

COGNITIVE AND PERSONALITY VARIABLES IN THE DEVELOPMENT OF BEHAVIORAL ADDICTIONS IN ADOLESCENCE AND EMERGING ADULTHOOD

EDITED BY: Alessia Passanisi, Luca Milani, Ugo Pace and
Adriano Schimmenti

PUBLISHED IN: Frontiers in Psychology 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 978-2-88976-050-3

DOI 10.3389/978-2-88976-050-3

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

COGNITIVE AND PERSONALITY VARIABLES IN THE DEVELOPMENT OF BEHAVIORAL ADDICTIONS IN ADOLESCENCE AND EMERGING ADULTHOOD

Topic Editors:

Alessia Passanisi, Kore University of Enna, Italy

Luca Milani, Catholic University of the Sacred Heart, Italy

Ugo Pace, Kore University of Enna, Italy

Adriano Schimmenti, Kore University of Enna, Italy

Citation: Passanisi, A., Milani, L., Pace, U., Schimmenti, A., eds. (2022). Cognitive and Personality Variables in the Development of Behavioral Addictions in Adolescence and Emerging Adulthood. Lausanne: Frontiers Media SA.
doi: 10.3389/978-2-88976-050-3

Table of Contents

- 04 Editorial: Cognitive and Personality Variables in the Development of Behavioral Addictions in Adolescence and Emerging Adulthood**
Alessia Passanisi, Ugo Pace, Luca Milani and Adriano Schimmenti
- 06 Effect of Physical Activity on Drug Craving of Women With Substance Use Disorder in Compulsory Isolation: Mediating Effect of Internal Inhibition**
Kun Wang, Jiong Luo, Tingran Zhang, Yiyi Ouyang, Chenglin Zhou and Yingzhi Lu
- 18 Maladaptive Personality Functioning and Psychopathological Symptoms in Problematic Video Game Players: A Person-Centered Approach**
Alessandro Musetti, Tiziana Mancini, Paola Corsano, Gianluca Santoro, Maria Clara Cavallini and Adriano Schimmenti
- 32 The Potential Role of the Early Maladaptive Schema in Behavioral Addictions Among Late Adolescents and Young Adults**
Matteo Aloï, Valeria Verrastro, Marianna Rania, Raffaella Sacco, Fernando Fernández-Aranda, Susana Jiménez-Murcia, Pasquale De Fazio and Cristina Segura-Garcia
- 42 Video Game Addiction and Emotional States: Possible Confusion Between Pleasure and Happiness?**
Lucio Gros, Nicolas Debue, Jonathan Lete and Cécile van de Leemput
- 63 Objectified Body Consciousness, Body Image Control in Photos, and Problematic Social Networking: The Role of Appearance Control Beliefs**
Valentina Boursier, Francesca Gioia and Mark D. Griffiths
- 74 A Typology of Buyers Grounded in Psychological Risk Factors for Compulsive Buying (Impulsivity, Self-Esteem, and Buying Motives): Latent Class Analysis Approach in a Community Sample**
Gaëlle Challet-Bouju, Julie Mariez, Bastien Perrot, Marie Grall-Bronnec and Emeline Chauchard
- 83 Coping Strategies, Creativity, Social Self-Efficacy, and Hypercompetitiveness in Gambling Behaviors: A Study on Male Adolescent Regular Gamblers**
Alessia Passanisi, Giulio D'Urso, Adriano Schimmenti, Stefano Ruggieri and Ugo Pace
- 90 A Correlative Study Between Personality Traits and the Preference of Site Selection in Cosmetic Treatment**
Huan Qian, Yuxiao Ling, Chen Wang, Cameron Lenahan, Mengwen Zhang, Min Zheng and Anwen Shao
- 98 The Prevalence of Compulsive Buying and Hoarding Behaviours in Emerging, Early, and Middle Adulthood: Multicentre Epidemiological Analysis of Non-clinical Chinese Samples**
Jiawen Ye, Simon Ching Lam and Heping He



Editorial: Cognitive and Personality Variables in the Development of Behavioral Addictions in Adolescence and Emerging Adulthood

Alessia Passanisi¹, Ugo Pace^{1*}, Luca Milani² and Adriano Schimmenti¹

¹ Department of Human and Social Sciences, Kore University of Enna, Enna, Italy, ² Centre for Research Into Developmental and Educational Dynamics, Department of Psychology, Catholic University of Milan, Milan, Italy

Keywords: behavioral addiction, cognitive variable, personality, adolescence, emerging adult

Editorial on the Research Topic

Cognitive and Personality Variables in the Development of Behavioral Addictions in Adolescence and Emerging Adulthood

As part of the scientific debate on the nature of behavioral addictions, it has been shown the tendency of researchers to elaborate, for the lack of theoretical and clinical conceptualizations, evidence related to disorders by adapting the criteria for addictive disorders linked to substance abuse, assuming that there is a sort of conceptual overlap or similarity. Indeed, some researchers have observed that people characterized by behavioral addictions show symptoms related behaviors similar to those of people with substance use disorders, such as compulsive behaviors, frequent and obsessive thoughts about a particular activity, to the exclusion of other social interests, psychological distress when the activity is reduced, reduction in social, recreational, professional, educational, and domestic activities.

Especially in the period from puberty to early adulthood, some behaviors generally considered adaptive as gaming, physical activity or buying can assume a particular meaning in the psychosocial development of the individual (Milani et al., 2018; Triberti et al., 2018; Ruggieri et al., 2020). Moreover, behaviors that are moderately maladaptive, such as gambling, may exacerbate and compel adolescents into a clear addiction. The risk, in this case, is to generate a condition in which psychological dependence pushes the craving for the object, without which, the very existence loses its primary meaning. Thus, the displacement of psychic energies on the object of the addiction itself and the complementary withdrawal from life without the object of addiction, experienced as monotonous, can become real risk factors in lives of adolescents and young adults (Pace et al., 2019). For individuals in this stage of development, these behaviors could provide ideal ground for virtual transposition of points of view, dreams, desires, but also hardships and existential problems.

This Research Topic aims to deepen the knowledge about the conditions under which compulsiveness, craving, pleasure gained or loss of control act as a catalyst for compensating those psychosocial needs that are not met in adolescence and emerging adulthood, leading to so-called “new addiction.” Due to their condition of fragility linked to the particular developmental period, adolescents and young adults represent the population most at risk of behavioral or social addictions.

Recently, in the psychology literature, a great amount of empirical research on behavioral addictions among adolescents and young adults has led to the suggestion that there might be

OPEN ACCESS

Edited and reviewed by:

Bernhard Hommel,
University Hospital Carl Gustav
Carus, Germany

*Correspondence:

Ugo Pace
ugo.pace@unikore.it

Specialty section:

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

Received: 09 March 2022

Accepted: 18 March 2022

Published: 08 April 2022

Citation:

Passanisi A, Pace U, Milani L and
Schimmenti A (2022) Editorial:
Cognitive and Personality Variables in
the Development of Behavioral
Addictions in Adolescence and
Emerging Adulthood.
Front. Psychol. 13:892669.
doi: 10.3389/fpsyg.2022.892669

a general predisposition toward addiction in some individuals characterized by neuro-biological abnormalities which inhibit the “rational brake” in specific cortical areas that regulate the ability to make rational decisions. Others researchers have tried to go beyond the simple concept of predisposition, suggesting that the complex factors linked to a behavioral addictions would result from scarcity in a multiplicity of cognitive and emotional devices associated with decision making. Beyond studies on neural circuitry, considered central to neurobiological models of pathological behaviors, remains the dilemma of how to understand the relationship between predisposing characteristics of personality and processes of decision making in individuals with addiction.

