controlled long-term follow-up study. *J Spinal Disord Tech*. (2015) 28:398–403. doi: 10.1097/bsd.0000000000000032
42. Donk RD, Verbeek ALM, Verhagen WIM, Groenewoud H, Hosman AJF, Bartels R. What's the best surgical treatment for patients with cervical radiculopathy due to single-level degenerative disease? A randomized controlled trial. *PLoS One*. (2017) 12:e0183603. doi: 10.1371/journal.pone.0183603
43. Sundseth J, Fredriksli OA, Kolstad F, Johnsen LG, Pripp AH, Andresen H, Myrseth E, Müller K, Nygaard Ø P, Zwart JA. The Norwegian Cervical Arthroplasty Trial (NORCAT): 2-year clinical outcome after single-level cervical arthroplasty versus fusion—a prospective, single-blinded, randomized, controlled multicenter study. *Eu Spine J*. (2017) 26:1225–35. doi: 10.1007/s00586-016-4922-5
44. Vleggeert-Lankamp CLA, Janssen TMH, van Zwet E, Goedmakers CMW, Bosscher L, Peul W, et al. The NECK trial: Effectiveness of anterior cervical discectomy with or without interbody fusion and arthroplasty in the treatment of cervical disc herniation; a double-blinded randomized controlled trial. *Spine J: Off J North AmSpine Soc*. (2019) 19:965–75. doi: 10.1016/j.spinee.2018.12.013
45. Cloward RB. The anterior approach for removal of ruptured cervical disks. *J Neurosurg*. (1958) 15:602–17. doi: 10.3171/jns.1958.15.6.0602
46. Ragab AA, Escarcega AJ, Zdeblick TA, A. quantitative analysis of strain at adjacent segments after segmental immobilization of the cervical spine. *J Spinal Disord Tech*. (2006) 19:407–10. doi: 10.1097/00024720-200608000-00006
47. Hilibrand AS, Carlson GD, Palumbo MA, Jones PK, Bohlman HH. Radiculopathy and myelopathy at segments adjacent to the site of a previous anterior cervical arthrodesis. *J Bone Joint Surg Am Vol*. (1999) 81:519–28. doi: 10.2106/00004623-199904000-00009
48. Auerbach JD, Anakwenze OA, Milby AH, Lonner BS, Balderston RA. Segmental contribution toward total cervical range of motion: a comparison of cervical disc arthroplasty and fusion. *Spine*. (2011) 1:36:E1593-9. doi: 10.1097/BRS.0b013e31821cfd47
49. Blumenthal SL, Ohnmeiss DD, Guyer RD, Zigler JE. Reoperations in cervical total disc replacement compared with anterior cervical

- fusion: results compiled from multiple prospective food and drug administration investigational device exemption trials conducted at a single site. *Spine*. (2013) 38:1177–823. doi: 10.1097/BRS.0b013e31828ce774
50. Mansfield HE, Canar WJ, Gerard CS, O'Toole JE. Single-level anterior cervical discectomy and fusion versus minimally invasive posterior cervical foraminotomy for patients with cervical radiculopathy: a cost analysis. *Neurosurg Focus*. (2014) 37:E9. doi: 10.3171/2014.8.Focus14373
 51. Dunn C, Moore J, Sahai N, Issa K, Faloony M, Sinha K, et al. Minimally invasive posterior cervical foraminotomy with tubes to prevent undesired fusion: a long-term follow-up study. *J Neurosurg Spine*. (2018) 29:358–64. doi: 10.3171/2018.2.Spine171003
 52. Sahai N, Changoor S, Dunn CJ, Sinha K, Hwang KS, Faloony M, Emami A. minimally invasive posterior cervical foraminotomy as an alternative to anterior cervical discectomy and fusion for unilateral cervical radiculopathy: a systematic review and meta-analysis. *Spine*. (2019). 44:1731–9. doi: 10.1097/brs.0000000000003156

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2022 Gao, Wei, Zhu, Zhou, Zhang, Cui, Li, Qian and Hao. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



OPEN ACCESS

EDITED BY

Wenjie Duan,
East China University of Science
and Technology, China

REVIEWED BY

John Michael Felt,
The Pennsylvania State University
(PSU), United States
Helena Carvalho,
University Institute of Lisbon (ISCTE),
Portugal

*CORRESPONDENCE

Siu-ming To
siumingto@cuhk.edu.hk

SPECIALTY SECTION

This article was submitted to
Positive Psychology,
a section of the journal
Frontiers in Psychology

RECEIVED 02 May 2022

ACCEPTED 04 July 2022

PUBLISHED 26 July 2022

CITATION

To S-m, Yang L, Dong L, Yan M-w,
So Y-y and Chung M-y (2022)
Development and validation of a
quantitative measure for parent
empowerment *via* transformative
learning.
Front. Psychol. 13:934142.
doi: 10.3389/fpsyg.2022.934142

COPYRIGHT

© 2022 To, Yang, Dong, Yan, So and
Chung. This is an open-access article
distributed under the terms of the
[Creative Commons Attribution License](#)
(CC BY). The use, distribution or
reproduction in other forums is
permitted, provided the original
author(s) and the copyright owner(s)
are credited and that the original
publication in this journal is cited, in
accordance with accepted academic
practice. No use, distribution or
reproduction is permitted which does
not comply with these terms.

Development and validation of a quantitative measure for parent empowerment *via* transformative learning

Siu-ming To*, Lei Yang, Lei Dong, Ming-wai Yan, Yuk-yan So
and Mee-yee Chung

Department of Social Work, The Chinese University of Hong Kong, Shatin, Hong Kong SAR, China

Although current literature demonstrates how parents benefit from parent empowerment programs, the development of a quantitative measure of parent empowerment has garnered limited attention in parenting research. The goal of this research was therefore to develop and validate a quantitative measure for the assessment of practitioners' attitudes and competence in parent empowerment. In the process of item generation, the qualitative findings derived from four studies in relation to the perceived outcomes and experiences in parent empowerment were synthesized in the first stage. In the second stage, a list of narratives that articulated different themes of parent empowerment was generated, which resulted in an item pool containing 28 items. In the third stage, the research team converted the 28 items into a survey instrument. In the fourth stage, a first-scale validation study was conducted to explore the factor structure of the initial 28-item questionnaire. The exploratory factor analysis on the first sample of 366 practitioners yielded a twofold factor structure with 17 items, including practitioners' attitudes in parent empowerment and practitioners' competence in parent empowerment. In the final stage, a second-scale validation study was undertaken to verify the fit of the twofold factor structure. A confirmatory factor analysis on the second sample of 170 practitioners demonstrated a good model fit. The results of reliability tests for the whole scale and two subscales also indicate satisfactory internal consistency. The Parent Empowerment *via* Transformative Learning Questionnaire (PETLQ) was thus developed and confirmed as a scale with sufficient factorial validity and internal consistency to be used for assessing parenting practitioners' attitudes and competence in parent empowerment and for evaluating the effectiveness of parent empowerment programs.

KEYWORDS

parent empowerment, transformative learning, scale development, scale validation, parenting intervention

Introduction

The current social concerns over parenting in many societies have led to much intellectual discussion about the purpose and direction of parenting intervention (e.g., Lam et al., 2019; To et al., 2019b). Social discourse surrounding globalization has convinced many parents that their children will experience massive economic, social, and technological changes in the near future, leaving many parents scrambling to find ways to help their children grow, adapt, and survive amidst the changing global landscape. In addition, many parents are now seeking professional advice or services because of the strong impression that such professionals are experts on child development and can therefore guide and instruct parents on what to do (Leung and Lam, 2009; Lam and Kwong, 2012). Such prevailing beliefs may have contributed heavily to an emerging set of standards placed upon today's parents, who face increasing pressures to adhere to such expectations and to partake in parent education programs that will ultimately enhance their children's "success" later on. In view of such a changing ecology of parenting, parents have been found to experience a sense of powerlessness, generalized distrust, and alienation from resources for social influence (Lam and Kwong, 2012; To and Chan, 2013; Lam et al., 2018; To et al., 2018b).

This feeling of powerlessness, self-blame, and self-doubt among parents suggests the need for a new paradigm in parent education. Alternative approaches can benefit from paying attention to how social and cultural contexts influence parents' beliefs, strengthening their personal growth, promoting critical dialog, and enhancing mutual support among parents. In recent years, empowerment has become an attractive concept in the development of parenting intervention and parent education services. According to Lam (2003), the goal of parent empowerment is to activate the strengths, competence, and possibilities for change that exist in parents and in the social context. Instead of transmitting knowledge and skills regarding parenting, practitioners who emphasize parent empowerment tend to embrace parents' life experiences and facilitate critical reflection about these experiences. Empowerment-oriented practitioners also help parents develop their own beliefs and perspectives in a critical and reflexive way, which can then guide their day-to-day parenting practices. Consequently, parent empowerment has tremendous potential to address the problems inherent in expert-led and deficit-based parenting interventions while shedding light on how to develop more parent-focused, strength-based, and integrated practices.

While current literature demonstrates how parents benefit from parent empowerment programs (e.g., Nieves et al., 2021), few studies elaborate on the perceptions and abilities of practitioners who facilitate the collaborative learning journey. In fact, previous research on community empowerment interventions has indicated that practitioners, as co-learners during the empowerment process, gradually adopt a more

situated learning perspective by highlighting flexibility, support, and holism (Quillinan et al., 2019). However, the development of a quantitative measure of parent empowerment has garnered limited attention in parenting intervention research. Most of the relevant studies on parent empowerment have used qualitative methods, such as individual interviews and focus groups, to understand how participants individually and collectively make sense of their experiences in various programs.

That said, a few quantitative studies have been undertaken to examine the concept of parent empowerment or the outcomes of parent empowerment programs. For instance, a study undertaken by Rodriguez et al. (2011) found that the Parent Engagement and Empowerment Program, which aims to improve children's mental health, helped increase family empowerment, mental health services efficacy, and self-assessment of skills among participants. This study adopted the Family Empowerment Scale (FES) that was originally used to assess empowerment in families whose children have emotional disabilities (Koren et al., 1992). Moreover, Freiberg et al. (2014) constructed the Parent Empowerment and Efficacy Measure (PEEM), which aims to enhance the accountability and effectiveness of family support services by measuring participants' sense of control or capacity to meet the challenges in parenting. Recently, based on a sample of parents from low-income families, Figueroa et al. (2020) developed a self-administered questionnaire on parental health-related empowerment. Nevertheless, there are still very few quantitative measures targeting the construct of parent empowerment in the area of parenting intervention and parent education. There is also a scarcity of measures adopting a "bottom-up" approach to scale development (Hinkin, 1998), which can be understood as using participants' direct experiences in parent empowerment programs to generate items of a related scale. Despite the increasing use of parent empowerment as a concept to guide the design of parenting practice, there is thus a pressing need to develop psychometrically valid and reliable tools for measuring the unique features of parent empowerment, especially from the perspective of practitioners who may both enable and constrain the actualization of parent empowerment (Lam and Kwong, 2012).

Parent empowerment informed by transformative learning

Considering that parent education programs emphasizing the transmission of knowledge and skills might remind parents of their deficits in parenting (To et al., 2013), a transformative learning perspective, which is a well-established concept in adult education, can offer a theoretical framework for exploring the components and content areas of parent empowerment. Whereas parent education often adopts a transmission perspective, which assumes learners are passive

and will look to the educator to pass down relevant information, rules, and values (Pope and Denicolo, 2001), a transformative learning approach generally posits learners as active participants in the learning process. Mezirow (2000) defines transformative learning as “the process by which we transform our taken-for-granted frames of reference to make them more inclusive, discriminating, open, emotionally capable of change, and reflective so that they may generate beliefs and opinions that will prove more true or justified to guide actions” (p. 7). As a result of such transformation, individuals develop a more dependable frame of reference and gain greater control over their lives, hence becoming socially responsible decision makers who actively negotiate for and act upon their goals, values, feelings, and meanings rather than being subjected to the discretion of others or to the situation at hand. In sum, transformative learning aims to help individuals develop autonomy and make informed decisions. Furthermore, this approach places focus on the learner as a unique individual and on the surrounding social variables and implications.

Empowerment and transformative learning coalesce around the facilitation of individuals as well as their interactions and relationships with others and the social world in effecting personal and social change (Sokol and Cranton, 1998). Programs and services adopting both approaches provide opportunities for individuals to critically reflect on their values and perspectives, thereby becoming autonomous, socially responsible, and informed decision makers who can forge their own viewpoints and actions without any oppressive constraints. In addition, practitioners who are familiar with transformative learning and empowerment approaches are more cognizant of the hegemonic nature of the current practices in parent education. Similarly, these practitioners may also be better trained to truly respect and empower parents and to help parents develop a critical awareness and engage in reflexive parenting (Leung and Lam, 2009). Furthermore, both approaches may prove to be highly effective in nurturing collaboration and mutual support among parents. As such, the adoption of a transformative learning perspective can help enrich and deepen our understanding of parent empowerment.

Components of transformative learning and their relations to parent empowerment

Since it is built upon various theoretical underpinnings such as humanism-existentialism, critical theory, and constructivism, transformative learning holds various assumptions and consists of different aspects stemming from its diverse theoretical origins. Thus, it is very difficult, if not impossible, to develop a single, generic scale to capture every aspect of transformative learning (Romano, 2018). Moreover, the process and outcomes

of transformative learning may vary according to context and those involved (Stuckey et al., 2013). Therefore, a more feasible approach would be to develop instruments that are specific to the target and type of change sought (Romano, 2018). In this regard, the following essential components of transformative learning and their relations to parent empowerment are highlighted.

Centrality of experience

Transformative educators view learners as self-directing individuals who can actively make sense of their lived experiences, derive meaning from information or experiences, and develop their own perspectives and viewpoints (Sokol and Cranton, 1998). The life experiences of individuals therefore have a critical role to play in facilitating learning and critical reflection (Taylor, 2009). Given that experiential learning and life experiences provide “pedagogical entry points” (Lange, 2004), the transformative learning approach assumes that incorporating learners’ lived experiences will offer opportunities for engaging in critical reflections about values, perspectives, and purpose, potentially leading to a transformative experience or a new perspective (Taylor, 2009).

Applying this component of transformative learning in understanding parent empowerment, it is clear that the information provided by parenting experts cannot replace the tacit knowledge generated by parents’ own lived experiences (To et al., 2015). By understanding the importance of their own inner resources and experiences, parents may feel more confident in interacting with their children and participating in their children’s life development without relying extensively on external support (To and Chan, 2013). Therefore, helping parents to review and reflect on their lived experiences is a central part of a transformative learning approach to parent empowerment.

Holistic orientation

Believing that learning is not confined to the head, transformative learning emphasizes a holistic orientation to education and encourages the engagement of other ways of knowing such as affective and relational (Taylor, 2009). Affective knowing, which involves developing an awareness of emotions, is important for transformative learning (Taylor, 2009). Meanwhile, transformative educators also use different means like music or arts and other expressive ways of knowing to evoke experiences for greater exploration, thus creating a learning environment conducive to holistic development (Taylor, 2009).

A transformative learning approach to parent empowerment aims for a holistic approach to parenting. This

includes both the personal growth of parents and a strengthened sense of parental competence (Lam, 2003). It believes that the personal growth and learning involved in parenthood is a lifelong journey, and thus, parent empowerment programs should help parents develop self-awareness and sensitivity toward others in order to be fully immersed in the mindset that parenthood is a challenging yet rewarding journey. Parents should also be helped to access necessary support and to participate in decision-making in various domains and levels of parenthood.

Contextual understanding of knowledge

Knowledge can be derived from a variety of sources (Griffith and Frieden, 2000), but access to knowledge can often be restricted by social, cultural, or historical networks constituted by the interweaving of power and knowledge (Mezirow, 2000). Therefore, it is important to recognize the influences and assumptions of social, cultural, and historical networks and to critically reflect on how related ideologies may impede autonomous learning (Mezirow, 2000). Based on the assumption that knowledge needs to be understood in relation to the surrounding context (Griffith and Frieden, 2000), transformative learning programs or strategies rely heavily on context and its implications for learners (Taylor, 2009). In this regard, context comprises the immediate learning environment, the personal circumstances of learners, and any contexts that have shaped society (Taylor, 2009).

Parent empowerment programs using this approach see the importance of using transformative learning to explore how domination and oppression are maintained through taken-for-granted assumptions, hoping to encourage alternative readings of experience free from domination and oppression. Such an approach provides opportunities for parents to critically reflect on their values and perspectives, thereby becoming autonomous, socially responsible, and informed decision makers in childrearing (Stuckey et al., 2013). Other positive consequences of this approach include stronger interpersonal relationships and positive social change.

Communicative learning

The use of dialog is a means through which critical reflections can further one's transformation with the self or with others (Taylor, 2009). Dialog used in transformative learning comprises highly personal, self-disclosing conversations that demonstrate a trust between participants, who are trying to reach an agreement, embrace differences, explore other points of views, and consider reframes in their own thinking (Mezirow, 2000; Traverso-Yépez, 2008). Conditions that create

an environment for reflective dialog to occur include freedom from coercion and distorting self-deception, an openness to alternative points of view, empathy and concern about how others think and feel, and an equal opportunity to participate (Mezirow, 2000).

There are two aspects of communicative learning in parent empowerment programs. First, a transformative learning approach promotes the importance of a strong parent-child relationship and the opportunities for parent-child dialog. Specifically, cultivating a deep, sentimental relationship with the child and being able to identify with the child's experiences are both necessary components for a strong parent-child relationship. When parents and children are actively involved in genuine dialog and shared activities, a sense of connection can naturally form (To and Chan, 2013). So, rather than using various parenting skills in settling the power and control struggle between the parent and child, parents may find greater joy and fulfillment from their role as a parent when their relationship with the child is premised on constructive and meaningful interactions.

Second, practitioners adopting this approach to parent empowerment strive to cultivate a constructive environment for mutual support and learning among parents. Meaningful conversations and mutual support from peers in parent groups can stimulate parents' continuous growth and the development of parent empowerment programs in a sustainable way. Support networks and learning communities can also be formed as a result of such parent empowerment initiatives.

The above key components suggest that parent empowerment can be generated in a number of ways through the lens of transformative learning. The synthesis of these components opens up the possibility for developing a tentative list of dimensions and expected outcomes of a transformative learning approach to parent empowerment. A rigorous psychometric approach can thus be adopted to generate items and validate a quantitative measure that can be used to understand the perspective of practitioners engaging in parent empowerment interventions and to assess possible changes made by practitioners participating in transformative learning-based training programs. Meanwhile, previous literature points out that a transformative learning approach requires practitioners to have a deep understanding not only of their skills and abilities that allow for culturally responsive practices in collaboration with learners, but also of their mindsets and attitudes toward the nature of learning and transformation (Taylor and Cranton, 2012; Quillinan et al., 2019). Thus, it seems warranted to measure both the attitudes and competence of practitioners to capture their perceptions of reflections and practices in the transformative learning process (Baartman and De Bruijn, 2011).

The goal of this research was thus to develop and validate a quantitative measure for the assessment of practitioners' attitudes and competence in parent empowerment *via*

transformative learning. To achieve this goal, we examined the factor structure and psychometric properties of the proposed questionnaire.

Materials and methods

Stage 1: Re-analysis and synthesis of narratives of parents' perceived outcomes and experiences in parenting programs adopting a transformative learning approach

To construct and validate a quantitative measure for parent empowerment informed by transformative learning, we first synthesized the qualitative findings derived from four studies in relation to the perceived outcomes and experiences in parenting programs adopting a transformative learning approach. All parenting programs reported in these studies were undertaken by members of the Hong Kong Parent Education Association, a non-profit organization formed by a group of social workers and parent education practitioners. The practitioners of these programs were equipped themselves with rich knowledge and experience in adopting a transformative learning approach to designing and implementing parent education programs (To et al., 2013). Therefore, the themes elicited from the narratives of the participants can reflect not only their perceptions of the programs, but also their perceptions of a transformative learning approach to parent education as a whole (To et al., 2013).

In Study 1 (To et al., 2013), a total of 17 parents joined three post-intervention focus groups after the program. They were all Hong Kong Chinese parents with at least one child who was receiving education in a local secondary school (equivalent to middle and high school). In Study 2 (To et al., 2014), a total of 20 participants joined three post-intervention focus groups after the program. They were all Hong Kong Chinese parents with at least one child studying in a nursery school. In Study 3 (To et al., 2015), a total of 25 participants joined five post-intervention focus groups after the program. All were Hong Kong Chinese parents who had at least one child in kindergarten, primary school (equivalent to elementary school), or secondary school. In Study 4 (To et al., 2018b), a total of 45 participants joined 11 post-intervention focus groups after the program. All of them were Hong Kong Chinese parents with at least one child studying in nursery school or primary school. In sum, we gathered the narratives of 107 Hong Kong Chinese parents from a total of 22 focus groups regarding their perceived outcomes and experiences in parent education programs informed by transformative learning. All these narratives provided specific information about the themes or content areas related to parent empowerment *via* transformative learning as perceived by local parents.

Stage 2: Item generation

In the second stage, two of our team's researchers re-analyzed and synthesized the narratives derived from these focus group studies to generate a list of participants' narratives that articulated different themes of parent empowerment *via* transformative learning (see Table 1), including (1) emphasis on parents' own experiential knowledge and meaning-making in parenthood, (2) facilitation of self-integration and self-enrichment through telling life stories, (3) generation of critical reflections on the dominant discourses and ideologies in parenting, (4) cultivation of parent-child connectedness and improvement in parent-child relationships, (5) understanding of children's developmental needs, emotions, potentials, and individuality, and (6) cultivation of mutual support and mutual learning through small group sharing. The articulation of these themes was guided by the principle that they were elicited from at least two focus group studies and that they could reflect the general perceptions of the participants regarding their learning outcomes and experiences. The research team also identified 12 sub-themes under the six aforementioned themes: (1) parents openly and honestly reflect on their everyday parental experiences, (2) parents explore and deepen the meaning of being a parent, (3) parents organize their life stories and growth experiences, (4) parents experience personal growth, (5) parents have deep critical reflections on the sociocultural context in which they are situated, (6) parents discover their own resources and abilities to face the challenges of being a parent, (7) parents place more emphasis on the relational connection with their children, (8) parents use different ways to deepen their relational connection with their children, (9) parents understand their own developmental and emotional needs so that they can better understand their children's developmental and emotional needs, (10) parents explore their own way to raise their children, (11) parents trust and support each other, and (12) parents build a community to mutually support and learn from each other.

Then, the other three team members discussed these preliminary themes and found that when applying these themes in studying the perceptions of practitioners with regard to parent empowerment *via* transformative learning, these themes could be re-categorized into two major components, namely attitudes (i.e., practitioners' beliefs and motivation in adopting a transformative learning approach to parent empowerment) and competence (i.e., practitioners' sense of competence in adopting a transformative learning approach to parent empowerment) (Baartman and De Bruijn, 2011). Based on these six themes, 12 sub-themes, and two major components (i.e., attitudes and competence), these three project-team researchers independently generated different items of the instrument. Then, they cross-evaluated the items generated by each researcher, and the items receiving unanimous agreement were retained in the item pool. At the end of this process, the resulting item pool contained 28 items regarding the

TABLE 1 Themes and examples of narratives of parent empowerment *via* transformative learning.

Dimension	Theme	Example of narratives
(A) Emphasis on parents' own experiential knowledge and meaning-making in parenthood.	(1) Parents openly and honestly reflect on their everyday parental experiences. (2) Parents explore and deepen the meaning of being a parent.	"Although we had similar experiences in parenting, some group members had different reflections on those experiences. Their reflections stimulated me to use other perspectives to think about the meaning of parenthood." (as cited in To et al., 2013 , p. 86). "At this moment of life, this person [the child] is the most important person to me. You will refocus your life according to this understanding. This helps you filter out a lot of things in life and then you can restart your life journey." (as cited in To et al., 2018b , p. 175).
(B) Facilitation of self-integration and self-enrichment through telling life stories.	(3) Parents organize their life stories and growth experiences. (4) Parents experience personal growth.	"You can remember the beautiful life episodes in this process, which can help reassert a sense of mastery in facing future challenges. You will not only focus on problems or family conflicts, which are in fact trivial. There were many good things that you did in the past such as working together with your spouse to build the family and nurture your children. When you think about these, you will experience personal growth and development." (as cited in To et al., 2013 , p. 87). "The program gave me an opportunity of self-evaluation, and I could reorganize my life experiences, no matter positive or negative. It was good for me because all these experiences have affected my life attitude. After the reorganization of my life experiences, I found that life should be very simple in the way that we should cherish our children." (as cited in To et al., 2015 , p. 107).
(C) Generation of critical reflections on the dominant discourses and ideologies in parenting.	(5) Parents have deep critical reflections on the sociocultural context in which they are situated. (6) Parents discover their own resources and abilities to face the challenges of being a parent.	"I have received many messages from society regarding the roles of being a parent. The practitioner helped us challenge the old way of thinking. [He] did not talk much about theories. He used many daily life examples and his own life experiences to help us reflect." (as cited in To et al., 2013 , p. 86). "As a person, I used to be very doubtful about myself. But after the workshop, I became more confident. Now I just do what I think is right." (as cited in To et al., 2018b , p. 176).
(D) Cultivation of parent-child connectedness and improvement in parent-child relationships.	(7) Parents place more emphasis on the relational connection with their children. (8) Parents use different ways to deepen their relational connection with their children.	"My child is my 'flesh and bones.' It's not a responsibility but a life devotion to take care of my children. It's natural for you to take care of your leg when it hurts because it is a part of your body. I have a stronger sense of the parent-child connection after participating in this group." (as cited in To et al., 2014 , p. 52). "I came home and looked at my daughter — she is really my 'flesh and bone.' The practitioner encouraged us to review the photos that were taken when my child was born. At that time, I often asked myself how I could take care of my baby. Now I am amazed by my ability to bring her up." (as cited in To et al., 2015 , p. 108).
(E) Understanding of children's developmental needs, emotions, potential, and individuality.	(9) Parents understand their own developmental and emotional needs so that they can better understand their children's developmental and emotional needs. (10) Parents explore their own way to raise their children.	"These three workshops can provide opportunities for me to think about my life, to reorganize, and to address issues. When anger emerges, I will be alert and remind myself that this has nothing to do with my child's behavior. Then, I can calm down." (as cited in To et al., 2018b , p. 177). "I could manage my own life when I grew up. Why can't my child? Now I always remind myself that I should allow more space and freedom for him to grow. I feel more relaxed now. I try my best to help my child, but I resist putting so much pressure on myself. It seems that everything has become smoother!" (as cited in To et al., 2015 , p. 108).
(F) Cultivation of mutual support and mutual learning through small group sharing.	(11) Parents trust and support each other. (12) Parents build a community to mutually support and learn from each other.	"We joined our hands to go through the process of life integration. We shared our life experiences with each other. We also talked about our experiences in parenting. I could learn from my group members' experiences and know how to preserve a positive attitude to face the difficulties." (as cited in To et al., 2014 , p. 53). "When I listened to other group members' sharing, I could learn about how other parents coped with problems in childrearing. I could take their experience and wisdom as my reference. Moreover, through the sharing of male group members, I could have a deeper understanding of males' perceptions and viewpoints. Therefore, I knew how to put myself in my family members' shoes." (as cited in To et al., 2015 , p. 109).

outcomes and experiences of parent empowerment. During the process of item generation, the researchers were careful to keep items concise and focused, and avoid double-barreled questions and complicated syntax to decrease item ambiguity ([Podsakoff et al., 2003](#)).

Stage 3: Pilot survey

In the third stage, the research team converted the 28 items into a survey instrument. Each item was rated along a seven-point Likert scale. This preliminary survey instrument was

pilot-tested with a non-random sample of 51 practitioners who had rich professional knowledge and experience in adopting a transformative learning approach to parent education. Besides filling out the questionnaire, they were asked to give comments on the questionnaire items. Among the pilot study respondents, 9.8% were male and 90.2% were female. Of the 51 respondents, 2.2% were aged 21–30, 15.7% were 31–40, 43.1% were 41–50, 35.1% were 51–60, and 3.9% were 61 or above. In terms of education level, 3.9% had college-level education or below, 19.6% university level, 74.5% master's level, and 2.0% doctoral level. Then, the research team retained or modified the items of the questionnaire based on the results of the preliminary

analysis, including the initial reliability analysis and item analysis, as well as the practitioners' written comments. They thus developed a 28-item questionnaire and then tested it in the first validation study.

Stage 4: First validation study

In the fourth stage, we conducted the first-scale validation study to explore the factor structure of the initial 28-item questionnaire on data collected from the pre-test assessment of a parent education project in Hong Kong. In this stage, we sent invitation letters to ten collaborating social service agencies to solicit their support in recruiting practitioners to participate in this study, and a total of 366 practitioners were surveyed in the first-scale validation study. Exploratory factor analysis (EFA) was performed to examine the underlying factor structure of the 28-item questionnaire.

Stage 5: Second validation study

In the final stage, we conducted the second-scale validation study to verify the fit of the factor structure derived from the EFA of the first study. Following Hinkin's (1998) recommendation on the steps of scale development and validation, we performed a confirmatory factor analysis (CFA) on data collected from a new sample, which was taken from the intermediate-test assessment of this parent education project. After excluding the practitioners who had been surveyed in the first validation study, a total of 170 practitioners participated in the second validation study.

Prior to conducting this research, we obtained ethics approval from the Survey and Behavioral Research Ethics Committee of the affiliated institution. The team members obtained informed written consent from the practitioners prior to their participation, and the consent form clearly demonstrated the research objective and the way that the data would be processed. It also emphasized that their participation was completely voluntary and anonymous and that their information would be kept strictly confidential (Podsakoff et al., 2003).