Extensive research has shown that behavioral addictions and personality disorders are highly comorbid in both treatment and community research studies. The DSM-5 defines a personality disorder as “an enduring pattern of internal experience and markedly deviating behavior of the expectations of the culture of the individual, it is pervasive and inflexible.” The impact of maladaptive personality traits on play is an expanding Research Topic. Several authors have explored the role of personality dimensions in the development of gambling disorder using the Big Five Model e the five-factor model (FFM). In particular, several studies have shown greater neuroticism and lower scores of agreeableness, conscientiousness and openness among behavioral addicted people. This suggests that people with problem behavior are more likely to be less imaginative, intellectually curious, orderly, responsible, and open-minded.

Moreover, according to psychological literature, the process of deciding on the basis of instantaneous reward or, conversely, on postponed but elevated reward, is considered a decisive point on an adaptive psychosocial developmental trajectory. An adaptive decision-making function should be based on the postponement of impulsive urges for immediate gratification and persistence in

goal-directed behavior to achieve positive outcomes in the future. This model outlines a complex set of cognitive mechanisms that encourage persistent maladaptive behaviors (Passanisi et al., 2017). The power and occurrence of irrational cognitive beliefs get stronger with increasing levels of a behavioral addiction: poor critical thinking would be involved in the development and maintenance of the different behaviors that, although socially accepted, become the fulcrum of the adolescent's life due to their pervasiveness and excessive interest at the expense of any other adolescent development task.

The research presented in this topic highlights some interesting results for the understanding of behavioral addictions among adolescents and young adults. In particular, some subjects of these studies were: gaming and gambling, seen in their opposite meanings of moment of leisure or addiction and through their personality correlates; physical activities, as protective factors, in the case of addiction related to substances, or as risk factors; and, finally, buying and cosmetic treatments, with respect to its increasingly compulsive meaning in our society.

Taken as a whole, results highlight the pervasiveness of the developmental risks connected with the loss of control on those behaviors that can be thought as non-atypical *per se*, but also the array of potential protective factors that can buffer the maladaptive trajectories of adaptation into healthier outcomes. Nonetheless, the need for a comprehensive theoretical and clinical model about “new addictions” emerges clearly. This is likely to be the challenge that lays ahead for the upcoming research.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

REFERENCES

- Milani, L., La Torre, G., Fiore, M., Grumi, S., Gentile, D. A., Ferrante, M., et al. (2018). Internet gaming addiction in adolescence: Risk factors and maladjustment correlates. *Int. J. Ment. Health Addiction* 16, 888–904. doi: 10.1007/s11469-017-9750-2
- Pace, U., D'Urso, G., and Zappulla, C. (2019). Internalizing problems as a mediator in the relationship between low effortful control and internet abuse in adolescence: a three-wave longitudinal study. *Comput. Hum. Behav.* 92, 47–54. doi: 10.1016/j.chb.2018.10.030
- Passanisi, A., Craparo, G., and Pace, U. (2017). Magical thinking and decision-making strategies among late adolescent regular gamblers: a mediation model. *J. Adolesc.* 59, 51–58 doi: 10.1016/j.adolescence.2017.05.016
- Ruggieri, S., Santoro, G., Pace, U., Passanisi, A., and Schimmenti, A. (2020). Problematic Facebook use and anxiety concerning use of social media in mothers and their offspring: an actor-partner interdependence model. *Addict. Behav. Rep.* 11, 100256. doi: 10.1016/j.abrep.2020.100256
- Triberti, S., Milani, L., Villani, D., Grumi, S., Peracchia, S., Curcio, G., et al. (2018). What matters is when you play: Investigating the relationship between online

video games addiction and time spent playing over specific day phases. *Addict. Behav. Rep.* 8, 185–188. doi: 10.1016/j.abrep.2018.06.003

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 Passanisi, Pace, Milani and Schimmenti. 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.



Effect of Physical Activity on Drug Craving of Women With Substance Use Disorder in Compulsory Isolation: Mediating Effect of Internal Inhibition

Kun Wang¹, Jiong Luo¹, Tingran Zhang¹, Yiyi Ouyang¹, Chenglin Zhou² and Yingzhi Lu^{2*}

¹ Research Centre for Exercise Detoxification, College of Physical Education, Southwest University, Chongqing, China,

² School of Kinesiology, Shanghai University of Sport, Shanghai, China

OPEN ACCESS

Edited by:

Adriano Schimmenti,
Kore University of Enna, Italy

Reviewed by:

Alessandro Musetti,
University of Parma, Italy
Marco Venniro,
National Institute on Drug Abuse
(NIDA), United States

*Correspondence:

Yingzhi Lu
yingzhi.lu.sus@gmail.com

Specialty section:

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

Received: 05 June 2019

Accepted: 05 August 2019

Published: 03 September 2019

Citation:

Wang K, Luo J, Zhang T,
Ouyang Y, Zhou C and Lu Y (2019)
Effect of Physical Activity on Drug
Craving of Women With Substance
Use Disorder in Compulsory Isolation:
Mediating Effect of Internal Inhibition.
Front. Psychol. 10:1928.
doi: 10.3389/fpsyg.2019.01928

Background: Women with substance use disorder has attracted widespread attention as a prominent social issue. According to reports, physical exercise can improve the internal inhibition, effectively reduce the substance user's drug craving, and improve withdrawal symptoms, however, the specific mechanism of internal inhibition should be further considered. This study was designed to determine the critical role of internal inhibition in the path of physical exertion affecting the drug cravings of women drug users.

Methods: By means of Physical Activity Rating Scale (PARS-3), internal Inhibition Scale and Drug Craving Scale, this study investigated the individuals with substance use disorder under rehabilitation in the women compulsory isolation rehabilitation center in Chongqing, China.

Results: (1) Women with traditional drug users had the strongest internal inhibition and new drug use disorder had the highest drug craving. The longer the duration of drug abuse, the lower the internal inhibition and the higher the drug craving. Women with moderate-intensity activity had the strongest internal inhibition and the lowest drug craving. (2) The physical activity intensity was negatively correlated with drug craving, positively correlated with intrinsic inhibition, and negatively correlated with drug craving. (3) Internal inhibition played a partial mediating effect between physical activity intensity and drug craving.

Conclusion: Physical activity has a positive effect on inhibiting drug craving among drug addicts, while moderate-intensity activity seems to be more conducive to enhancing the internal inhibition of addicts, to improving their resistance to drugs, and thus more conducive to reducing drug craving.

Keywords: physical activity, substance use disorder, drug craving, internal inhibition, mediating effect

INTRODUCTION

According to the *World Drug Report 2018*, about 275 million individuals used drugs at least once in 2016 all over the world, which posing a huge threat to safety and health to humankind. It is well known that when an individual continues to use a certain drug and forms the dependence, it is easy to produce a drug craving and a related drug impulse behavior. Drug craving is the subjective craving of drug addicts or users for drug effects, and their inner expectations of pleasant experience, relieving withdrawal symptoms and negative emotions brought by drugs, and subconsciously paying too much attention to drug-related cues (Washton, 1986; Field et al., 2009). When an individual is craving for drugs, there will be a rift between his real self and his ought self, which will easily lead to negative emotions related to anxiety and depression (De los Cobos et al., 2011). The higher the degree of drug craving, the higher the level of anxiety and depression (Higgins, 1987). On the basis of the self-medication hypothesis, young individuals with high social anxiety may use marijuana to alleviate emotional distress and respond to unpleasant social conditions (Khantzian, 1997), and individuals with higher drug dependence are more likely to be paranoid, and then exacerbate psychotic-like symptoms (Musetti et al., 2016). At the same time, individuals with substance use disorder may actually use substance or excessive behavior as an external regulator and self-medication to treat their emotional disorders and painful mental states, and individuals with alcohol use disorders often suffers more traumatic events in childhood (Craparo et al., 2014; Caretti et al., 2018). Based on this, Schimmenti and Bifulco (2015) pointed out in the report that *the Childhood Experience of Care and Abuse* (CECA) has good psychometric characteristics and was considered to be the gold standard for assessing trauma and lack of care experienced during childhood, and these also achieved initial results in predicting depression. It can be seen that the psychological mechanism of drug addiction and addictive behavior is very extensive and has always been an important topic in academic circles.

In recent years, the role of physical activity in reducing drug craving has attracted wide attention. Among tobacco abusers, Roberts et al. (2012) found that aerobic activity can significantly reduce tobacco abusers' craving for tobacco, while women tobacco abusers seem to be more likely to abandon tobacco than male tobacco abusers. Linke et al. (2013) pointed out that aerobic activity can effectively prevent or alleviate the negative emotional state when quitting smoking, and reduce their craving for tobacco. Physical activity can reduce the craving for smoking and improve the adverse symptoms after withdrawal. In a study of drug abstainers, such as cannabis and opioids, it was found that after 6 months, three times a week and 2 h of aerobic activity intervention, drug abstainers' craving for drugs was significantly reduced (Roessler, 2010). Similarly, Buchowski et al. (2011) also found that aerobic exercise can effectively reduce the craving for marijuana by addicts. A review study has shown that the proper physical exercise can effectively inhibit the psychological cravings of the addicts and the corresponding relapse behavior through the regulation of neurotransmitters

and hormones (Zhao et al., 2018). Strickland et al. (2016) pointed out that participation in sports can enhance the ability of dopaminergic signaling, especially in the "reward" approach, which can effectively reduce the excessive use of drugs by addicts. Some scholars hypothesized that physical exercise can reduce smoking dependence, and validate the hypothesis through the path model. It have found that among the college students who were addicted to smoking, the greater the amount of physical exercise, the lower the smoking dependence Chang et al. (2014). It can be seen that physical activity does play a positive role in reducing drug craving, but the specific path between these two is still unknown.

Internal inhibition is an important component of executive function of the brain. It intends to cancel a dominant response or stop an inappropriate ability unrelated to action. It is closely related to the prevention and treatment of smoking addiction, hyperactivity disorder, drug abuse and schizophrenia clinically (Schachar et al., 2000; Friedman and Miyake, 2003; Tomporowski et al., 2008). A large number of studies have found that: two consecutive weeks of self-control training can significantly prolong the duration of smoking cessation of the abstainer (Muraven et al., 1999). Individuals with low self-control level are more likely to have drug craving and abuse behavior, while those with high self-control level show less substance abuse behavior (Tarantino et al., 2015). Self-control ability of male drug addicts is one of the important influencing factors of relapse behavior. It is negatively correlated with relapse tendency (Gong et al., 2013). However, this result has not been verified in women with substance use disorder so far. The influence of physical activity on individual inhibition ability is also supported by more studies (Huang et al., 2014). Normal people who participated in aerobic activity performed better in the Flanker tasks related to inhibition, and the fronto-parietal network was more optimized in the execution of the task. Low-intensity of acute aerobic activity can promote the performance of the subjects when executing Stroop inhibits task, and effectively improve the activation level of dorsolateral prefrontal cortex and frontal polar brain area (Byun et al., 2014). However, acute aerobic exercise at moderate-intensity is better to promote human inhibition. Empirical studies have shown that both acute exercise and aerobic exercise can improve the inhibitory function of methamphetamine addicts (Buchowski et al., 2011). Although previous studies on the effects of physical exercise on the cravings and physical fitness of women with substance use disorder (see **Table 1**), whether physical exercise has the same effect on the inhibition ability of women drug users, and the relevant mechanism of action still needs further exploration. As known, acute aerobic activity at moderate-intensity can better promote human inhibition ability, and the response speed of inhibition task after moderate-intensity aerobic activity is significantly better than that of no activity and other activity intensity. Other studies have found that there is an inverted U-shaped relationship between acute aerobic activity and inhibition (Wang and Zhou, 2014).

In conclusion, physical activity plays a unique role in reducing drug users' craving for drugs, improving depression

TABLE 1 | Research review on physical exercise on the drug craving and physical fitness in women with substance use disorder.

Authors (Date)	Subjects	Protocol	Frequency	Outcome indicators
Dolezal et al., 2013	Methamphetamine dependents (total of 39 of men and women aged 18–55)	Endurance and resistance exercise (treadmill, smith machine or dumbbell)	3 days/weeks, 1 h/times, total of 5 weeks	Significantly increased VO_{2max} , leg, and waist strength and endurance, significantly decreased fat
Rawson et al., 2015	Methamphetamine addicts (total of 135 of men and women aged 18–45)	Aerobic exercise and resistance training (aerobic for 30 min, resistance for 15 min)	3 days/weeks, 55 min/day, total of 8 weeks	Significant improvement in aerobic performance, heart rate variability, significantly decreased scores of depression and anxiety, decreased relapse rate
Geng et al., 2016	Synthetic drug force (total of 60 of women)	Taichi rehabilitation exercise (Wild horses branching, rewinding, kneeling, stalking, golden chicken independence and single whip)	5 days/weeks, 45 min/days, total of 3 months	Significant improvement in systolic pressure, balance ability, somatization disorder, depression, and anxiety
Wang et al., 2017	Methamphetamine dependents (men: 44, women: 6)	Aerobic exercise intervention (cycle ergometer, jogging, rope skipping) (warm-up: 5 min, aerobic exercise: 30 min, cool down: 5 min)	3 days/weeks, 30–40 min/days, total of 12 weeks	Effective improvement in physical fitness, craving degree and emotional disorder?
Caretti et al. (2018)	Clinical group (total 515 of women 111, men 398); Control group (total of 183, women 98, men 84)	the Severity Index (SI); the Seven Domains Addiction Scale (7DAS)	—	The better psychological assessment characteristics of The Addictive Behavior Questionnaire (ABQ)
Zhang et al., 2018	Amphetamine-type stimulant dependents (men: 76, women: 79)	Desire for Speed Questionnaire, DSQ; Sports Activity Rating Scale, PARS-3, etc.	—	Improving the negative emotions, mental state, and physical health, and then alleviate the psychological cravings of dependents
Zhu et al., 2018	Amphetamine-type stimulant dependents (women: 80)	Taichi boxing (warm-up: 10 min, Taichi for 40 min, cool-down: 10 min)	5 days/weeks in first 3 months; 3 days/weeks in second 3 months	Increased sleep efficiency, significantly reduced pulse rate, significantly improved body fat content, significantly reduced withdrawal rate
Nygaard et al., 2018	Methamphetamine addicts (men: 17, women: 6)	Resistance training (4 sets of half-squat exercises)	3 days/weeks, total of 12 weeks	Obviously upgrade in physical fitness
Liang et al., 2019	New drugs (Ice, ecstasy, K powder) abusers (women: 73)	Yoga and moderate-intensity aerobics (warm-up: 10 min, aerobics: 20 min, Yoga: 10 min)	3 days/weeks, ~40 min/days, total of 3 months	Effective alleviated the negative emotion of depression and anxiety of subjects
Huang et al., 2019	Personnel in drug rehabilitation center (men: 7947, women : 790)	Physique measures (cardiopulmonary fitness, muscular strength fitness, and neural fitness, etc.)	—	Physical benefits not optimistic, and significant regional differences

and anxiety, and increasing drug withdrawal rate. Proper aerobic activity can promote the recovery of the impaired cognitive control ability of drug abusers, enhance the inhibition ability of drug craving, and then achieve the curative effect of rehabilitation. It can be seen that internal inhibition plays a key role between physical activity and drug addicts' craving for drugs. Although most studies have confirmed that physical activity is closely related to internal inhibition, with the change of physical activity intensity, whether internal inhibition will change accordingly has been confirmed by few studies at present. Similarly, few studies have explored physical activity, internal inhibition and drug craving in the path model, especially for women with substance use disorder. Therefore, in view of the limitations of previous studies, this study proposes the following assumptions: (X1) Physical activity was negatively correlated with drug craving. (X2) Internal inhibition was negatively correlated with drug craving. (X3) Physical activity is positively correlated with internal inhibition. (X4) Internal inhibition mediates the physical activity