Measures

Parent empowerment via transformative learning questionnaire

As demonstrated, five stages were completed to develop the PETLQ. The initial PETLQ included 28 items, each rated on a seven-point Likert scale. As proposed and hypothesized, the PETLQ was made up of the attitude subscale (14 items)

and the competence subscale (14 items). A sample item from the attitude subscale includes "I think parent work should involve helping parents critically reflect on various prevailing childrearing practices or discourses in society." A sample item from the competence subscale includes "I am able to help parents organize their life stories and growth experiences." For each subscale, the scores of the items are summed as the subscale score. A higher subscale score reflects a higher degree of agreement with the attitudes or competence in adopting a transformative learning approach in parent empowerment. The

TABLE 2 Sociodemographic characteristics of participants.

Variable	<i>n</i> = 366 (%) ^a	<i>n</i> = 170 (%) ^b
Age group		
20–30	93 (25.6)	46 (27.1)
31–40	171 (47.1)	66 (38.8)
41–50	71 (19.6)	39 (22.9)
51 or above	28 (7.7)	19 (11.2)
Missing	3	0
Gender		
Male	76 (20.8)	41 (24.1)
Female	289 (79.2)	129 (75.9)
Missing	1	0
Having child(ren) or not		
Yes	133 (36.4)	67 (39.4)
No	232 (63.6)	103 (60.6)
Missing	1	0
Education level		
College or below	54 (14.8)	35 (20.6)
University	169 (46.3)	78 (45.9)
Postgraduate or above	142 (38.9)	57 (33.5)
Missing	1	0
Years of experience in the current job position		
1 year or below	80 (22.7)	16 (9.4)
1 year above to 5 years	118 (33.4)	79 (46.5)
5 years above to 10 years	68 (19.3)	30 (17.6)
10 years above to 15 years	37 (10.5)	19 (11.2)
15 years above to 20 years	20 (5.7)	13 (7.6)
20 years above	30 (8.5)	13 (7.6)
Missing	13	0
Frequency of participation in parent education training in the last year		
None	91 (25.0)	41 (24.1)
1–3 times	208 (57.1)	104 (61.2)
4–6 times	44 (12.1)	20 (11.8)
7–9 times	9 (2.5)	4 (2.4)
10 times or above	12 (3.3)	1 (0.6)
Missing	2	0

^aSample size of the EFA; ^bsample size of the CFA.

original version of the questionnaire was in Chinese as the items were derived from interview texts with the original linguistic expressions retained as faithfully as possible. Given the need to disseminate research-based knowledge in research papers, the original Chinese version of the PETLQ was translated into English and then back-translated into Chinese. With several modifications and wording revisions based on the results of translation and back-translation, the items of the PETLQ were finalized. A copy of the questionnaire is available from the first author upon request.

Sociodemographic characteristics

Age, gender, educational level, and relevant information about work experience were collected. Descriptive analyses were performed to obtain the frequencies and percentages or mean and standard deviations of demographic variables. The details of the sociodemographic characteristics are presented in [Table 2](#).

Data analysis

All data analyses were conducted using SPSS 28 and Amos 25. In the first-scale validation study, we conducted an EFA to identify the factor structure for the items of the PETLQ. After the factor structure had been explored, reliability analysis and item analysis were carried out based on this sample. In the second-scale validation study, we conducted a CFA to test whether the data fit the hypothesized factor structure. We assessed the goodness-of-fit using a variety of fit indices. A relative chi-square value (CMIN/df) less than 5 ([Schumacker and Lomax, 2004](#)), a root-mean-square error of approximation (RMSEA) value lower than 0.08 ([Browne and Cudeck, 1993](#)), an incremental fit index (IFI) and a Tucker–Lewis index (TLI) score higher than 0.90 ([Bollen, 1989](#)), and a comparative fit index (CFI) value higher than 0.93 ([Byrne, 1994](#)) were set as the criteria for model acceptability.

Results

In the first-scale validation study, an EFA was performed to examine the underlying factor structure of the 28-item questionnaire based on a sample of 366 participants. We used principal axis factoring (PAF) with an oblique rotation to produce five factors with eigenvalues > 1.0 . However, eight items (items 2, 4, 8, 11, 16, 22, 25, and 27) were deleted because of their scattering in three different factors with weak loadings. Then, we conducted PAF with an oblique rotation on the remaining 20 items again, which yielded three factors with eigenvalues exceeding unity. Due to weak loadings below 0.40, two items (items 12 and 19) were deleted

([Tabachnick and Fidell, 2007](#)). Meanwhile, we also evaluated the cross-loadings of a variable by the ratio of their squared loadings. As suggested by [Hair et al. \(2019\)](#), both problematic and potential cross-loadings (i.e., ratio between 1.0 and 2.0) can be deleted. Thus, item 7 was deleted in this step. After that, further analysis with an oblique rotation was performed on the remaining 17 items. The Kaiser–Meyer–Olkin measure of sampling adequacy and the Bartlett’s test of sphericity were explored to assess the appropriateness of factor analysis ([Hair et al., 2019](#)). At this stage, the Kaiser–Meyer–Olkin value was 0.91, and Bartlett’s test of sphericity reached statistical significance ($p < 0.001$), indicating that the sample met the criteria for factor analysis ([Hair et al., 2019](#)).

As shown in [Table 3](#), according to the extraction of factors with eigenvalues > 1.0 , a twofold factor structure was generated. These factors explained 51.4% of the total variance. Factor 1 accounted for 36% of the total variance and contained nine items; factor 2 accounted for 15.4% of the total variance and contained eight items. All items had single dominant factor loadings higher than 0.4. Factor 1 (nine items) measured competence, and Factor 2 (eight items) measured attitudes. The communalities of most variables were higher than 0.4, with a mean level of 0.5, indicating that the reliability of the indicators is acceptable ([Costello and Osborne, 2005](#); [Hair et al., 2019](#)).

Item analyses, including the item-total correlations and reliability tests, are also demonstrated in [Table 3](#). The McDonald Omega coefficient (ω) for the whole scale was 0.857. The subscale Omega coefficients were 0.775 (PETLQ-attitude subscale) and 0.919 (PETLQ-competence subscale). These results indicate satisfactory internal consistency ([Green and Yang, 2015](#); [Flora, 2020](#)). Furthermore, the means, standard deviations, and correlations of the two factors and the whole scale are presented in [Table 4](#). The results indicate that these two factors represent separate but related constructs.

To verify the fit of the twofold factor structure derived from EFA, we conducted a CFA based on a sample of 170 participants. The standardized parameters, path diagrams, and factor loadings are presented in [Figure 1](#). All of the parameter estimates were significant at a level of $p \leq 0.001$ or $p \leq 0.01$, and all factor loadings exceeded 0.5 except for that of Item A6 (0.434). Based on the factor loadings, the composite reliability of attitudes and competence was 0.976 and 0.993, respectively, which indicated that all the items consistently measure their corresponding construct ([Nunnally and Bernstein, 1994](#)). Meanwhile, covariances were added within the factor because of the high modification index value, which may be caused by the similarity in the wordings and theoretical correlations of these items ([Datu and Yuen, 2021](#)). Furthermore, as shown in [Table 5](#), the satisfactory model fit confirmed the structural validity of the scale (CMIN/df = 1.826, RMSEA = 0.070). Likewise, the incremental fit index (IFI = 0.940), the Tucker–Lewis index (TLI = 0.929), and the comparative fit index (CFI = 0.940) also supported a satisfactory model fit. Moreover,

TABLE 3 Exploratory factor analysis and item analysis of the 17-item parent empowerment *via* transformative learning questionnaire (PETLQ).

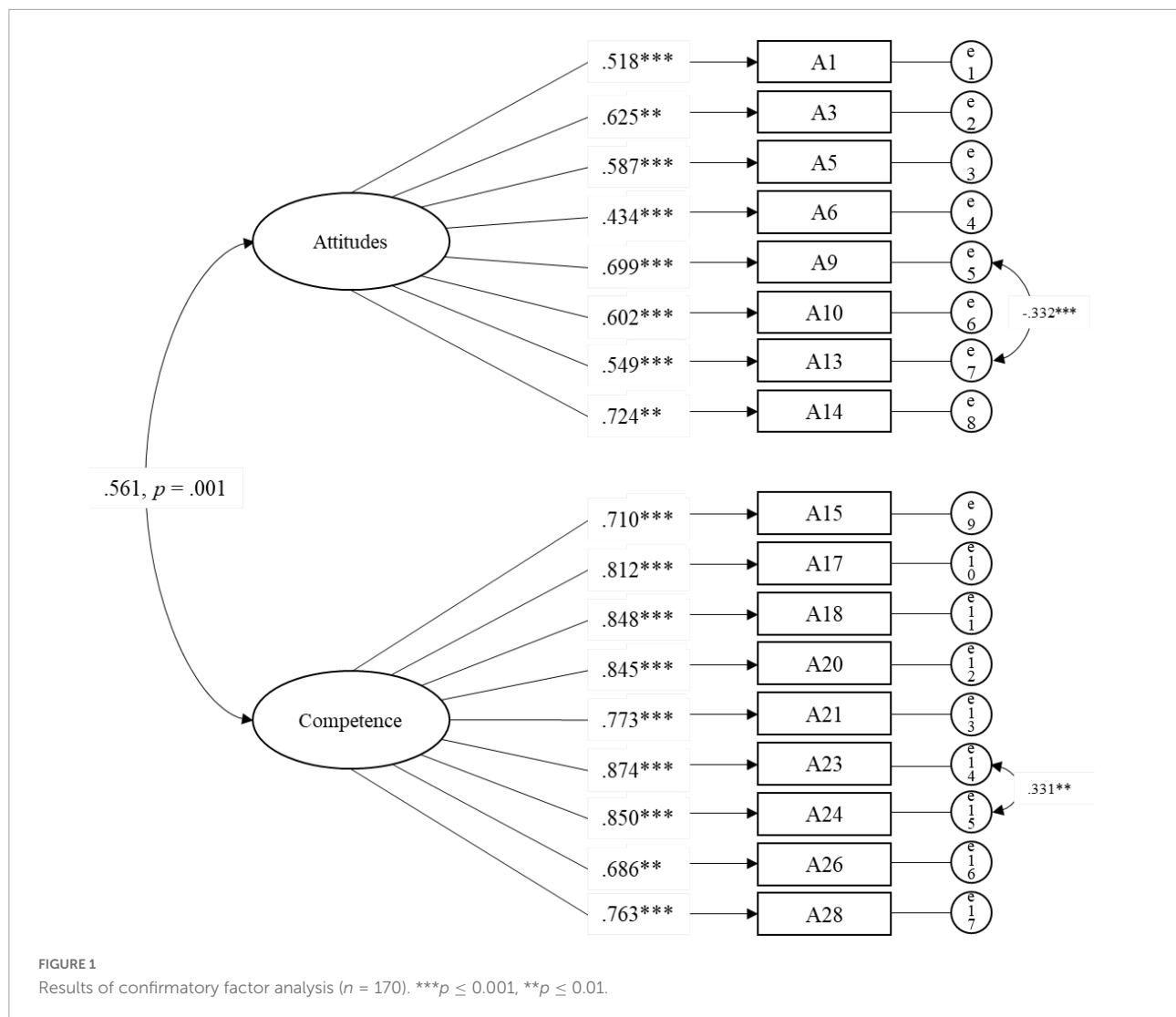
	Item analysis(<i>n</i> = 366)			Factor loadings from EFA(<i>n</i> = 366)		
	<i>M</i>	<i>SD</i>	Item-total [^]	Com [^]	1	2
Factor 1: Competence (variance explained: 36.0%)						
18. I have the ability to facilitate parents' personal growth.	4.967	0.998	0.790	0.689	0.825	0.014
23. I am able to assist parents to understand their own developmental and emotional needs so that they can better understand their children's developmental and emotional needs.	5.157	0.888	0.753	0.638	0.822	−0.082
24. I can help parents explore their own way to raise their children.	5.111	0.840	0.705	0.554	0.762	−0.060
17. I am able to help parents organize their life stories and growth experiences.	4.828	0.984	0.725	0.575	0.753	0.016
20. I am able to help parents discover their own resources and abilities to face the challenges of being a parent.	5.219	0.848	0.718	0.568	0.731	0.061
28. I am able to assist parents to explore and deepen the meaning of being a parent.	4.818	0.974	0.723	0.575	0.724	0.090
21. I am able to help parents deepen their understanding of the relational connection with their children.	4.816	1.032	0.688	0.519	0.716	0.014
26. I have confidence in helping parents build a community to mutually support and learn from each other.	5.028	0.976	0.627	0.440	0.688	−0.089
15. I am able to assist parents to reflect on their everyday parental experiences openly and honestly.	5.230	0.911	0.702	0.565	0.674	0.178
Factor 2: Attitudes (variance explained: 15.4%)						
14. I think it is more important for parents to explore and deepen the meaning of being a parent than to learn correct parenting knowledge and skills.	5.470	1.099	0.608	0.505	−0.067	0.730
9. I think it is more important for parents to experience deep relational connection with their children than to learn communication methods and skills.	5.050	1.340	0.564	0.440	0.084	0.630
10. I think that when parents can understand their own developmental and emotional needs, they can better understand their children's developmental and emotional needs.	5.915	0.934	0.527	0.365	0.006	0.602
5. To facilitate parents' personal growth and integration of lived experiences, I think it is necessary to assist parents in narrating and reflecting on their life stories.	5.764	0.903	0.459	0.271	−0.064	0.538
13. I think it is more important to help parents build a community to mutually support and learn from each other than to find professionals to teach parents.	5.626	0.968	0.431	0.255	0.012	0.501
1. I think that whether parents can openly and honestly reflect on their everyday parental experiences is more important than whether they can acquire correct childrearing knowledge and skills.	5.655	1.066	0.441	0.255	0.016	0.499
3. I think the primary goal of parent work should be to facilitate parents' personal growth and their integration of lived experiences.	5.758	0.858	0.439	0.279	0.125	0.473
6. I think parent work should involve helping parents critically reflect on various prevailing childrearing practices or discourses in society.	4.728	1.376	0.374	0.178	−0.020	0.428
Total variance explained: 51.4%						
McDonald's omega (<i>n</i> = 366):0.857					0.919	0.775

Item-total[^], item-total correlation; Com[^], communalities. The bold values reflect the twofold factor structure of this measure.

TABLE 4 Means, standard deviations, and correlations among the subscales and whole scale (*n* = 366).

		1	2	Mean	SD
(1)	Attitudes in parent empowerment <i>via</i> transformative learning			5.491	0.667
(2)	Competence in parent empowerment <i>via</i> transformative learning	0.316***		5.019	0.733
(3)	Whole scale: parent empowerment <i>via</i> transformative learning	0.765***	0.853***	5.241	0.571

****p* < 0.001.



the factor correlation between attitudes and competence in parent empowerment *via* a transformative learning approach was significantly correlated in this study ($r = 0.561$, $p \leq 0.001$).

Discussion

This study represents one of the few efforts to develop and validate a quantitative measure for assessing parent education practitioners' attitudes and competence in parent empowerment informed by transformative learning. Based on the psychological

constructs generated from transformative learning-related theories and practices, the PETLQ was confirmed as a scale with sufficient factorial validity and internal consistency to be used for assessing and improving parent empowerment programs.

To start with, although practitioners may have different understandings of the goals and meanings of parent education, the relatively high mean scores and the confirmation of the PETLQ's two-factor model indicate that participants in general support the development of a transformative learning approach to parent empowerment that pays attention to the lived experiences of parents, the influence of social and cultural contexts in parenting, and the importance of mutual support and learning among parents. One possible explanation is that empowerment, characterized by a personally meaningful, goal-oriented process of increasing power in cognitive, emotional, and interpersonal domains (Cattaneo and Chapman, 2010), is widely accepted by practitioners who want to improve their parenting intervention effectiveness (Rodriguez et al., 2011;

TABLE 5 Goodness-of-fit measures of the parent empowerment *via* transformative learning questionnaire (PETLQ) ($n = 170$).

Model	χ^2	df	CMIN/df	RMSEA	IFI	TLI	CFI
Two-factor Structure	211	116	1.826	0.070	0.940	0.929	0.940

Figueroa et al., 2020). Thus, even for practitioners who are not familiar with the concept of transformative learning, they may still agree with some of the core ideas that align with empowerment.

Meanwhile, by comparing the PETLQ's items with other relevant questionnaires such as Family Empowerment Scale (FES) (Rodriguez et al., 2011), Parental Health-Related Empowerment Scale (Figueroa et al., 2020), or the Parent Empowerment and Efficacy Measure (PEEM) (Freiberg et al., 2014), the PETLQ demonstrates uniqueness since it was constructed based on a dialog between theories and items generated through a "bottom-up" approach (Hinkin, 1998). By integrating participants' understandings of their experiences into the development of the scale, the PETLQ may better reflect the conceptualization of a transformative learning approach to parent empowerment, which highlights the centrality of experience and a contextualized understanding of knowledge (Taylor, 2009). Moreover, while other scales mainly target parents in special situations (e.g., parents with children with disabilities and health needs), our scale demonstrates wider applicability by targeting practitioners who provide parenting services for different groups of parents.

As for the details in scale validation, based on the results of EFA, four proposed negatively worded items (i.e., item 2: "I think it is necessary to develop a comprehensive parent education curriculum by professionals to enhance parental competence in parenthood"; item 4: "I think the primary goal of parent work should be to teach parents how to nurture their children"; item 8: "I think most parents need to receive education to learn the knowledge and skills in improving parent-child relationships"; and item 11: "I believe parents can raise their children by a certain parent education method that is proven to be empirically effective") were deleted because they cannot be loaded into the attitude subscale. However, the four corresponding positively worded items (i.e., item 1: "I think whether parents can openly and honestly reflect on their everyday parental experiences is more important than whether they can acquire correct childrearing knowledge and skills"; item 3: "I think the primary goal of parent work should be to facilitate parents' personal growth and their integration of lived experiences"; item 5: "To facilitate parents' personal growth and integration of lived experiences, I think it is necessary to assist parents in narrating and reflecting on their life stories"; and item 14: "I think it is more important for parents to explore and deepen the meaning of being a parent than to learn correct parenting knowledge and skills"), which indicate a positive attitude toward a transformative learning approach to parent education, demonstrate sufficient factor loadings onto the attitude subscale. One possible explanation is that those proposed negatively worded items tend to form a different dimension (Merritt, 2012), rather than the opposite end of those positively worded items, which makes them not significantly associated with the factor indicating a positive attitude toward

parent education *via* a transformative learning approach. In other words, there may exist different dimensions of parent education (e.g., a transformative and a transmission approach) among some practitioners. For example, while practitioners hold positive attitudes toward parent empowerment in general situations, some of them may consider the special situations faced by different groups of parents (such as parents of children with special educational needs, parents with substance abuse concerns) in which transmission of knowledge and skills in childrearing is essential. Previous literature on the historical changes of education approaches also supports this explanation by arguing that today's education practices are layered, including didactic, authentic, and transformative approaches (Kalantzis and Cope, 2020).

Another notable finding related to the competence subscale during EFA is that four proposed negatively worded items (i.e., item 16: "I am worried that I cannot understand parents' distress and concerns"; item 22: "I have no confidence that I can help parents focus on deepening their relational connection with their children rather than solely learning the correct communication methods and skills"; item 25: "I do not know how to facilitate mutual trust and mutual aid among parents"; and item 27: "I am worried that I cannot understand the unique circumstance that each parent is facing") cannot be loaded into the competence subscale. As with the discussion on negatively worded items in the attitude subscale above, it is possible that these negatively worded items here also tend to form a different dimension, rather than the opposite end of practitioners' competence in adopting a transformative learning approach. In other words, practitioners may be somewhat worried about adopting a transformative learning approach and somewhat feel confident in adopting this approach. For example, being practitioners informed by transformative learning, they still face paradoxical situations and uncertainties in engaging parents in the transformative learning process which may lead to their continuous reflection on their own positions and approaches (Lam and Kwong, 2012). This finding echoes previous research on the assessment of transformative learning processes that emphasizes anticipating or experiencing uncertainties (Cox, 2021).

Limitations

There are three major limitations of this study. First, we only adopted self-reported questionnaires to collect data which may increase the threat of social desirability bias. Second, although two samples were used to validate the PETLQ, the generalizability of the findings should be subject to scrutiny because neither were randomized representative samples. Last, while this study targeted parent education practitioners, our team did not develop and validate relevant empowerment scales targeting parents.

Implications and future research directions

Despite the limitations, the present findings on the development and validation of the PETLQ still yield valuable implications. First, regarding the deletion of negatively worded items, this study implies that scholars have to take the effects of using negatively or reverse worded items into consideration when designing and validating scales (Zhang et al., 2016). Moreover, practitioners and parents may have different perceptions of the positively and negatively worded items in the scale. Thus, future studies could include both practitioners and parents to produce context-specific scales targeting different groups, which may help to depict a more comprehensive picture of the empowerment outcomes and processes.

There are also many practice-related aspects to be further explored in future. One is that the relatively lower mean score of the competence subscale highlights the importance of capacity building for parent education practitioners. Future trainings or workshops targeting practitioners may consider themes based on specific items of this scale, especially for practitioners' competence in facilitating parents' personal growth and helping them to explore the meaning of being a parent. Previous research on parent empowerment practices also emphasizes similar training components for practitioners, such as the capacity for reflective listening, showing empathy toward parents, and encouraging mutual support and learning among parents (Day et al., 2012; Quillinan et al., 2019; To et al., 2019a).

Meanwhile, practitioners themselves could design and implement parent empowerment programs with reference to the themes highlighted by the PETLQ. By integrating theoretical elements of transformative learning with participants' experience in parent empowerment programs, this scale could inspire practitioners to place greater emphasis on helping parents to increase self-understanding, reconstruct parental identities, and deepen parent-child relational connection (Lange, 2004; To et al., 2018a). For example, practitioners could help parents to reflect on dominant parenting discourses and realize the intrinsic value of their lived experience by creating a conversational space for parents to have genuine and constructive dialog with their children or other parents (Leung and Lam, 2009; Lam and Kwong, 2012; To and Chan, 2013).

Finally, for future research related to program evaluation, as a valid and reliable scale, the PETLQ can also be used to evaluate the effectiveness of parent empowerment informed by transformative learning. Based on a systematic review on empowerment interventions with families, Borges Rodrigues et al. (2021) pointed out that current studies lack details regarding how to operationalize key theoretical constructs of empowerment, noting that few studies present a theoretical application at the evaluation stage. Thus, the PETLQ could be used to address this knowledge gap by enabling

researchers and practitioners to conduct post-intervention assessment by measuring empowerment constructs informed by transformative learning. Moreover, the evaluation outcomes could help practitioners to guide decisions about how to improve parent empowerment programs.

Data availability statement

The datasets generated for this study are not readily available due to its ownership by the Hong Kong Jockey Club Charities Trust. Requests to access the datasets should be directed to S-MT, siumingto@cuhk.edu.hk.

Ethics statement

The studies involving human participants were reviewed and approved by the Survey and Behavioral Research Ethics Committee of The Chinese University of Hong Kong. The patients/participants provided their written informed consent to participate in this study.

Author contributions

S-MT: project leader, initiated the project, and active in all phases of the project, including design, data collection, data analysis, and writing. LY: active in data collection, data analysis, and writing. LD: active in writing and editing. M-WY: active in data analysis and writing. Y-YS: active in design. M-YC: active in data collection. All authors contributed to the article and approved the submitted version.

Funding

This study was funded by the Hong Kong Jockey Club Charities Trust (Ref. No. 6905600).

Acknowledgments

We want to thank the Hong Kong Council of Social Service and 10 social service agencies to participate in this survey, making this research possible.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated

organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

- Baartman, L. K., and De Bruijn, E. (2011). Integrating knowledge, skills and attitudes: conceptualising learning processes towards vocational competence. *Educ. Res. Rev.* 6, 125–134. doi: 10.1016/j.edurev.2011.03.001
- Bollen, K. A. (1989). *Structural Equations with Latent Variables*. New York, NY: John Wiley & Sons.
- Borges Rodrigues, S., Parisod, H., Barros, L., and Salantera, S. (2021). Examining empowerment interventions with families and preschool children: systematic review of randomized controlled trials. *Health Educ. Behav.* 49, 358–371. doi: 10.1177/10901981211031444
- Browne, M. W., and Cudeck, R. (1993). "Alternative ways of assessing model fit," in *Testing Structural Equation Models*, eds K. A. Bollen and J. S. Long (Newbury Park, CA: Sage), 136–162.
- Byrne, B. M. (1994). *Structural Equation Modeling with EQS and EQS/Windows*. Thousand Oaks, CA: Sage Publications.
- Cattaneo, L. B., and Chapman, A. R. (2010). The process of empowerment: a model for use in research and practice. *Am. Psychol.* 65, 646–659. doi: 10.1037/a0018854
- Costello, A. B., and Osborne, J. (2005). Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Pract. Assess. Res. Eval.* 10:7.
- Cox, R. (2021). Grounding transformative learning through assessment: TROPOS (TRansformative Outcomes and PrOcesses Scale). *J. Transf. Educ.* 19, 383–399. doi: 10.1177/15413446211045163
- Datu, J. A. D., and Yuen, M. (2021). Factorial validity of meaning in life questionnaire in Hong Kong secondary school students: a construct validation approach. *Counsel. Psychol. Q.* 35, 467–480. doi: 10.1080/09515070.2021.1875989
- Day, C., Michelson, D., Thomson, S., Penney, C., and Draper, L. (2012). Innovations in practice: empowering parents, empowering communities: a pilot evaluation of a peer-led parenting programme. *Child Adolesc. Ment. Health* 17, 52–57. doi: 10.1111/j.1475-3588.2011.00619.x
- Figueroa, R., Gago, C., Beckerman-Hsu, J., Aftosmes-Tobio, A., Yu, X., Davison, K., et al. (2020). Development and validation of a parental health-related empowerment scale with low income parents. *Int. J. Environ. Res. Public Health* 17, 1–10. doi: 10.3390/ijerph17228645
- Flora, D. B. (2020). Your coefficient alpha is probably wrong, but which coefficient omega is right? A tutorial on using R to obtain better reliability estimates. *Adv. Methods Pract. Psychol. Sci.* 3, 484–501. doi: 10.1177/2515245920951747
- Freiberg, K., Homel, R., and Branch, S. (2014). The parent empowerment and efficacy measure (PEEM): a tool for strengthening the accountability and effectiveness of family support services. *Austral. Soc. Work* 67, 405–418. doi: 10.1080/0312407X.2014.902980
- Green, S. B., and Yang, Y. (2015). Evaluation of dimensionality in the assessment of internal consistency reliability: coefficient alpha and omega coefficients. *Educ. Meas. Issues Pract.* 34, 14–20. doi: 10.1111/emip.12100
- Griffith, B. A., and Frieden, G. (2000). Facilitating reflective thinking in counselor education. *Counsel. Educ. Supervision* 40, 82–93. doi: 10.1002/j.1556-6978.2000.tb01240.x
- Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. (2019). *Multivariate Data Analysis: A Global Perspective*, 8th Edn. Upper Saddle River: Pearson International Edition.
- Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organ. Res. Methods* 1, 104–121. doi: 10.1177/109442819800100106
- Kalantzis, M., and Cope, B. (2020). *New Learning: Elements of a Science of Education*. Cambridge, MA: Cambridge University Press.
- Koren, P. E., DeChillo, N., and Friesen, B. J. (1992). Measuring empowerment in families whose children have emotional disabilities: a brief questionnaire. *Rehabil. Psychol.* 37:305.
- Lam, C. M. (2003). Parent education: revision and vision. *Asian J. Counsel.* 10, 147–168.
- Lam, C. M., and Kwong, W. M. (2012). The paradox of empowerment in parent education: a reflexive examination of parents' pedagogical expectations in an action research project. *Fam. Relat.* 61, 65–74. doi: 10.1111/j.1741-3729.2011.00685.x
- Lam, C. M., Kwong, W. M., and To, S. M. (2019). Has parenting changed over past decade? A qualitative study of generational shifts in parenting. *Int. J. Soc. Sci. Hum.* 9, 42–47. doi: 10.18178/ijssh.2019.V9.988
- Lam, C. M., To, S. M., and Kwong, W. M. (2018). Development and validation of a questionnaire on Chinese parents' beliefs in parental roles and responsibilities. *Appl. Res. Qual. Life* 15, 693–712. doi: 10.1007/s11482-018-9682-4
- Lange, R. (2004). Using narrative therapy in an educational parenting group. *Groupwork* 14, 63–79.
- Leung, T. T. F., and Lam, C. M. (2009). The warrants of parenting: emotionality and reflexivity in economically disadvantaged families. *J. Soc. Work Pract.* 23, 353–367. doi: 10.1080/02650530903102767
- Merritt, S. M. (2012). The two-factor solution to Allen and Meyer's (1990) affective commitment scale: effects of negatively worded items. *J. Bus. Psychol.* 27, 421–436. doi: 10.1007/s10869-011-9252-3
- Mezirow, J. (2000). "Learning to think like an adult: core concepts of transformative theory," in *Learning as Transformation: Critical Perspective or a Theory in Progress*, ed. J. Mezirow (San Francisco, CA: Jossey-Bass), 3–34.
- Nieves, H., Clements-Hickman, A., and Davies, C. (2021). Effect of a parent empowerment program on parental stress, satisfaction, and length of stay in the neonatal intensive care unit. *J. Perinatal Neonatal Nurs.* 35, 92–99. doi: 10.1097/JPN.0000000000000540
- Nunnally, J. C., and Bernstein, I. H. (1994). *Psychometric Theory*, 3rd Edn. New York, NY: McGraw-Hill.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88, 879–903. doi: 10.1037/0021-9010.88.5.879
- Pope, M. L., and Denicolo, P. M. (2001). *Transformative Education: Personal Construct Approaches to Practice and Research*. London: Whurr Publishers.
- Quillinan, B., MacPhail, A., Dempsey, C., and McEvoy, E. (2019). Transformative teaching and learning through engaged practice: lecturers' and students' experiences in a University and underserved community partnership in Ireland. *J. Transf. Educ.* 17, 228–250. doi: 10.1177/1541344618809681
- Rodriguez, J., Olin, S. S., Hoagwood, K. E., Shen, S., Burton, G., Radigan, M., et al. (2011). The development and evaluation of a parent empowerment program for family peer advocates. *J. Child Fam. Stud.* 20, 397–405. doi: 10.1007/s10826-010-9405-4
- Romano, A. (2018). Transformative learning: a review of the assessment tools. *J. Transf. Learn.* 5, 53–70.
- Schumacker, R. E., and Lomax, R. G. (2004). *A Beginner's Guide to Structural Equation Modeling*, 2nd Edn. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
- Sokol, A. V., and Cranton, P. (1998). Transforming, not training. *Adult Learn.* 9, 14–16. doi: 10.1177/104515959800900308
- Stuckey, H. L., Taylor, E. W., and Cranton, P. (2013). Developing a survey of transformative learning outcomes and processes based on theoretical principles. *J. Transf. Educ.* 11, 211–228. doi: 10.1177/1541344614540335
- Tabachnick, B. G., and Fidell, L. S. (2007). *Using Multivariate Statistics*, 5th Edn. New York, NY: Allyn and Bacon.