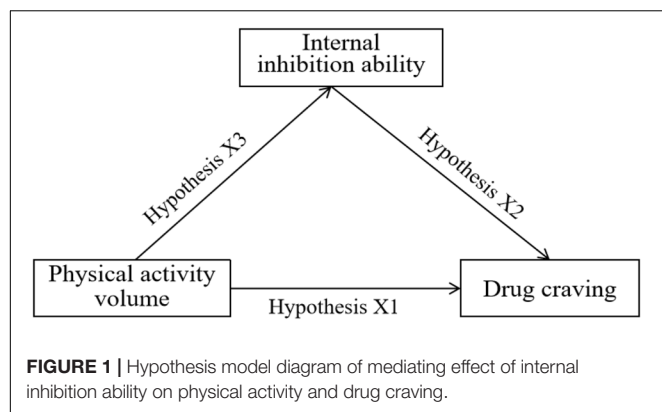
and drug craving of women with substance use disorder (see **Figure 1**).

SUBJECTS AND METHODS

Subjects

All the women with substance use disorder in Chongqing Women's Compulsory Drug Rehabilitation Center during the rehabilitation consolidation period were surveyed.

In order to ensure the validity and reliability of the questionnaire, all the questionnaires of drug users were sent out by the supervisors of the drug rehabilitation center on their behalf. The questionnaires were filled out and collected with the dormitory as a unit, and all the participants signed the informed consent before filling in. A total of 500 questionnaires were sent out and 487 questionnaires were collected, with a collection rate of 97.4%. Twelve invalid questionnaires were excluded, and 465 questionnaires were finally valid, with an



effective rate of 95.4%. The subjects were (35.77 ± 10.29) years old, (1.62 ± 0.64) m in height, (57.7 ± 8.51) kg in weight, (7.76 ± 7.24) years in drug abuse, 214 in traditional drugs, 119 in new drugs and 132 in mixed drugs (see **Table 2**).

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and was approved by the ethics committee of Shanghai University of Sport (102772019RT041). Written informed consent form was obtained from all participants before enrolling them in the study.

Research Methods

Measures

Structured questionnaire design was adopted. On the basis of consulting a large number of research literature, through drafting the preliminary draft, predicting the test, analyzing

the results of the preliminary test to complete the final draft of the questionnaire, the main contents include three parts consisting of the physical exercise of drug abusers, the internal inhibition, and the current state of medication cravings.

Physical Activity Rating Scale (PARS-3)

Three-question test method revised by Liang (1994) is adopted, namely the intensity, time and frequency of physical activity, 5-point Likert scale is adopted for quantification, scoring from 1 to 5 points, and thus measure the level of participation in physical activity. Physical activity score = activity intensity score \times (activity time score - 1) \times activity frequency score, score interval 0 to 100 points. The scale of physical activity is: low intensity physical activity ≤ 19 points, moderate-intensity physical activity $\leq 20-42$ points, and high intensity physical activity ≤ 43 points. The predictive test of the questionnaire showed that the test-retest reliability was higher, and the correlation coefficient $r = 0.82$.

Internal inhibition scale

The internal inhibition scale compiled and revised by Jiang and Lin (2000) was adopted. The scale contains 18 items (e.g., I am very easy to lose my temper, or under the teasing of others, I can do almost anything, etc.), which consists of three dimensions. Using 5-point Likert scale to quantify, the choice of "strongly agree, agree, neither agree nor disagree, disagree, strongly disagree" were scored 1–5 points, the higher the score, the stronger the internal inhibition. The internal consistency test showed that the deliberation Cronbach's α coefficient was 0.91 (seven items), the self-control Cronbach's α coefficient was 0.86 (five items), the self-discipline Cronbach's α coefficient

TABLE 2 | Basic characteristics of Subjects.

Demographic Variable		Mean \pm SD/ n (%)	Drug use-related data		Mean \pm SD/ n (%)
Age(years)		35.77 \pm 10.29	Drug types	Traditional drug	214(46.02%)
Body height(m)		1.62 \pm 0.64		New drug	119(25.59%)
Body Weight(kg)		57.70 \pm 8.51		Mixed drug	132(28.39%)
Educational status	Primary school or below	107(23.01%)	Mainly drug used	Cannabis	60(12.90%)
	Junior	115(24.73%)		Heroin	95(20.43%)
	Senior	154(33.12%)		Cocaine	42(9.03%)
	College or above	89(19.14%)		Methamphetamine	93(2.00%)
Career	Unemployed	141(30.32%)		K powder	18(3.87%)
	Self-employed	135(29.03%)	Relapse	Others	157(33.76%)
	Staff	132(28.39%)		Once	53(11.40%)
	Manual workers	57(12.26%)		Twice	165(35.48%)
			Drug use years	Three time or more	247(53.12%)
				7.76 \pm 7.24	
				≤ 10 years	301(64.7%)
			Withdrawal period	> 10 years	164(35.3%)
				≤ 1 years	163(35.05%)
				1–2 years	203(43.66%)
			History of disease	> 2 years	99(21.29%)
				Cardiovascular disease	85(18.28%)
				Physiological disease	46(9.89%)
				Mental disorder	15(3.23%)

was 0.93 (Six items), and the overall Cronbach's α coefficient was 0.952. The verification results of measurement model are: $\chi^2/df = 1.44$, RMSEA = 0.03, AGFI = 0.99, CFI = 0.99, TLI = 0.92, IFI = 0.98, GFI = 0.99. It shows that the questionnaire has good measurement validity and reliability.

Drug craving scale

The craving belief scale was compiled by Jiang and Lin (2000). The scale contains 22 items (e.g., I can't relieve my anxiety without taking drugs, or the desire for drug use is far better than my willpower, etc.), which consists of three dimensions. Using 5-point Likert scale to quantify, the choice of "strongly disagree, disagree, neither disagree nor agree, agree, strongly agree" were scored 1–5 points, the higher the score, the stronger the craving for drugs. Internal consistency test results showed that drug cognition Cronbach's α coefficient was 0.95 (10 items), irrational belief Cronbach's α coefficient was 0.94 (seven items), craving degree Cronbach's α coefficient was 0.94 (five items), and overall Cronbach's α coefficient was 0.963. The validation results of the measurement model are: $\chi^2/df = 1.24$, RMSEA = 0.03, AGFI = 0.99, CFI = 0.99, TLI = 0.92, IFI = 0.98, GFI = 0.99. It shows that the questionnaire has better measurement validity and reliability.

Statistical Analysis

Statistical analysis is carried out to the data with SPSS21.0, including variance analysis, correlation analysis, regression analysis, etc.; AMOS21.0 is adopted to construct the model and analyze the path, and the mediation effect is discussed according to Anderson's two-step procedure. The significant level of all indicators was set at $\alpha = 0.05$.

RESULTS

Differences Between the Types and Duration of Drug Abuse on Internal Inhibition and Drug Craving of Women With Substance Use Disorder

Based on the characteristics of the sample, this study classified the types of drugs used into three types: traditional drugs, new drugs, and mixed drugs. Traditional drugs refer to narcotic drugs that are extracted from natural plants and have sedative and acesodyne effects, which can make person addicted, mainly including opium, heroin, marijuana, etc.; new drugs refer to artificial chemical synthesis such as hallucinogen, stimulants, etc., which can directly act on the central nervous system, produce excitatory or inhibitory effects, irreversible damage to the brain, mainly including methamphetamine, K powder (mainly ketamine), etc.; mixed drugs refers to the use of the combination of two or more traditional and new drugs for a certain period of time. To further explore the effects of years of drug use on internal inhibition and drug craving, the years of drug use were recoded into two categories: (1) 10 years or less (group A); (2) more than 10 years (group B).