- Taylor, E. W. (2009). "Introduction," in *Transformative Learning in Practice: Insights from Community, Workplace and Higher Education*, eds J. Mezirow and E. W. Taylor (San Francisco, CA: John Wiley & Sons, Inc), 1–17.
- Taylor, E. W., and Cranton, P. (2012). *The Handbook of Transformative Learning: Theory, Research, and Practice*. San Francisco, CA: Jossey-Bass.
- To, S. M., and Chan, T. S. (2013). Searching for the meaning of parenthood: an existential approach to parent education in the Hong Kong-Chinese context. *Int. Soc. Work* 56, 467–481.
- To, S. M., Iu Kan, S. M., Tsoi, K. W., and Chan, T. S. (2013). A qualitative analysis of parents' perceived outcomes and experiences in a parent education program adopting a transformative approach. *J. Soc. Work Pract.* 27, 79–94. doi: 10.1080/02650533.2012.732046
- To, S. M., Iu Kan, S. M., Tsoi, K. W., and Chan, T. S. (2015). Reviving parents' life momentum: a qualitative evaluation of a parent education program adopting an existential approach. *Open Fam. Stud. J.* 7, 103–111. doi: 10.2174/18749224015070100103
- To, S. M., So, Y. Y., Iu Kan, S. M., Tsoi, K. W., and Chan, T. S. (2018b). Supporting parents in late modernity through parent education: a mixed methods study in Hong Kong. *J. Soc. Work* 18, 164–184. doi: 10.1177/1468017316656090
- To, S. M., Kwok, C. M., So, Y. Y., and Yan, M. W. (2018a). Parent education for migrant mothers of left-behind children in China: a pilot randomized controlled trial. *Fam. Process* 58, 318–333. doi: 10.1111/famp.12369
- To, S. M., Lam, C. M., and So, Y. Y. (2019b). Reflections of parents and parent work practitioners on the changing experiences and circumstances of parenting in Hong Kong. *Int. J. Soc. Sci. Hum.* 9, 57–62. doi: 10.18178/ijssh.2019.V9.991
- To, S. M., Lam, C. M., and So, Y. Y. (2019a). A qualitative study of rural-to-urban migrant Chinese mothers' experiences in mother-child interactions and self-evaluation. *Appl. Res. Qual. Life* 15, 813–833. doi: 10.1007/s11482-019-9704-x
- To, S. M., So, Y. Y., and Chan, T. S. (2014). An exploratory study on the effectiveness and experience of a parent enhancement group adopting a narrative approach. *J. Soc. Work* 14, 41–61. doi: 10.1177/1468017313475554
- Traverso-Yépez, M. (2008). "Examining transformative learning amidst the challenges of self-reflection," in *Narrating Transformative Learning in Education*, eds M. Gardner and U. A. M. Kelly (New York, NY: Palgrave Macmillan), 157–171.
- Zhang, X., Noor, R., and Savalei, V. (2016). Examining the effect of reverse worded items on the factor structure of the need for cognition scale. *PLoS One* 11:e0157795. doi: 10.1371/journal.pone.0157795



OPEN ACCESS

EDITED BY

Chen Zheng,
Wuhan University, China

REVIEWED BY

Ting Ting Li,
Dalian Maritime University, China
Jing Ni,
Jiujiang University, China

*CORRESPONDENCE

Ya Wei Zhang
ziliao_2005@163.com

SPECIALTY SECTION

This article was submitted to
Public Mental Health,
a section of the journal
Frontiers in Public Health

RECEIVED 26 May 2022

ACCEPTED 05 August 2022

PUBLISHED 24 August 2022

CITATION

Zhang YW, Wang J and Fang TH (2022)
The effect of horticultural therapy on
depressive symptoms among the
elderly: A systematic review and
meta-analysis.
Front. Public Health 10:953363.
doi: 10.3389/fpubh.2022.953363

COPYRIGHT

© 2022 Zhang, Wang and Fang. This is
an open-access article distributed
under the terms of the [Creative
Commons Attribution License \(CC BY\)](#).
The use, distribution or reproduction
in other forums is permitted, provided
the original author(s) and the copyright
owner(s) are credited and that the
original publication in this journal is
cited, in accordance with accepted
academic practice. No use, distribution
or reproduction is permitted which
does not comply with these terms.

The effect of horticultural therapy on depressive symptoms among the elderly: A systematic review and meta-analysis

Ya Wei Zhang*, Jun Wang and Tian Hong Fang

School of Art Design and Media, East China University of Science of Technology, Shanghai, China

Objective: This systematic review and meta-analysis aimed to assess the effectiveness of horticultural therapy on depressive symptoms in the elderly and determine the potential moderators of the intervention effect.

Methods: In early June 2022, randomized controlled trials and Quasi-experimental studies were searched on Web of Science, PsycINFO, CINAHL, EMBASE, Medline, PubMed, CNKI, WANFANG DATA, and CQVIP. Three independent authors proposed the following inclusion criterion for this study: the elderly with applied horticultural therapy intervention compared to non-HT intervention. From a total of 3,068 records, only 34 studies met the inclusion criteria. After the full-text screening, 13 studies were included in the analysis. An assessment of the risk of bias was conducted using RoBINS-I and RoB 2 tools. The comprehensive Meta-Analysis 3.3 tool was used for the meta-analysis.

Results: Meta-analysis suggested that mean depression scores of elderly people who underwent horticultural therapy intervention were significantly lower than those who did not receive HT therapy. More significant effects were found for the elderly with mean age equal to or over 75 years instead of younger than 75 years, in randomized controlled trials instead of quasi-experimental studies, for studies with more than 20 participants receiving horticultural therapy at the same time and place instead of equal to or fewer than 20 horticultural therapy participants.

Conclusions: This evidence supported that horticultural therapy had a significant positive effect on the depressive symptoms outcomes for the elderly. Therefore, our data revealed that horticultural therapy could be considered as a part of therapy in depressive symptoms reduction programs. Due to the high degree of heterogeneity and the limited number of studies, a future review is warranted to determine the effects of horticultural therapy on depressive symptoms reduction in the elderly.

Systematic review registration: https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=272464, identifier: CRD42021272464.

KEYWORDS

horticultural therapy, the elderly, systematic review, meta-analysis, depressive symptoms

Introduction

Depression has been one of the most common mental health disorders among the elderly worldwide (1, 2). Several studies have explored the prevalence of depression in the elderly around the world in recent years (3–5). As revealed by data from the Survey on Aging and Health in Europe (SHARE), which covered information on elderly people in 27 European countries in 2015, the late-life depression rate was 29% (10483/36069), with the highest prevalence in southern Europe (35%), followed by central-eastern Europe (32%), western Europe (26%) and Scandinavia (17%) (6). Data from the China Longitudinal Study on Health and Retirement (CHARLS) suggested that rates of depressive disorder in the elderly were 41.6% (2747/6609), 32.6% (2333/7158), and 35.5% (2919/8231) in 2011, 2013, and 2015, respectively (7). Studies have shown that depression among the elderly can lead to a decrease in quality and satisfaction of life and an increase in health care costs (8, 9). Furthermore, depression has a high recurrence rate, and the elderly are particularly vulnerable to long-term harm. Research has shown that patients who have been successfully treated for depression are more than three times as likely to suffer from depression in the future as the general population (2). Therefore, even elderly people, who have overcome depression, are susceptible to relapse. Moreover, it should be noted that, after a second relapse, patients are particularly vulnerable to a longer course of depression, and after a third episode, depression is likely to become a lifetime illness, causing people to suffer from it for an extended period of time (10). As the global elderly population is expected to increase to 1.4 billion by 2030 and 2.1 billion by 2050, the global burden of depression in this age group will continue to increase (11, 12). Therefore, scholars and policymakers around the world are trying to find a solution to the depression crisis. Pharmacological treatment is the most common method of treating depression, however, continued use of these medications can result in certain side effects (13, 14). Thus, researchers have been exploring non-pharmacological treatment programs to alleviate depressive symptoms in the elderly (15). Non-pharmacological therapies, such as music therapy (16), mindfulness-based cognitive therapy (17) and animal-assisted therapy (18), have been shown to reduce depressive symptoms among elderly people. As one of the non-pharmacological therapies, horticultural therapy (HT) has been receiving increasing attention from researchers in recent decades (19). HT differs from the previously non-pharmacological therapies by encouraging human-plant interaction (20, 21).

Referring to the systematic review study by Nicholas et al. (22), the term horticultural therapy is defined as an open program that uses horticulture-based activities, whether facilitated by registered horticultural therapists or not, which is used to improve a variety of outcomes without being limited to meet specific therapeutic or rehabilitative goals. However, unlike

the study from Nicholas et al., merely viewing or visiting green spaces without horticultural activities (such as planting, taking care of plants, or creating plant-related crafts) was not regarded as HT in this systematic review (23) since mere exposure to green spaces was not enough to satisfy horticulture-based activities and therefore, might not be qualified as HT intervention.

Regardless of the terminology used, researchers have conducted studies on the mechanisms of how HT promotes mental health support and reduces depressive symptoms. The biophilic tendency of humans to interact with plants and nature is one of the mechanisms linking HT to depressive symptoms (24). According to the Attention Restoration Theory (ART), HT program activities involve being in touch with plants and nature to divert attention away from negative emotions and reduce depressive feelings (25). These leisure activities in a natural setting create a sense of separation from everyday life and urban environments, which is crucial to improving mental health and reducing mental fatigue (26). HT enhances decision-making and promotes a sense of personal control and empowerment, which serves as a protective buffer from negative mental health impacts (25). A previous study of the psychophysiological relaxing effects of horticulture activities on humans also found that viewing foliage plants reduced the activity of the prefrontal cortex, increased the activity of parasympathetic nervous, improved emotional state, and reduced negative emotions compared to participants not exposed to foliage plants (27, 28). Additionally, physical activities, social cohesion, and connectedness are important mechanisms that link HT and depressive symptoms (29–31). Depressed individuals tend to spend much time in inactive behavior. One way to address this problem is to systematically change behavior by allocating more time to activities that bring fulfillment and pleasure but less time to passive or unrewarding activities. When people reduce passive activities in favor of active and beneficial behaviors, such as horticultural activities, they typically feel more fulfilled and happier, which may lead to a reduction in depressive symptoms (32). Also, in comparison with normal mental health counterparts, depressed people are significantly less satisfied with their physical health condition (33). Horticultural therapy programs that involved low-to moderate-intensity gardening activities could improve the physical function of participants (34, 35) and alleviate depressive symptoms caused by physical health concerns (36). Moreover, one of the core objectives of HT is to promote social connectedness and integration among the participants (37). According to Noone et al. (38) and Domènech-Abella et al. (39), community gardening was a way to improve social connectedness and foster community integration through its features, thus, reducing depressive symptoms caused by loneliness and lack of social interaction.

As a result of its biophilic and physical nature, its ability to restore depleted attention and encourage social connectedness. HT can help reduce depressive symptoms among the elderly;

however, there is a lack of a comprehensive synthesis of the evidence on the effects of HT on reducing depressive symptoms among the elderly. Taking the two most recent systematic reviews of HT as examples, in Tu et al. (40), on the effect of HT on mental health outcomes, only two of the 18 trials included in his analysis reported the effect of HT on depressive symptoms among the elderly; in Nicholas et al. (22), on the effectiveness of HT in the elderly, only six of the 20 trials reported the effect of HT on depressive symptoms among the elderly. Additionally, since previous evidence synthesized combined measures of depressive symptoms with other constructs and did not explore the direct association between horticultural therapy and the reduction of depressive symptoms among the elderly, it was difficult to directly discern whether HT was an effective way of reducing depressive symptoms among the elderly. Such knowledge gaps limit the use of HT by those who might be willing to employ it to reduce depressive symptoms among the elderly. To address the knowledge gap, we conducted a systematic review and meta-analysis to answer whether there is sufficient evidence to support the implementation of HT as an effective intervention to reduce depressive symptoms among the elderly. Given the high rate of recurrence of depression in the elderly, prevention and treatment of depression are equally important. Thus, in this review, depressive symptoms were referred to as the various symptoms and manifestations that characterize depression rather than clinically diagnosed depression.

In our review of the literature, three novel contributions are presented. First, as far as the authors are concerned, this is the first review to focus exclusively on the effects of HT on depressive symptoms among the elderly. Second, more original and quantitative studies reporting outcomes of depressive symptoms among the elderly than previous studies were included, providing estimates of the effect of HT on depressive symptoms among the elderly. Third, in this study, the potential moderators of the intervention effects were discussed.

Materials

Articles were searched in English and Chinese databases in early June 2022 based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. Kunpeuk et al. (41) and Patel et al. (42) were referenced to acquire the search terms. Nine electronic databases, i.e., Web of Science, PsycINFO, CINAHL, PubMed, Medline, EMBASE, CNKI, WANFANG DATA, and CQVIP, related to health care, psychological research, and social science, were explored regardless of the year of publication. CNKI, WANFANG DATA, and CQVIP are the most extensively used Chinese language databases. Search terms with identical English meanings were used in those Chinese databases. To match search engines, search strategies for each database were slightly inconsistent.

However, the use of the main keywords was consistent (Supplementary Tables S1–S10). In addition, a manual search was conducted by selecting seemingly relevant articles from the references of the available reviews to reduce the risk of missing relevant studies (Supplementary Table S11). Y.W. and T.H. involved in the search process. The review was registered with the International prospective register of systematic reviews (PROSPERO; registration no. CRD42021272464).

Inclusion and exclusion criteria

The inclusion criteria of this study are presented below.

- (i) Studies that measured depressive symptoms were included.
- (ii) Studies reporting original quantitative research measuring the effects of HT on depressive symptoms among the elderly. RCTs and quasi-experimental studies comparing HT interventions (as ‘treatment’) with non-HT interventions or alternative interventions (as ‘control’) were included. Quasi-experimental studies can also yield accurate answers. The inclusion of quasi-experimental studies can increase the external validity of results and the statistical power of a meta-analysis (43).
- (iii) Participants were the elderly aged 60 and above.
- (iv) Studies published in English or Chinese that have been peer-reviewed. Those studies which did not meet the inclusion criteria (e.g., irrelevant outcomes and referring to studies that measured some outcomes unrelated to depressive symptoms) were excluded from this study.

Study selection process

YWZ and THF initiated the study selection process by screening the articles based on the titles and abstracts. The criteria mentioned above were followed during the screening. After the initial screen, YWZ and THF retrieved and reviewed the articles and listed the reasons for exclusion in Supplementary Table S12. The three authors resolved any disagreement in the screening through discussion. ENDNOTE X9 software was adopted to store and process the identified articles. Duplicated articles were removed. Library databases provided by East China University of Science and Technology were employed to retrieve the full text of the identified articles.

Critical appraisal and quality assessment

The quality of the RCTs included in the meta-analysis was assessed using the RoB2 (Version 2 of the Cochrane risk-of-bias tool for randomized trials) tool (44), and the quality of quasi-experimental studies

included in the meta-analysis was assessed using the ROBINS-I (Risk of Bias In Non-randomized Studies of Interventions) tool (45). YWZ and THF assessed the quality of each study independently and then cross-checked the information. All domains were classified as low risk, some concern, and high risk of bias (Supplementary Table S12–S13).

Data extraction and analysis

YWZ and THF independently extracted study characteristics and treatment outcomes. Any disagreement was resolved by discussion until a consensus was reached or by consulting the third writer. Narrative summaries of specific findings are presented in Supplementary Table 13.

A meta-analysis was performed using Comprehensive Meta-analysis 3.3 (46). A random effects model was used to generalize the results beyond the included articles, assuming that the selected articles originated from random samples of a larger population. Effect sizes of Hedges' g , a Cohen variation and correct for biases due to small sample sizes, were determined (47). The magnitude of Hedge's g could be interpreted according to Cohen's convention, with 0.2, 0.5, and 0.8 considered small, medium, and large effect sizes, respectively (48). The degree of heterogeneity within the articles was calculated using the I^2 -statistic, with 0.25, 0.5, and 0.75 considered low, moderate, and high degrees of heterogeneity, respectively (49). Furthermore, due to the possibility that the results of a meta-analysis may be influenced by bias in the selection of studies, called publication bias, which can often result in an overestimation of the average effect size of an intervention, the funnel plot, and Egger's test were used to assess the risk of publication bias. A meta-analysis is unlikely to have publication bias if the selected studies are largely concentrated at the top of the funnel plot, with few at the bottom, and are equally distributed on both sides with largely symmetrical trends (50). Egger's test is based primarily on the P -value of the bias coefficient, and it is generally accepted that $p > 0.05$ (two-tailed) indicates that there is no publication bias (50, 51). The overall calculation was conducted by YWZ.

Results

Figure 1 presents the overall article selection criteria. On the whole, 3,068 articles from electronic searches and 18 articles from manual searches were covered. After deleting duplicates, 2,800 studies were used for the screening of the title and summary. Of the 2,800 articles retrieved, 34 were read in full. Lastly, 13 articles were selected for the review,

while 21 were excluded. Reasons for exclusion were listed in Supplementary Table S12.

Location

Study locations of the 13 articles were reported in only two continents, Asia and Oceania. The majority of the studies were conducted in Asia ($n = 12$), among which five articles were reported in China (52–56), four in Japan (57–60), two in South Korea (61, 62), and one in Singapore (63). The study conducted in Oceania was in Australia (64).

Population and sample size

Most articles ($n = 8/13$) indicated that their participants were recruited from nursing homes (52, 53, 55, 58, 59, 61, 63, 64), two from neighborhoods (57, 60), two from hospitals (54, 56), and one from a homeless living facility (62). Some studies were conducted on specific populations. These included participants with significant depressive symptoms (55–57), dementia (64), and post-traumatic stress disorder (60). In three studies, all participants were female (55, 60, 61). Nine studies had both male and female participants. One study did not describe the gender of the participants (59).

There were 608 subjects involved in the 13 studies, with sample sizes ranging from 6 to 150. For sampling methods and data collection, all 13 articles employed convenience sampling and undertook a self-reported survey.

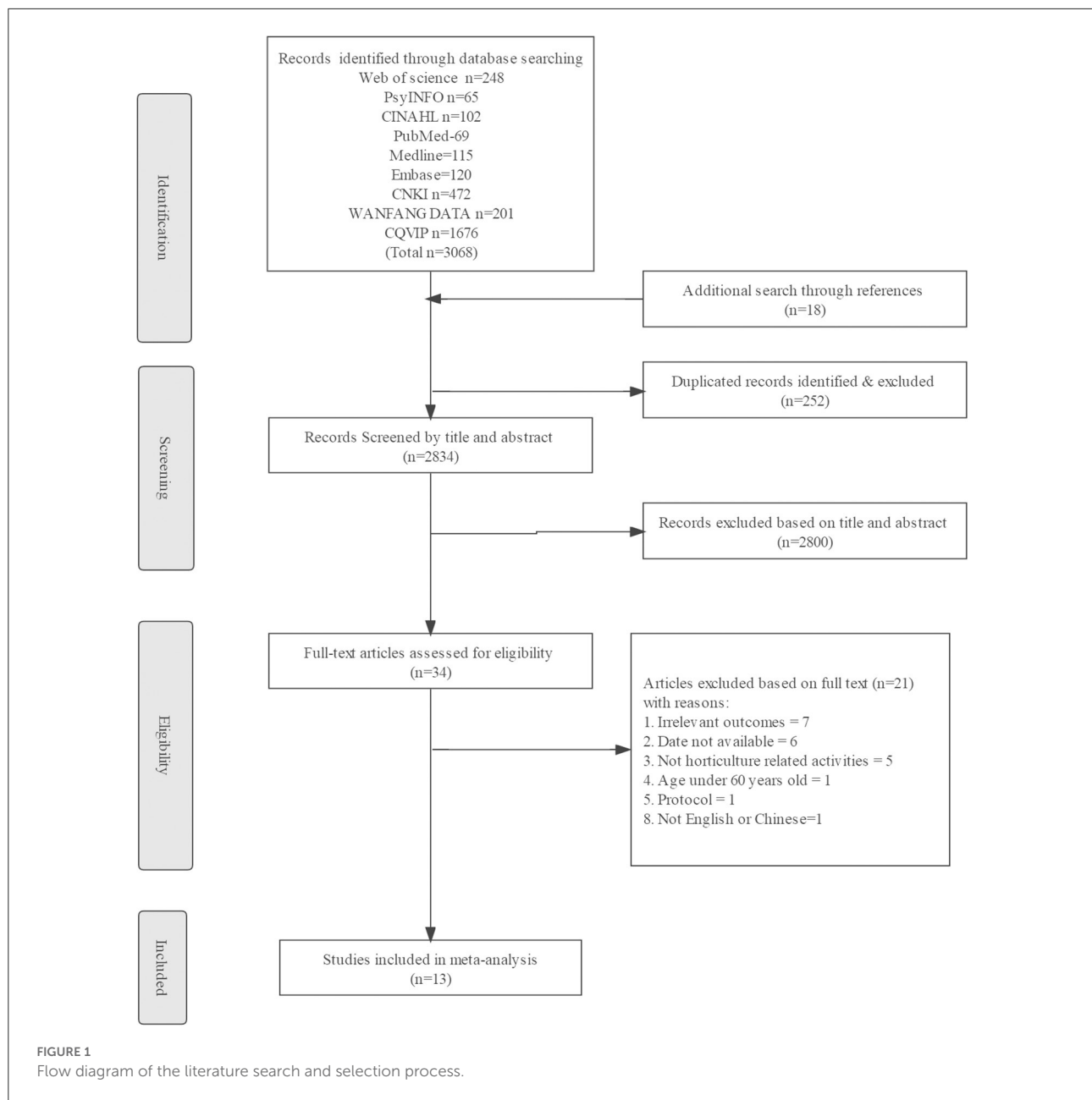
Except for one article that only stated that people over 60 years were recruited without explicitly giving the mean age (54). The mean sample age of the remaining studies ranged from 65.15 to 90.3 years. In previous studies, a cutoff age of 75 years was used as the separating age between young-old (< 75 years) and old-old (≥ 75 years) (65–68). Based on the above separation criteria, seven studies focused on old-old (52, 53, 58, 59, 61, 63, 64), and five studies focused on young-old (55–57, 60, 62).

Study design

Among the 13 articles included, seven were identified as quasi-experimental studies (53, 55, 58, 61–64), and six were identified as RCTs (52, 54, 56, 57, 59, 60). For RCTs, two applied single-blind RCT (57, 60), and one of which is crossover RCT (60).

Intervention and control

The contents of HT interventions and control interventions were different in different articles. Besides gardening activities



(e.g., seeding, cultivating, and harvesting) performed by nearly all subjects, the HT interventions mentioned in the articles also included nature-art activities [e.g., flower arrangement (53, 54, 56, 59, 61, 62), decorating drawing papers with dry flowers and leaves (52, 55, 63), dyeing nails with garden balsam (62)], nutrition education (57), field trips to green land (55, 62, 64), and cooking and tasting (55, 58, 62). Additionally, of the 13 studies, eight were facilitated by registered horticultural therapists (52, 55, 60–63) or professionals trained in horticultural techniques (58, 59), while five studies did not indicate whether registered horticultural therapists or professionals trained in horticultural techniques were involved (53, 54, 56, 57, 64). For

the controls, two studies arranged extra interventions besides routine activities. Yuka et al. (60) arranged a weekly 60-min session consisting of a lecture on stress education for the control group. Zhen Lan et al. (56) reported that an irregularly arranged 30-min sports nursing program was included in the control intervention.

Regarding the duration of the intervention session in the HT groups, the shortest session duration was 250 seconds (59), six studies conducted a 60–90 min intervention session (53, 55, 57, 60, 62, 63), and the longest session duration was 120 min (52, 54, 56). For the HT sessions lasting only 250 seconds, a simple indoor HT program called “Bedside structured floral

arrangement (SFA)" was used. This program was developed specifically for the elderly, who required assistance with their mobility (59). In terms of the frequency of intervention, the intervention was conducted once a week in nine studies (52, 53, 55, 57–60, 62, 63), twice a week in one study (61), and six times a week in one study (56). Two studies did not describe the number of interventions per week (54, 64). In terms of the length of the intervention, the shortest duration was 1 day (59), and the longest durations in two different studies were 1 (56) and 2 years (54). Ten studies conducted an intervention for 6–24 weeks, with 6 weeks ($n = 2$) and 8 weeks ($n = 3$) as the most widely used length of intervention.

Depressive symptoms measurement tools

Different depressive symptoms measurement tools were applied. Geriatric Depression Scale (GDS) was the most widely used, appearing in nine studies, with six studies using the short version of GDS (GDS-15) (52, 53, 55, 57, 58, 60), and two studies using the Korean version of GDS-15 (61, 62). Other tools applied consisted of Self-Rating Depression Scales (SDS) (54, 63) and Cornell Scale for Depression in Dementia (CSDD) (59, 64).

Risk of bias and quality of the selected articles

The results of the assessment of risk of bias are listed in [Supplementary Tables S12, S13](#). The RoB2 tool was used to evaluate six randomized studies, and the ROBINS-I tool was used to evaluate seven quasi-experimental studies. All randomized studies followed an acceptable randomization process, deviations from intended interventions, measurement of the results, and selection of the reported results. Three studies (54, 56, 60) were classified as high risk for not granting the dropout rate of participants. All quasi-experimental studies followed acceptable confounders, classification of interventions, deviations from intended interventions, missing data, measurement of the results, and selection of the reported results. A study (64) was classified as high risk because it selected participants based on the physical and mental health of the individuals observed after the start of the intervention, and two participants with significantly decreased physical and mental health were excluded from this study.

Narrative summary

As reported in most articles ($n = 9/13$), the elderly exhibited significantly lower levels of depression after receiving HT

interventions. Among the nine articles, one proposed a follow-up evaluation, and the result suggested that the reduction effect of depressive symptoms of the HT intervention was maintained even 8 weeks after the sessions ended (60). However, for control groups without active interventions, none showed a significant decrease in depression scores after the trials. For control groups receiving other active interventions ($n = 2/13$), one (60) had a significant increase in GDS scores after receiving a stress control education intervention, while the HT group had a significant decrease in GDS scores, and the other (56) had a significant decrease in depression scores after receiving sports nursing interventions, although the effect was weaker than that of the HT intervention used in this study.

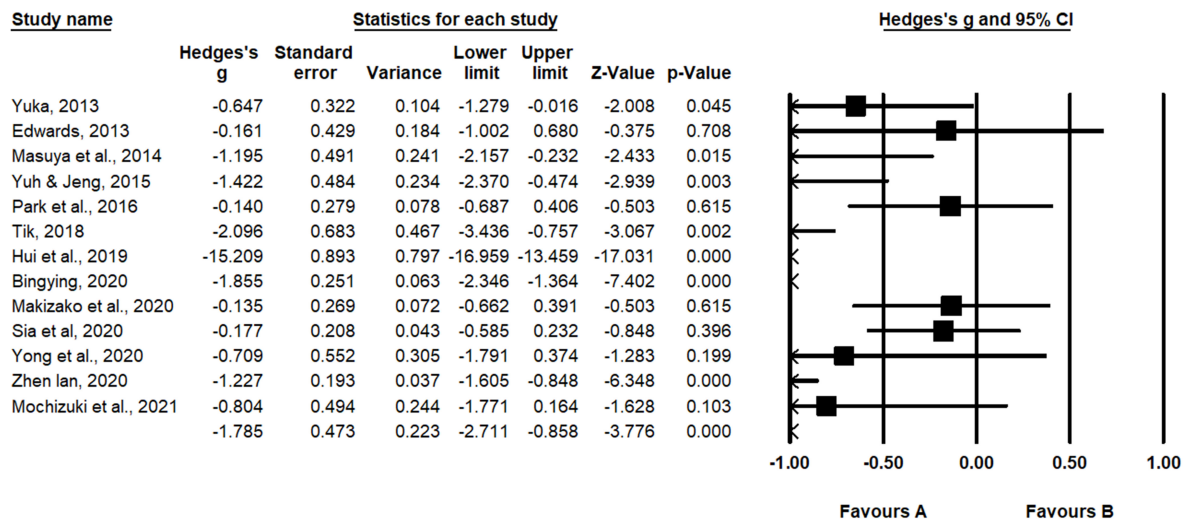
Overall meta-analysis of HT and depressive symptoms

Thirteen articles were included in the meta-analysis to investigate the immediate post-test effects of HT on the depressive symptoms of the elderly. We extracted the mean value, sample size (n), and standard deviation (SD) of depressive symptoms from the included articles. For articles measuring the outcomes of depressive symptoms during HT interventions at multiple time points, only data points at the start and end were applied. The results of the meta-analysis suggested that the mean depression scores of the elderly, who received HT interventions, were significantly lower than those without HT interventions (Hedge's $g = -1.785$, $p < 0.001$) ([Figure 2](#)). The I^2 value was 96.128% ($P < 0.001$). $I^2 \geq 75\%$ with statistical significance suggested a high degree of heterogeneity between articles. After removing the four studies (54, 56, 60, 64), which were classified as high risk, the results remained stable and significant, with Hedge's g of -2.274 ($p = 0.003$) and I^2 value of 97.205% ($P < 0.001$) ([Supplementary Figure 1](#)). After removing the two studies (56, 60) in which alternative interventions were used in the control groups, Hedge's g was -2.06 ($p = 0.001$), and the value of I^2 was 96.737% ($P < 0.001$) ([Supplementary Figure 2](#)). These results suggested that HT had a significant positive effect on the reduction of depressive symptoms among the elderly, regardless of whether alternative interventions were used in the control groups.