Figure 2 shows that the different types and drug use years have significant differences in the internal inhibition and drug craving of women with substance use disorder. In terms of internal inhibition, by within-group comparisons, it has been found that: (1) in the new drug users, there were significant differences in the internal inhibition in women with different drug use years (Group A > Group B, $T = 2.01$, $P < 0.05$); (2) in the traditional drug users, the internal inhibition of women with different drug use years was significant difference (Group A > Group B, $T = 3.75$, $P < 0.001$); (3) in the mixed drug users, there were significant differences in the internal inhibition of women with different drug use years (Group A > Group B, $T = 2.42$, $P < 0.01$) by within-group comparisons, it has been found that in the Group A, significant differences occurred among different types of drug users ($F = 5.15$, $P < 0.01$, traditional drug users > new drug users, traditional drug users > mixed drug users), however, there was no significant difference between the new drug users and the mixed drug users ($P > 0.05$), (2) in the Group B, there was no significant difference in the internal inhibition of women with different drug use types ($F = 1.18$, $P > 0.05$).

In terms of drug craving, by within-group comparisons, it has been found that: (1) in new drug users, there were significant differences in drug craving among women with different drug use years (Group A < Group B, $T = -2.52$, $P < 0.01$), and (2) in traditional drug users, there were significant differences in drug craving among women with different drug use years (Group A < Group B, $T = -3.96$, $P < 0.001$), and (3) in mixed drug users, there was no significant difference in drug craving among women with different drug use years ($T = -0.97$, $P > 0.05$). By between-group comparisons, the results showed that: (1) there were significant differences in drug craving between traditional drug users and mixed drug users ($F = 3.51$, $P < 0.05$, mixed drug users > traditional drug users), but there was no significant difference between new drug users and traditional drug users ($P > 0.05$), new drug users and mixed drug users ($P > 0.05$), (2) there was no significant difference in drug craving among women of different types of drug user ($F = 1.00$, $P > 0.05$).

Differences of Internal Inhibition and Drug Craving of Women With Substance Use Disorder by Physical Activity Intensity

When processing the data, we found that none of the women with substance use disorder reached the high intensity activity, so only two groups of members were obtained, and the score of low-intensity activity group was ≤ 19 points; moderate-intensity activity group: 20–42 points.

In terms of internal inhibition, by within-group comparisons, **Figure 3** shows that: (1) when the drug use period was 10 years or less, there were significant differences in the internal inhibition of women with different physical exercise volume (moderate level > low level, $T = -4.42$, $P < 0.001$), and (2) when the drug use period was more than 10 years, there was a significant difference in the internal inhibition of women between different exercise volume (moderate exercise

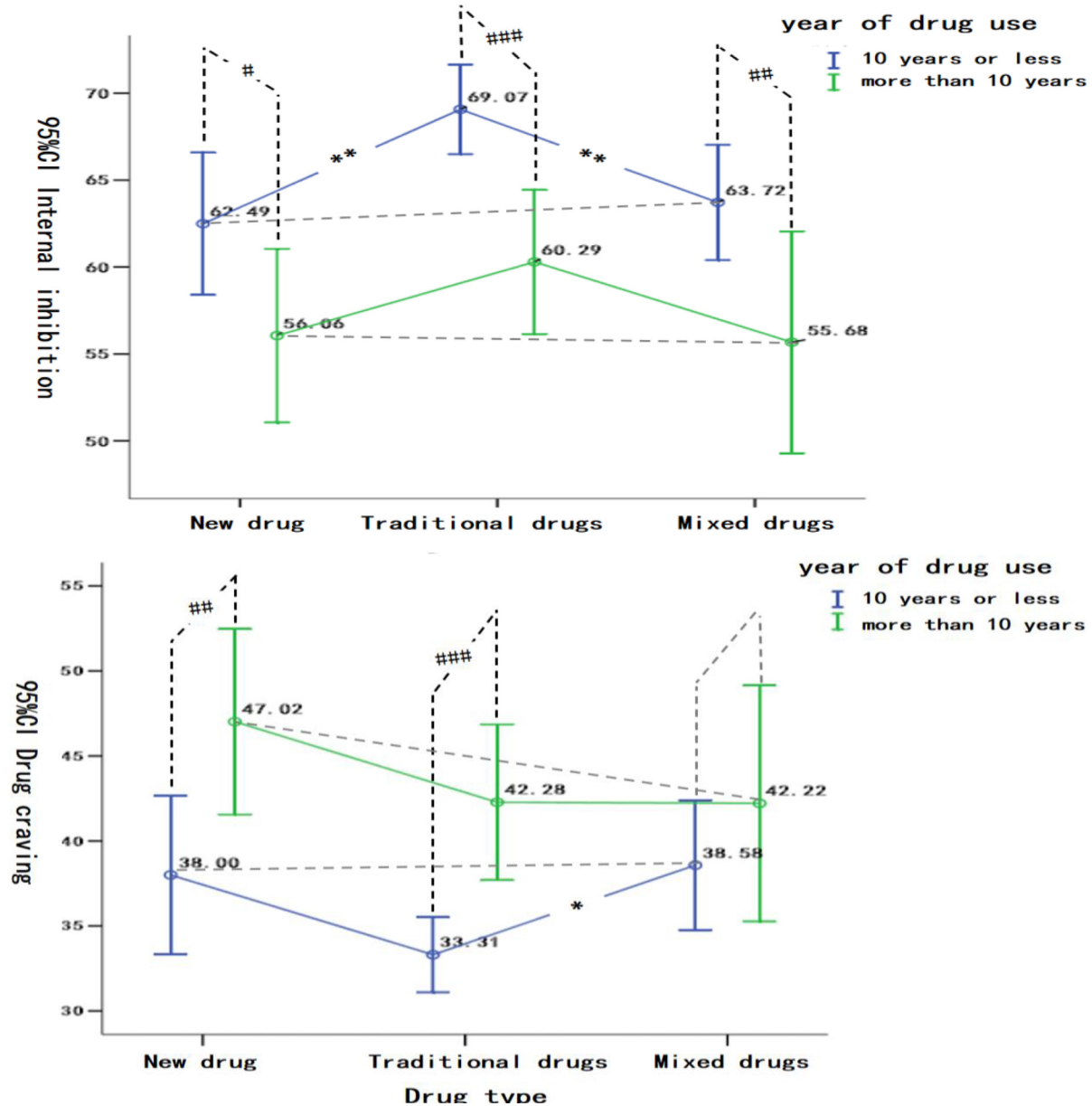
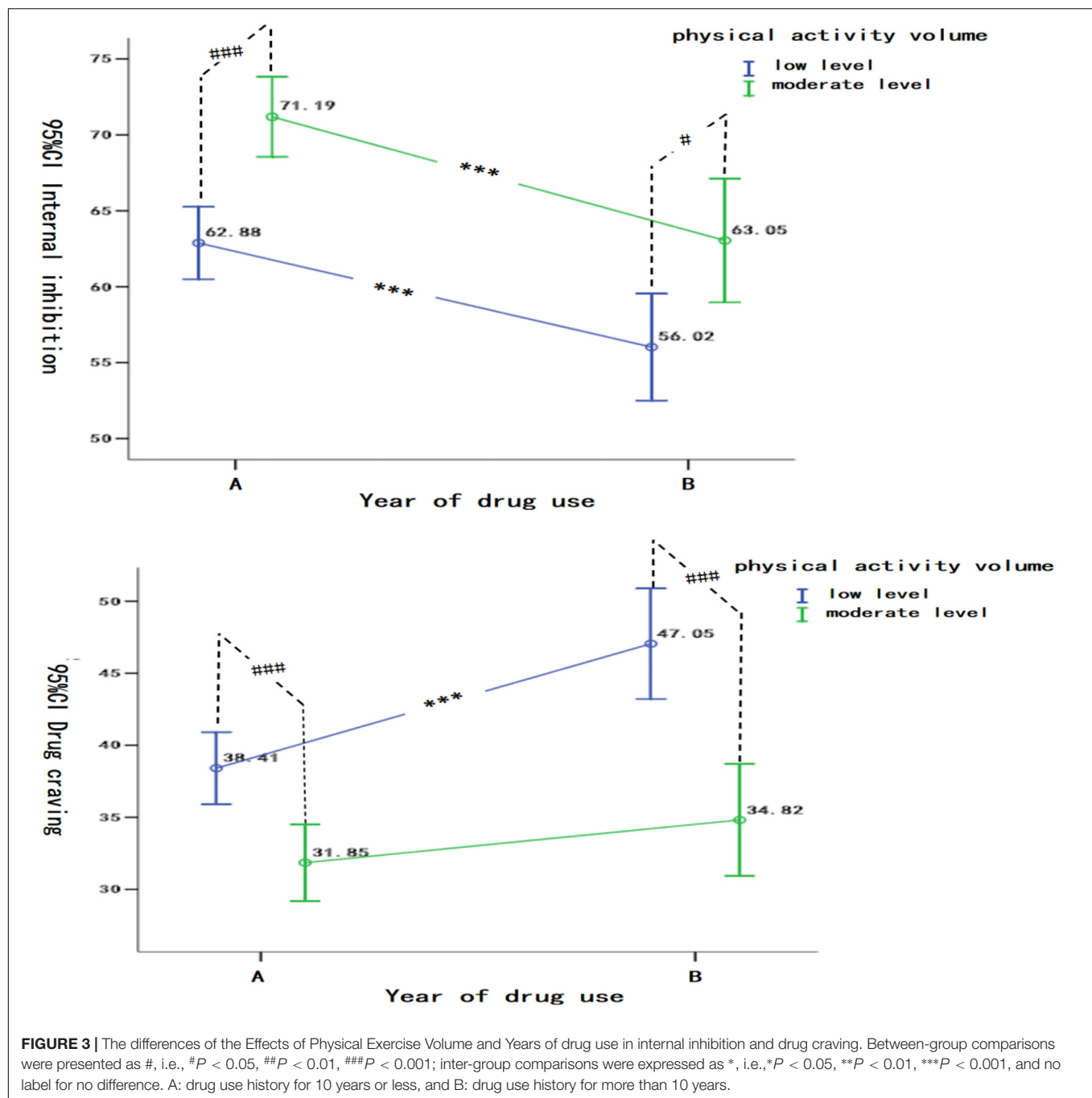