Subgroup meta-analysis

Subgroup analysis was conducted to assess the source of heterogeneity. Each (categorical) subgroup variable should have at least four studies, and this number is the lower bound for considering a subgroup analysis (69). These articles were divided into two subgroups based on age group (young-old, $n = 5$; old-old, $n = 7$), study design (RCTs = 6, Quasi-experimental

Meta Analysis



Meta Analysis

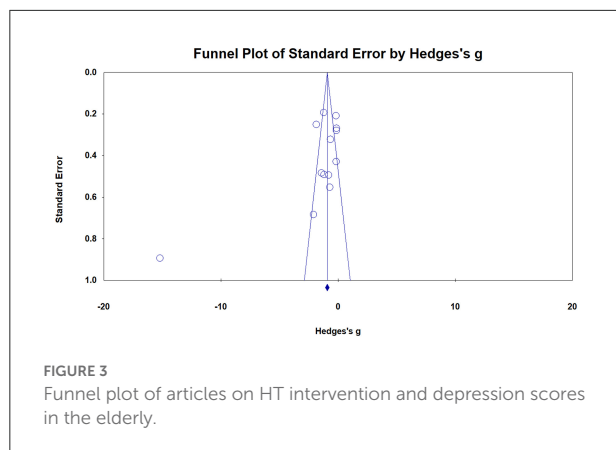
FIGURE 2
Forest plot: HT group vs. control for depression scores (continuous outcome).

TABLE 1 Summary of the meta-analysis for six subgroups.

Subgroup	No. of comparison	Effect size		Heterogeneity	
		Hedge's g	P-value	Q-value	P-value
Age group					
Young-old	5	-0.855	0.010	2.744	0.098 < 0.1
Old-old	7	-2.574	0.004		
Study design					
RCT	6	-0.3070	0.001	6.208	0.013 < 0.1
Quasi-experimental studies	7	-0.679	0.006		
Participants' number					
Under or equal to 20	8	-0.760	0.000	6.160	0.013 < 0.1
Above 20	5	-3.434	0.001		

studies = 7), and the number of participants who received the HT intervention at the same time and the same place in each study (under or equal to 20 = 8; above 20 = 5). The value between groups of the Q-statistic was used to statistically assess heterogeneity. Since the Q statistic has a low differential power, a value of $P < 0.1$ is considered to indicate significant differences between groups (70, 71). The results indicated that there were significant differences in the effect size (Hedge's g) of variables on the outcome of depressive symptoms in the two

subgroups of all three types. The effect of the intervention on the old-old was significantly greater than that on the young-old ($g: 2.574 > 0.855$, $p = 0.098 < 0.1$). The intervention effect of the RCTs was significantly greater than that of the quasi-experimental studies ($g: 3.070 > 0.679$, $p = 0.013 < 0.1$). Moreover, the intervention effect of programs with more than 20 HT participants was significantly greater than those with fewer HT participants ($g: 3.434 > 0.760$, $p = 0.013 < 0.1$) (Table 1).



Results of publication bias

The funnel plot shows an approximate symmetrical distribution of study effect size, which suggests that there might not be any publication bias (Figure 3). Egger's test further verified the conclusion. The bias coefficient of Egger's test was 0.11326 (p -value > 0.05 , two-tailed), so the evidence of publication bias is weak.

Discussion

As a result of this study, we found that HT could significantly reduce depressive symptoms. It can be concluded that HT is effective in reducing depressive symptoms in the elderly. Horticultural activities, such as watering, weeding, etc., can enable the elderly to move their limbs, exercise their entire body, promote the recovery of body functions, increase physical fitness, promote metabolism, and reduce depressive emotions caused by concerns about physical health (61). The elderly can feel relaxed, relieve stress, and reduce negative emotions by paying attention to changes in plants, rubbing parts of plants with their own hands, and smelling natural scents emitted by plants (54). Taking care of plants and sharing experiences with others give the elderly a sense of satisfaction, accomplishment, and self-confidence (52). Elderly people who experience a sense of satisfaction, accomplishment, and self-confidence are less likely to have depression symptoms (53). Additionally, activities of the HT program help the elderly to expand their social networks, become friends with members of the group, and help them feel accepted, which enables them to live a more active life and reduce feelings of depression (55).

Compared with the young-old, positive effects of HT were particularly evident in the old-old. Positive activities and social interactions for the old-old are difficult to develop spontaneously due to their physical conditions having declined

more significantly than those of the young-old (72, 73). A limited amount of exercise and social interaction would cause a further decline in physical and mental health. Using horticulture as a medium, the activities offer the old-old to have the opportunity to increase positive physical activities. Taking care of plants allows the old-old to gain a sense of achievement and pleasure, as well as improve physical health conditions (74), thus reducing feelings of depression caused by lack of achievement and concerns about physical health decline (75). Furthermore, participants often interact actively and happily with each other during horticultural activities (53). Horticulture, as a topic of mutual interest, facilitates conversation, improves social integration, promotes mental health, and reduces depressive symptoms in old-old (76, 77).

The present meta-analysis suggested that studies using RCTs found significantly larger effects compared to quasi-experimental studies. The results of RCTs can better rule out alternative explanations for established intervention effects than non-randomized designs. Selection bias in studies of nonrandom effects often leads to an overestimation of the effectiveness of treatment (78), but this did not occur in the present study.

More significant effects were found in studies with more than 20 HT participants compared to those with 20 or fewer HT participants. Social connectedness is extremely important for better mental health, and people with fewer interpersonal relationships or lower levels of social support have consistently higher rates of depression (79). HT intervention programs with a larger number of participants could provide the elderly with more opportunities to meet more people, expand their social connectedness, and increase interpersonal relationships. This may account for the greater effectiveness of HT interventions in reducing depressive symptoms with a higher number of participants.

Despite a favorable outcome of HT in the reduction of depressive symptoms among the elderly in this study, it is worthwhile to be aware of some methodological caveats. In terms of research location, included studies were only conducted in Asia and Oceania. No study was conducted on other continents, such as Europe. This could be a key confounding factor for the accuracy of the review results (80). For the sampling method, convenience sampling was applied in all included articles, thus, suggesting weak external validity. Moreover, non-response proportion was not reported in most articles, which could lead to non-response bias. In addition, all articles used self-reported surveys for data collection, which may result in systematic errors. Moreover, some articles are at a high risk of bias based on the results of quality assessment, and this could lead to internal validity bias.

It is acknowledged that this review has some weaknesses. First, non-English and non-Chinese evidence was not included in the review. Second, qualitative studies, which were not included, could explain the mechanism of HT in more detail.

Third, due to the limited number of studies enrolled, some relationships between HT and depressive symptoms reduction, such as the connection between HT intensity and depressive symptoms, the comparison between the effects of HT on the first and recurrent depression, or the comparison of the effects of HT on elderly individuals with a serious mental or physical disability with those in good health, were not subgroup analyzed.

Subsequent research is recommended. For more effective measurement, novel biological detection technologies, e.g., electroencephalogram testing (81) or blood examination (82), are recommended because they can provide a more objective indication of depression levels than self-reported methods. Additionally, more evidence is required from other continents. Furthermore, more research is necessary for all age groups to better understand the causal relationship between HT and depressive symptoms.

Conclusion

In summary, HT has a significant positive effect on reducing depressive symptoms in the elderly. Subgroup analysis suggested that HT had a more positive effect on the old-old. Programs with more than 20 HT participants at the same time and in the same place were more effective. However, the number of original studies included in this meta-analysis was limited, and more articles are required to identify the causal correlation between HT and reduction of depressive symptoms among the elderly and the evaluation of challenges, such as disadvantages and advantages of the promotion of HT is popularly applied in the elderly.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

References

- Salari N, Mohammadi M, Vaisi RA, Abdi A, Jalali R. The prevalence of severe depression in Iranian older adult: a meta-analysis and meta-regression. *BMC Geriatr.* (2020) 20:1–8. doi: 10.1186/s12877-020-1444-0
- Luijendijk HJ, Van den Berg JF, Dekker MJ, Van Tilburg HR, Otte W, Smit F, et al. Incidence and recurrence of late-life depression. *Arch Gen Psychiatry.* (2008) 65:1394–401. doi: 10.1001/archpsyc.65.12.1394
- Assariparambil AR, Noronha JA, Kamath A, Adhikari P, Nayak BS, Shankar R, et al. Depression among older adults: a systematic review of South Asian Countries. *Psychogeriatrics.* (2021) 21:201–19. doi: 10.1111/psyg.12644
- Bedaso A, Mekonnen N, Duko B. Estimate of the prevalence of depression among older people in Africa: a systematic review and meta-analysis. *Aging Ment Health.* (2022) 26:1095–105. doi: 10.1080/13607863.2021.1932740
- Tang T, Jiang J, Tang X. Prevalence of depressive symptoms among older adults in mainland China: a systematic review and meta-analysis. *J Affect Disord.* (2021) 293:379–90. doi: 10.1016/j.jad.2021.06.050
- Horackova K, Kopecek M, Machu V, Kagstrom A, Aarsland D, Motlova LB, et al. Prevalence of late-life depression and gap in mental health service use across European regions. *Eur Psychiatry.* (2019) 57:19–25. doi: 10.1016/j.eurpsy.2018.12.002
- Hu Y, Li B. Temporal trend of prevalence of depressive symptoms and associated factors among Chinese older adults: an analysis based on the Charls panel data. *Chinese General Practice.* (2021) 24:3281–7.
- Angelina RS, Antonio T, Yuri M, Yang A. The trajectory of depressive symptoms across the adult life span. *JAMA Psychiatry.* (2013) 70:803–11. doi: 10.1001/jamapsychiatry.2013.193
- Derek DS, Bob GK, Steven D. Cognitive behavioral interventions with older adults: integrating clinical and gerontological research. *Prof Psychol Res Pract.* (2006) 37:489–98. doi: 10.1037/0735-7028.37.5.489
- Zhang T. Current status of research to prevent disease relapse in patients with depression. *J Clin Med.* (2016) 5:186–9. doi: 10.3877/j.issn.2095-8242.2016.40.153

Author contributions

Study design and writing—review and editing: YWZ and JW. Methodology: YWZ and THF. Formal analysis and writing—drafting: YWZ, JW, and THF. All authors contributed to the article and approved the submitted version.

Acknowledgments

We would like to thank Associated Professor Aibing Yan, School of Art Design and Media, East China University of Science and Technology, for his advice during the early process.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpubh.2022.953363/full#supplementary-material>