FIGURE 2 | The Differences of the effects of Drug Types and Years in Internal Inhibition and Drug Craving. Within-group comparisons were presented as "#", i.e., # $P < 0.05$, ## $P < 0.01$, ### $P < 0.001$; Between-group comparisons were presented as *, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

level > low exercise level, $T = -2.61$, $P < 0.05$). By between-group comparisons, it has been found that: (1) there were significant differences in the internal inhibition of women with different drug use years in low exercise volume (Group A > Group B, $T = 3.31$, $P < 0.001$), (2) there were significant differences in the internal inhibition of women with different drug use years in moderate exercise volume (Group A < Group B, $T = 3.32$, $P < 0.001$).

In terms of drug craving, by within-group comparisons, it has been showed that: (1) when drug use period was 10 years or less, there were significant differences in drug craving of

women with different physical exercise volume (low exercise level > moderate exercise level, $T = 3.55$, $P < 0.001$), and (2) when drug use period was more than 10 years, there were significant differences in drug craving of women with different physical exercise volume (low exercise level > moderate exercise level, $T = 4.48$, $P < 0.001$). By between-group comparisons, it has been found that: (1) there were significant differences in drug craving of women with different drug use years (Group B > Group A, $T = -3.90$, $P < 0.001$), (2) there was no significant difference in drug craving of women with moderate exercise volume ($T = -1.21$, $P > 0.05$).



Correlation Among Physical Activity Intensity, Internal Inhibition, and Drug Craving

Table 3 shows that the physical activity intensity was negatively correlated with drug craving ($r = -0.28$), the internal inhibition was negatively correlated with drug craving ($r = -0.42$), and the physical activity intensity was positively correlated with the internal inhibition ($r = 0.31$). The results show that there is a significant correlation among the variables, which provides an ideal footstone for the subsequent test of mediating effect.

Therefore, the hypothesis X1, X2, and X3 in this study has all been confirmed.

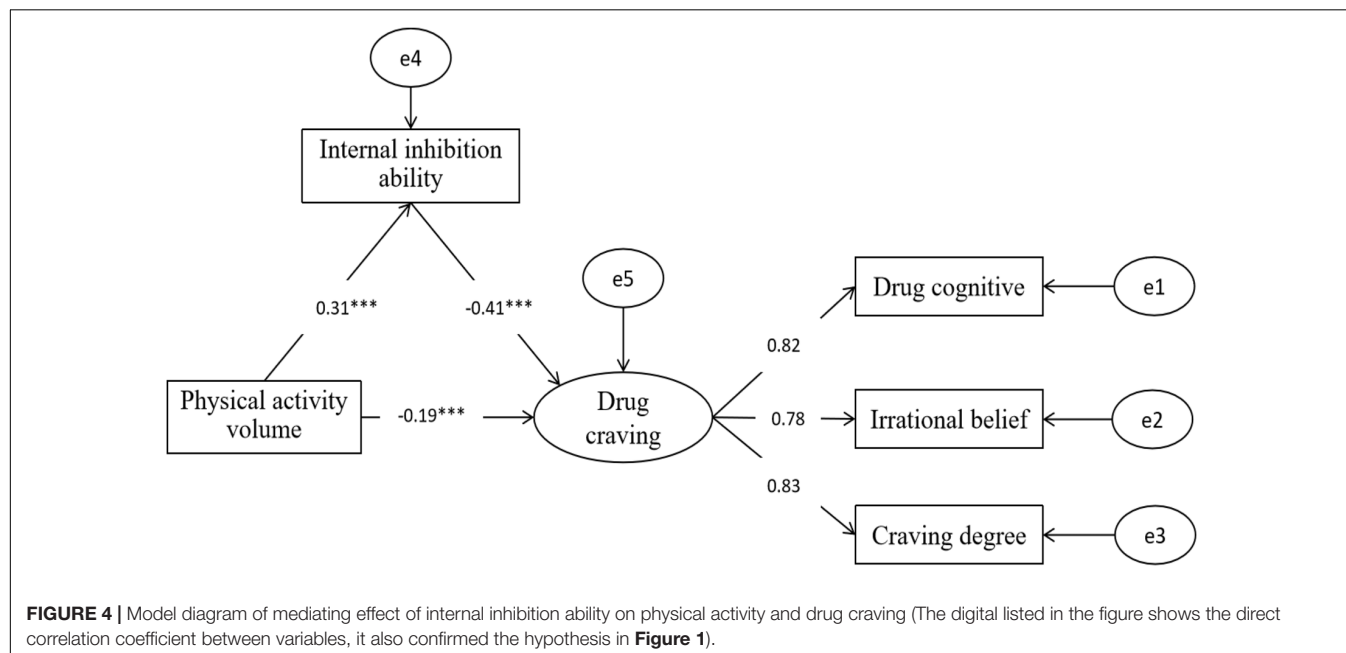
Test of Mediating Effect of Physical Activity Intensity on Drug Craving

Figure 4 shows: Structural equation model was used to examine the mediating effect of internal inhibition between physical activity and drug craving. The fitting indexes of structural equation model are as follows: $\chi^2/df = 1.12$, RMSEA = 0.02, GFI = 0.99, TLI = 0.99, CFI = 0.99,

TABLE 3 | Analysis of the correlation among the physical activity intensity, internal inhibition and drug craving ($N = 465$).

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
(1) Amount of physical activity	20.27	9.56	–						
(2) Internal inhibition	63.09	17.36	0.31***	–					
(3) Drug craving	38.75	18.25	–0.28***	–0.42***	–				
(4) Drug Cognition	16.65	8.92	–0.23***	–0.35***	0.92***	–			
(5) Irrational belief	14.41	7.25	–0.25***	–0.38***	0.87***	0.65***	–		
(6) Craving degree	7.69	4.50	–0.28***	–0.40***	0.83***	0.69***	0.63***	–	
(7) Years of drug abuse	7.76	7.24	–0.07	–0.28***	0.26***	0.18***	0.22***	0.25***	–

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.



NFI = 0.99, AGFI = 0.98. It indicates that the model fitness is suitable for testing.

Firstly, taking the physical activity intensity as predictive variable and drug craving as dependent variable, the direct effect path coefficient of physical activity intensity on drug craving ($\beta_1 = -0.31$, $P < 0.001$) is significant. Secondly, after adding the internal inhibition between the physical activity intensity and drug craving as the mediating variable, the path coefficients of physical activity and internal inhibition ($\beta = 0.31$, $SE = 0.08$, $P < 0.001$) are significant, and the path coefficient of internal inhibition and drug craving ($\beta = -0.41$, $SE = 0.02$, $P < 0.001$) are significant. It is noteworthy that after adding mediating variable, the path coefficient of physical activity volume and drug craving have been decrease from ($\beta_1 = -0.31$, $P < 0.001$) to ($\beta_2 = -0.19$, $SE = 0.04$, $P < 0.001$), and the path coefficient remain reached significance, it indicated the partial mediating effect of internal inhibition between physical activity and drug craving, the mediating effect is ($\beta = -0.13$, $P < 0.001$), so the total ratio of the mediating effect is 41%. Therefore, the hypothesis X4 of this study has been confirmed.

The path model shows that physical activity can directly and negatively predict drug craving. Internal inhibition can

directly and negatively predict drug craving. The physical activity intensity can directly and positively predict the internal inhibition. The physical activity intensity can also produce indirect effect on drug craving through internal inhibition, that is, the greater the physical activity intensity, the stronger the internal inhibition, and then the drug craving can be effectively reduced.

DISCUSSION AND ANALYSIS

Analysis of the Influencing Factors of Internal Inhibition and Drug Craving

This study found that the type of drug abuse has a significant impact on internal inhibition and drug craving. Female who uses traditional drugs has higher internal inhibition than those who use new drugs and mixed drugs, which is similar to previous studies (Du and Zhao, 2014). Female who takes new drugs has a higher craving for drugs than those who take traditional drugs. In other words, the use of new drugs has a serious impact on women's internal inhibition, and irreversible damage to the brain of the drug users, and will lead to increased drug craving (Yang,

2010; Wang T.Y. et al., 2015). Additionally, the duration of drug abuse is another cause for the difference between internal inhibition and drug craving. With the increase of drug addiction years, the degree of brain inhibition function damage increases and the internal inhibition weakens. At the same time, it will increase the craving for drugs, generate the impulse to continue drug abuse, and eventually lead to repeated relapse behavior. Some studies have pointed out that the longer the time of drug abuse, the stronger the drug dependence of drug users (Chen et al., 2017), the stronger the body's tolerance to drugs (Jiang, 2006), the lower the cognitive level, and that female are significantly lower than male (Zhang et al., 2016).

Similarly, the physical activity intensity is another important reason for the difference in the internal inhibition and drug craving among women with substance use disorder. The results of this study show that the total physical activity intensity of women with substance use disorder in Chongqing is at a medium or low level. In fact, this special group (women with substance use disorder) restricts their own level of physical activity, so that it is difficult to reach a high level of activity. Women in the moderate-intensity activity group had significantly higher internal inhibition than those in the low-intensity activity group, and their craving for drugs was significantly lower than that in the low-intensity activity group, which was consistent with the earlier studies. For example, the inverted U-shaped theory holds that different intensity of activity has different effects on inhibition ability (Yerkes and Dodson, 1908). Compared with low-intensity and high-intensity aerobic activity, acute aerobic activity at moderate intensity has the greatest promoting effect on human inhibition ability, which can effectively improve cognitive processing efficiency, thereby reducing drug craving and corresponding drug-seeking behavior (Wang T.Y. et al., 2015).

The Direct Influence of Physical Activity on Drug Craving

The correlation analysis showed that the physical activity intensity was negatively correlated with drug craving of women with substance use disorder. Within a certain range, with the increase of physical activity, it will reduce the drug craving of substance users, which is similar to previous studies (Taylor et al., 2007; Kinnunen et al., 2008; Zhao et al., 2018). Of the college students addicted to smoking, the greater the physical activity intensity, the lower the dependence on smoking (Zhu et al., 2014). Of the MA users, the researchers found that the aerobic activity at moderate intensity for 12 weeks was more effective in reducing drug craving and improving the emotional disorders of the substance users than activity intervention for 6 and 9 weeks (Wang and Zhu, 2017). Specifically, 6 weeks of moderate-intensity activity can reduce drug intake during the initial and maintenance stages of drugs. In abstinence stage, 12 weeks of moderate-intensity activity can significantly reduce drug craving (Friedman and Miyake, 2003). Moderate-intensity activity is most beneficial to the dose-response relationship between drug craving and inhibition control in drug users (Wang D.S. et al., 2015), and can significantly reduce drug

craving and drug-seeking behavior in drug users (Sinyor et al., 1982). In the field of neurobiology, there is a similar viewpoint that long-term and sustained moderate-intensity endurance activity can keep the dopamine conversion rate rising steadily, and maintain the dose effect of "increase immediately after activity – decrease slowly after 24 h," thus delaying the relapse interval (Fisher et al., 2004). If the stimulation of physical activity is too large and the time is too long, it will cause metabolic imbalance or metabolic impotence. The synthesis rate of DA far exceeds the metabolic rate, which leads to the "counter-promotion" effect of inducing relapse impulse (Zhao et al., 2018). Therefore, under the condition of controlling the physical activity intensity, the purpose of reducing drug craving can be achieved by increasing the physical activity intensity of drug users, and this study confirms the viewpoint of the above research.

Mediating Effect of Internal Inhibition on Physical Activity and Drug Craving

Path model shows that physical activity is positively correlated with internal inhibition, while internal inhibition is negatively correlated with drug craving, which is consistent with previous research results (Baumeister et al., 1996; Muraven, 2010; Zhu et al., 2014). With the increase of the physical activity intensity, the internal inhibition of drug-dependent patients will be effectively enhanced, which indicates that physical activity and internal inhibition are mutually reinforcing and influencing, which has also reached a consistent conclusion in the normal population (Roessler, 2010; Barenberg et al., 2011; Drollette et al., 2012). Of course, this does not mean that the higher the physical activity intensity, the better it will be. Especially for drug users, if the physical activity intensity is too large, the relapse impulse will not be effectively suppressed, and even have the opposite side effects (Zhao et al., 2018). Therefore, some studies have pointed out that compared with low-intensity activity, moderate-intensity activity can improve the response speed of inhibition task more effectively (Joyce et al., 2009), and acute aerobic activity at moderate intensity can induce the best level of arousal, which has the greatest benefit on cognitive ability (McMorris and Hale, 2012). This confirms the findings of this study: between low and moderate-intensity activity, the positive linear relationship between physical activity and internal inhibition is reasonable and scientific, and it also supports and enriches the internal mechanism of inverted U-shaped theory.