11. Sally AC, Elita S, Jillian M, Andrew W, Linda A. Mental ill-health in adults with intellectual disabilities: prevalence and associated factors. *Br J Psychiatry*. (2007) 190:27–35. doi: 10.1192/bjp.bp.106.022483
12. United Nation. *World Population Aging 2015*. (2015) [cited 2022 June 12]. Available online at: <https://www.un.org/development/desa/pd/node/3341>.
13. Lee Y, Rosenblat JD, Lee J, Carmona NE, Subramaniapillai M, Shekotikhina M, et al. Efficacy of antidepressants on measures of workplace functioning in major depressive disorder: a systematic review. *J Affect Disord*. (2018) 227:406–15. doi: 10.1016/j.jad.2017.11.003
14. Guo S, Yang Y, Pei X, Liu F. Comparative risk of selective serotonin reuptake inhibitors (SSRIs)-induced nausea among Chinese senile depression patients: a network meta-analysis of randomized-controlled trials. *Medicine*. (2020) 99:1–10. doi: 10.1097/MD.00000000000019133
15. Zhang MW, Harris KM, Ho RC. Is off-label repeat prescription of ketamine as a rapid antidepressant safe? Controversies, ethical concerns, and legal implications. *BMC Med Ethics*. (2016) 17:1–8. doi: 10.1186/s12910-016-0087-3
16. Zhao K, Bai ZG, Bo A, Chi I. A systematic review and meta-analysis of music therapy for the older adults with depression. *Int J Geriatr Psychiatry*. (2016) 31:1188–98. doi: 10.1002/gps.4494
17. Thomas R, Chur-Hansen A, Turner M. A systematic review of studies on the use of mindfulness-based cognitive therapy for the treatment of anxiety and depression in older people. *Mindfulness*. (2020) 11:1599–609. doi: 10.1007/s12671-020-01336-3
18. Chang SJ, Lee J, An H, Hong WH, Lee JY. Animal-assisted therapy as an intervention for older adults: a systematic review and meta-analysis to guide evidence-based practice. *Worldviews Evid Based Nurs*. (2021) 18:60–7. doi: 10.1111/wvn.12484
19. Chu H, Chen M, Tsai C, Chan H, Wu T. Efficacy of a horticultural activity program for reducing depression and loneliness in older residents of nursing homes in Taiwan. *Geriatric Nurs*. (2019) 40:386–91. doi: 10.1016/j.gerinurse.2018.12.012
20. Kim MY, Kim GS, Mattson NS, Kim WS. Effects of horticultural occupational therapy on the physical and psychological rehabilitation of patients with hemiplegia after stroke. *Korean J Hort Sci Technol*. (2010) 28:884–90. doi: 10.1590/S0102-05362010000400020
21. Kim K-H, Park S-A. Horticultural therapy program for middle-aged women's depression, anxiety, and self-identify. *Complement Ther Med*. (2018) 39:154–9. doi: 10.1016/j.ctim.2018.06.008
22. Nicholas SO, Giang AT, Yap PLK. The effectiveness of horticultural therapy on older adults: a systematic review. *J Am Med Dir Assoc*. (2019) 20:1–11. doi: 10.1016/j.jamda.2019.06.021
23. Tu P-C, Cheng W-C, Hou P-C, Chang Y-S. Effects of types of horticultural activity on the physical and mental state of elderly individuals. *Int J Environ Res Public Health*. (2020) 17:5225. doi: 10.3390/ijerph17145225
24. Chen H, Tu H, Ho C. Understanding biophilia leisure as facilitating wellbeing and the environment: an examination of participants' attitudes toward horticultural activity. *Leis Sci*. (2013) 35:301–19. doi: 10.1080/01490400.2013.797323
25. Kenmochi T, Kenmochi A, Hoshiyama M. Effects of horticultural therapy on symptoms and future perspective of patients with schizophrenia in the chronic stage. *J Ther Hort*. (2019) 29:1–10. Available online at: <https://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=136758473&site=ehost-live>
26. Von Lindern E. Perceived interdependencies between settings as constraints for self-reported restoration. *J Environ Psychol*. (2017) 49:8–17. doi: 10.1016/j.jenvp.2016.11.004
27. Ikei H, Song C, Igarashi M, Namekawa T, Miyazaki Y. Physiological and psychological relaxing effects of visual stimulation with foliage plants in high school students. *Adv Hort Sci*. (2014) 28:111–6. doi: 10.1400/230107
28. Choi J-Y, Park S-A, Jung S-J, Lee J-Y, Son K-C, An Y-J, et al. Physiological and psychological responses of humans to the index of greenness of an interior space. *Complement Ther Med*. (2016) 28:37–43. doi: 10.1016/j.ctim.2016.08.002
29. Ng TKS, Gan DRY, Mahendran R, Kua EH, Ho RCM. Social connectedness as a mediator for horticultural therapy's biological effect on community-dwelling older adults: secondary analyses of a randomized controlled trial. *Soc Sci Med*. (2021) 284:1–6. doi: 10.1016/j.socscimed.2021.114191
30. Thompson Coon J, Boddy K, Stein K, Whear R, Barton J, Depledge MH, et al. Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors? A systematic review. *Environ sci*. (2011) 45:1761–72. doi: 10.1021/es102947t
31. Van den Berg MM, van Poppel M, van Kamp I, Ruijsbroek A, Triguero-Mas M, Gidlow C, et al. Do physical activity, social cohesion, and loneliness mediate the association between time spent visiting green space and mental health? *Environ Behav*. (2019) 51:144–66. doi: 10.1177/0013916517738563
32. Dinas P, Koutedakis Y, Flouris A. Effects of exercise and physical activity on depression. *Irish J Med Sci*. (2011) 180:319–25. doi: 10.1007/s11845-010-0633-9
33. Han A-R, Park S-A, Ahn B-E. Reduced stress and improved physical functional ability in elderly with mental health problems following a horticultural therapy program. *Complement Ther Med*. (2018) 38:19–23. doi: 10.1016/j.ctim.2018.03.011
34. Park S, Lee A, Kim J-J, Lee K-S, So J-M, Son K-C. Electromyographic analysis of upper and lower limb muscles during gardening tasks. *Hortic Sci Technol*. (2014) 32:710–20. doi: 10.7235/hort.2014.14059
35. Turner LW, Bass MA, Ting L, Brown B. Influence of yard work and weight training on bone mineral density among older us women. *J Women Aging*. (2002) 14:139–48. doi: 10.1300/J074v14n03_09
36. Milligan C, Gattrell A, Bingley A. 'Cultivating Health': therapeutic landscapes and older people in Northern England. *Soc Sci Med*. (2004) 58:1781–93. doi: 10.1016/S0277-9536(03)00397-6
37. Ng KST, Sia A, Ng MKW, Tan CTY, Chan HY, Tan CH, et al. Effects of horticultural therapy on asian older adults: a randomized controlled trial. *Int J Environ Res Public Health*. (2018) 15:1–14. doi: 10.3390/ijerph15081705
38. Noone S, Innes A, Kelly F, Mayers A. The nourishing soil of the soul: the role of horticultural therapy in promoting well-being in community-dwelling people with dementia. *Dementia*. (2017) 16:897–910. doi: 10.1177/1471301215623889
39. Domènech-Abella J, Lara E, Rubio-Valera M, Olaya B, Moneta MV, Rico-Urbe LA, et al. Loneliness and depression in the elderly: the role of social network. *Soc Psychiatry Psychiatr Epidemiol*. (2017) 52:381–90. doi: 10.1007/s00127-017-1339-3
40. Tu H. Effect of Horticultural therapy on mental health: a meta-analysis of randomized controlled trials. *J Psychiatr Ment Health Nurs*. (2022) 00:1–13. doi: 10.1111/jpm.12818
41. Kunpeuk W, Spence W, Phulkerd S, Suphanchaimat R, Pitayangsarit S. The impact of gardening on nutrition and physical health outcomes: a systematic review and meta-analysis. *Health Promot Int*. (2020) 35:397–408. doi: 10.1093/heapro/daz027
42. Patel V, Burns JK, Dhillon M, Tarver L, Kohrt BA, Lund C. Income inequality and depression: a systematic review and meta-analysis of the association and a scoping review of mechanisms. *World Psychiatry*. (2018) 17:76–89. doi: 10.1002/wps.20492
43. Shadish WR, Clark MH, Steiner PM. Can non-randomized experiments yield accurate answers? a randomized experiment comparing random and nonrandom assignments. *J Am Stat Assoc*. (2008) 103:1334–44. doi: 10.1198/016214508000000733
44. Sterne JA, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. Rob 2: a revised tool for assessing risk of bias in randomized trials. *BMJ*. (2019) 366:1–8. doi: 10.1136/bmj.l4898
45. Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, et al. Robins-I: a tool for assessing risk of bias in non-randomized studies of interventions. *BMJ*. (2016) 355:1–7. doi: 10.1136/bmj.i4919
46. Vollestad J, Nielsen MB, Nielsen GH. Mindfulness-and acceptance-based interventions for anxiety disorders: a systematic review and meta-analysis. *Br J Clin Psychol*. (2012) 51:239–60. doi: 10.1111/j.2044-8260.2011.02024.x
47. Hedges LV, Olkin I. *Statistical Methods for Meta-Analysis*. Orlando, Florida: Academic Press. (1985).
48. Jacob C. *Statistical Power Analysis for the Behavioral Sciences*, 2nd Edition. Hillsdale, NJ: Erlbaum. (1988).
49. Michael B, Larry VH, Julian PTH, Hannah RR. A basic introduction to fixed-effect and random-effects models for meta-analysis. *Res Synth Methods*. (2010) 1:97–111. doi: 10.1002/jrsm.12
50. Dubben HH, Beck BHP. Systematic review of publication bias in studies on publication bias. *BMJ*. (2005) 331:433–4. doi: 10.1136/bmj.38478.497164.F7
51. Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. *BMJ*. (1997) 315:629–34. doi: 10.1136/bmj.315.7109.629
52. Hui YC, Mei FC, Chun CT, Hui SC, Tai LW. Efficacy of a horticultural activity program for reducing depression and loneliness in older residents of nursing homes in Taiwan. *Geriatric Nursing*. (2019) 40:386–91.
53. Yuh MC, Jeng YJ. Effects of horticultural therapy on psychosocial health in older nursing home residents: a preliminary study. *J Nurs Res*. (2015) 23:167–71. doi: 10.1097/jnr.0000000000000063

54. Bingying W. Effect of horticultural therapy on psychological condition of elderly patients. *Digest Med.* (2020) 20:256–8. doi: 10.19613/j.cnki.1671-3141.2020.48.162
55. Tik L. Study on the Effects of Horticultural Therapy on the Well-Being of Elderly with Mild Depression. *2018 HTAA International Conference & China Annual Symposium of Horticultural Therapy*; 2018 September 14–16. Tsinghua University. Beijing: China Forestry Publishing House (2018). p. 404–11.
56. Wang Z, Wu D. Nursing effect of horticultural therapy combined with sports nursing intervention in elderly patients with depression and its effect on aggressive behavior. *Chin Med Res.* (2020) 18:101–3. doi: 10.14033/j.cnki.cmr.2020.14.040
57. Makizako H, Tsutsumimoto K, Doi T, Makino K, Nakakubo S, Liu-Ambrose T, et al. Exercise and horticultural programs for older adults with depressive symptoms and memory problems: a randomized controlled trial. *J Clin Med.* (2020) 9:1–13. doi: 10.3390/jcm9010099
58. Masuya J, Ota K, Mashida Y. The effect of a horticultural activities program on the psychologic, physical, cognitive function and quality of life of elderly people living in nursing homes. *Int J Nursing Clin Pract.* (2014) 1:1–4. doi: 10.15344/2394-4978/2014/109
59. Mochizuki-Kawai H, Sakaba T, Yamakawa Y. Indoor horticultural therapy for older adults living in a nursing home: bedside structured floral arrangement program. *Geriatr Gerontol Int.* (2021) 21:538–9. doi: 10.1111/ggi.14155
60. Yuka K. The psychological changes of horticultural therapy intervention for elderly women of earthquake-related areas. *J Trauma Treat.* (2013) 3:1–6. doi: 10.4172/2167-1222.1000184
61. Park S-A, Lee AY, Son K-C, Lee W-L, Kim D-S. Gardening intervention for physical and psychological health benefits in elderly women at community centers. *Horttechnology.* (2016) 26:474–83. doi: 10.21273/HORTTECH.26.4.474
62. Yong HK, Hyeon LS, Chul SP, Hwaok B, Yun JK, Moo RH, et al. Horticultural therapy program focusing on gardening activities to promote psychological, emotional and social health of the elderly living in a homeless living facility for a long time: a pilot study. *J People Plants Environ.* (2020) 23:565–76. doi: 10.11628/kspe.2020.23.5.565
63. Sia A, Tam WWS, Fogel A, Kua EH, Khoo K, Ho RCM. Nature-based activities improve the well-being of older adults. *Sci Rep.* (2020) 10:1–8. doi: 10.1038/s41598-020-74828-w
64. Edwards CA, McDonnell C, Merl H. An evaluation of a therapeutic garden's influence on the quality of life of aged care residents with dementia. *Dementia.* (2013) 12:494–510. doi: 10.1177/1471301211435188
65. Carolyn CH, Mary AD, Charles FRI, Daniel JB, Peter DN, Timothy HM, et al. Longitudinal changes in diary-and laboratory-based sleep measures in healthy “Old Old” and “Young Old” subjects: a three-year follow-up. *Sleep.* (1997) 20:192–202. doi: 10.1093/sleep/20.3.192
66. Yasuda N, Zimmerman SI, Hawkes W, Fredman L, Hebel JR, Magaziner J. Relation of social network characteristics to 5-year mortality among young-old vs. old-old white women in an urban community. *Am J Epidemiol.* (1997) 145:516–23. doi: 10.1093/oxfordjournals.aje.a009139
67. Wu G, Wu X, Xu M. Preoperative pulmonary nodule localization methods: a comparison of microcoil and sclerosing agent. *Chin J Lung Cancer.* (2020) 23:429–35. doi: 10.3779/j.issn.1009-3419.2020.102.07
68. Li W, Sun Z, Liu X, Yu G. Volume Measurements of Human Parotid and Submandibular Glands. *J Peking Univ.* (2014) 46:288–93. doi: 10.3969/j.issn.1671-167X.2014.02.022
69. Fu R, Gartlehner G, Grant M, Shamliyan T, Sedrakyan A, Wilt TJ, et al. Conducting quantitative synthesis when comparing medical interventions: Ahrq and the effective health care program. *J Clin Epidemiol.* (2011) 64:1187–97. doi: 10.1016/j.jclinepi.2010.08.010
70. Sandercock G, Bromley PD, Brodie DA. Effects of exercise on heart rate variability: inferences from meta-analysis. *Medicine.* (2005) 37:433–9. doi: 10.1249/01.MSS.0000155388.39002.9D
71. Liu H, Li X, Romainoor NH. Meta-analysis of the influence of online reviews on clothing purchase intention. *J Silk.* (2021) 58:59–71. doi: 10.3969/j.issn.1001-7003.2021.01.010
72. Wei JL, Ning PL, Chih KL, Ching HL, Liang KC. Cognitive frailty predicting all-cause mortality among community-living older adults in Taiwan: a 4-year nationwide population-based cohort study. *PLoS ONE.* (2018) 13:1–10. doi: 10.1371/journal.pone.0200447
73. Zhang C, Chai Y, Li C. The Characteristics of Daily Activity of the Elderly in Beijing City. *Area Res Dev.* (2007) 26:116–20. doi: 10.3969/j.issn.1003-2363.2007.04.027
74. Sommerfeld AJ, Waliczek TM, Zajicek JM. Growing minds: evaluating the effect of gardening on quality of life and physical activity level of older adults. *Horttechnology.* (2010) 20:705–10. doi: 10.21273/HORTTECH.20.4.705
75. Park S-A, Lee A-Y, Lee K-S, Son K-C. Gardening tasks performed by adults are moderate-to high-intensity physical activities. *Horttechnology.* (2014) 24:58–63. doi: 10.21273/HORTTECH.24.1.58
76. Lee Y, Jang K, Lockhart NC. Impact of social integration and living arrangements on Korean older adults' depression: a moderation model. *Int J Aging Human Dev.* (2018) 86:306–21. doi: 10.1177/0091415017720887
77. Han J, Wang J, Wang Y, Xie B. Correlation between depression and social cohesion among the elderly in the community. *Chin Nurs Res.* (2021) 35:1145–50. doi: 10.12102/j.issn.1009-6493.2021.07.004
78. Valentine JC, Thompson SG. Issues Relating to Confounding and Meta-Analysis When Including Non-Randomized Studies in Systematic Reviews on the Effects of Interventions. *Res Synth Methods.* (2013) 4:26–35. doi: 10.1002/jrsm.1064
79. Cacioppo JT, Hughes ME, Waite LJ, Hawkley LC, Thisted RA. Loneliness as a specific risk factor for depressive symptoms: cross-sectional and longitudinal analyses. *Psychol Aging.* (2006) 21:140–51. doi: 10.1037/0882-7974.21.1.140
80. Van den Berg AE, Van Winsum-Westra M, De Vries S, Van Dillen SME. Allotment gardening and health: a comparative survey among allotment gardeners and their neighbors without an allotment. *Environ Health.* (2010) 9:1–12. doi: 10.1186/1476-069X-9-74
81. Landolt HP, Raimo EB, Schnierow BJ, Kelsoe JR, Rapaport MH, Gillin JC. Sleep and sleep electroencephalogram in depressed patients treated with phenelzine. *Arch Gen Psychiatry.* (2001) 58:268–76. doi: 10.1001/archpsyc.58.3.268
82. Le-Niculescu H, Roseberry K, Gill SS, Levey DF, Phalen PL, Mullen J, et al. Precision medicine for mood disorders: objective assessment, risk prediction, pharmacogenomics, and repurposed drugs. *Mol Psychiatry.* (2021):2776–804. doi: 10.1038/s41380-021-01061-w

Advantages of publishing in Frontiers



OPEN ACCESS

Articles are free to read
for greatest visibility
and readership



FAST PUBLICATION

Around 90 days
from submission
to decision



HIGH QUALITY PEER-REVIEW

Rigorous, collaborative,
and constructive
peer-review



TRANSPARENT PEER-REVIEW

Editors and reviewers
acknowledged by name
on published articles

Frontiers

Avenue du Tribunal-Fédéral 34
1005 Lausanne | Switzerland

Visit us: www.frontiersin.org

Contact us: frontiersin.org/about/contact



REPRODUCIBILITY OF RESEARCH

Support open data
and methods to enhance
research reproducibility



DIGITAL PUBLISHING

Articles designed
for optimal readership
across devices



FOLLOW US

@frontiersin



IMPACT METRICS

Advanced article metrics
track visibility across
digital media



EXTENSIVE PROMOTION

Marketing
and promotion
of impactful research



LOOP RESEARCH NETWORK

Our network
increases your
article's readership