In addition, internal inhibition can negatively predict drug craving. Studies have shown that internal inhibition is closely related to drug craving and relapse behavior (Jiang and Lin, 2000; Yang et al., 2007). This has been verified in the study of AIDS drug abusers. There is a significant negative correlation between the internal inhibition of AIDS drug abusers and drug craving (Liu, 2008). That is, the higher the internal inhibition, the lower the drug craving, and the internal inhibition can reduce the occurrence of deviation or criminal behavior. According to the theory of self-control, people with strong self-control ability seldom have bad behaviors, such as smoking, excessive drinking, drug abuse, etc. Through 2 weeks of self-control training,

smoking addicts can effectively prolong the time to quit smoking (Roessler, 2010). Similarly, some bad behavior can have a negative effect on inhibition function. For example, long-term drug abuse can lead to disorders in the prefrontal area of the brain. Even after withdrawal, the brain function of drug users will be impaired, inhibition and other advanced cognitive functions will still be abnormal (Yuan et al., 2010; Peterson et al., 2014). Therefore, this study establishes a path mechanism between physical activity intensity, internal inhibition and drug craving.

In this study, internal inhibition was used as a mediating variable to explore the relationship between physical activity and drug craving. The results showed that internal inhibition played a part of the mediating role. This shows that physical activity can not only directly reduce drug users' drug craving, but also achieve the rehabilitation benefits of physical detoxification through the mediating effect of internal inhibition. Studies have shown that physical activity can inhibit drug craving by activating the anterior cingulate gyrus and improving cognitive function (Zhao et al., 2017). Although some research theories suggest that high intensity activity can maximize the inhibition ability, and low-intensity acute aerobic activity has a higher accuracy in the inhibition task than moderate-intensity and high intensity (Allard et al., 1989). However, it should be noted that it is very difficult for drug users to achieve high intensity activity, especially among female addicts, which has been fully proved in the practical investigation of this study. For drug users, moderate physical activity intensity plays a significant role in drug craving and drug seeking behavior (Sinyor et al., 1982). When the physical activity intensity is controlled in the moderate-intensity range, with the increase of the physical activity intensity, the internal inhibition will be strengthened, so the resistance to drug and other substances will be stronger, and the more conducive to reducing drug craving. This path mechanism has been supported by many empirical studies in the above studies (Liang, 1994; Peterson and Johnstone, 1995; Yang et al., 2007; Mcmorris and Hale, 2012; Wang and Zhu, 2017). Therefore, through combing the previous studies, this study believes that in the mechanism of activity drug treatment, physical activity should be carried out according to the actual situation, and meanwhile strengthen the monitoring and training of drug users' internal inhibition, and formulate the optimal activity intervention scheme, so as to minimize their drug craving and help them return to their families and society as soon as possible.

CONCLUSION

- (1) Women who take traditional drugs have the strongest internal inhibition, and those who take new drugs have the highest drug craving; the longer the duration of drug abuse, the lower the internal inhibition and the higher the drug craving; women with moderate activity intensity had the strongest internal inhibition and the lowest drug craving.
- (2) The physical activity intensity is negatively correlated with drug craving and positively correlated with the internal inhibition, and the internal inhibition is negatively correlated with drug craving.

- (3) Internal inhibition plays a partial mediating effect between physical activity intensity and drug craving.

Limitations and Further Research Directions

This study explores the mediating effect of internal inhibition in the influence of physical activity on women with substance use disorder' drug craving path for the first time. It shows that physical activity can directly or indirectly reduce drug abuser's drug craving in the treatment of drug problem in the whole society. To some extent, it reveals the potential path mechanism of physical detoxification. In the follow-up study, we can further explore the following issues:

- (1) Since the cross-sectional study is adopted, we get the correlation among variables, but we cannot get a deeper causal relationship. Longitudinal study can be added to the future study to better reveal the causal relationship among variables.
- (2) This study focuses on the mediating variables between internal inhibition and physical activity and drug craving, and more mediating or regulating variables can be explored in the future.
- (3) The main research object of this study is the influence of physical activity intensity on drug craving of women with substance use disorder, and male drug users can be added as a comparison in the follow-up study.

DATA AVAILABILITY

All datasets generated for this study are included in the manuscript and/or supplementary files.

ETHICS STATEMENT

Human subject research: the studies involving human participants were reviewed and approved by ethics committee of Shanghai University of Sport (102772019RT041). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors designed this study. KW and JL carried out the protocol and questionnaire survey. TZ recruited the individuals with drug addicts. YO and JL undertook the statistical analysis and graphical representation of the data. CZ and YL revised the draft. All authors contributed to and approved the final manuscript.

FUNDING

This work was supported by the National Social Science Foundation of China (Grant No:17ZDA330).

REFERENCES

- Allard, F., Brawley, L. R., and Deakin, J. (1989). The effect of exercise on visual attention performance. *Hum. Perform.* 2, 131–145.
- Barenberg, J., Berse, T., and Dutke, S. (2011). Executive functional in learning processes: do they benefit from physical activity. *Educ. Res. Rev.* 6, 208–222. doi: 10.1016/j.edurev.2011.04.002
- Baumeister, R. F., Heatherton, T. F., and Tice, D. M. (1996). Losing control: how and why people fail at self-regulation. *Contemp. Psychol.* 41, 943–944.
- Buchowski, M. S., Meade, N. N., Charboneau, E., Park, S., Dietrich, M. S., Cowan, R. L., et al. (2011). Aerobic exercise training reduces cannabis craving and use in non-treatment seeking cannabis-dependent adults. *PLoS One* 6:e17465. doi: 10.1371/journal.pone.0017465
- Byun, K. H., Hyodo, K., Suwabe, K., Ochi, G., Sakairi, Y., Kato, M., et al. (2014). Positive effect of acute mild exercise on executive function via arousal-related prefrontal activations: an fNIRS study. *Neuroimage* 98, 336–345. doi: 10.1016/j.neuroimage.2014.04.067
- Caretti, V., Gori, A., Craparo, G., Giannini, M., Iraci-Sareri, G., and Schimmenti, A. (2018). A new measure for assessing substance-related and addictive disorders: the addictive behavior questionnaire (ABQ). *J. Clin. Med.* 7:194. doi: 10.3390/jcm7080194
- Chang, Y. K., Chi, L., Etnier, J. L., Wang, C. C., Chu, C. H., and Zhou, C. L. (2014). Effect of acute aerobic exercise on cognitive performance: role of cardiovascular fitness. *Psychol. Sport Exerc.* 15, 464–470. doi: 10.1016/j.psychsport.2014.04.007
- Chen, Y. L., Zhao, M. X., Zhang, J. X., Wang, F. F., Wang, W. X., Zhang, Y., et al. (2017). Analysis of factors related to mental health and drug abuse of drug users in compulsory isolation during rehabilitation. *Chinese J. Drug Depend.* 26, 465–470. doi: 10.13936/j.cnki.cjdd1992.2017.06.012
- Craparo, G., Ardino, V., Gori, A., and Caretti, V. (2014). The relationships between early trauma, dissociation, and alexithymia in alcohol addiction. *Psychiatry Invest.* 11, 330–335. doi: 10.4306/pi.2014.11.3.330
- De los Cobos, J. P., Sinol, N., Trujols, J., Banuls, E., Batlle, F., and Tejero, A. (2011). Drug-dependent inpatients reporting continuous absence of spontaneous drug craving for the main substance throughout detoxification treatment. *Drug Alcohol Rev.* 30, 403–410. doi: 10.1111/j.1465-3362.2010.00241.x
- Dolezal, B. A., Chudzynski, J., Storer, T. W., Abrazado, M., Penate, J., Mooney, L., et al. (2013). Eight weeks of exercise training improves fitness measures in methamphetamine-dependent individuals in residential treatment. *J. Addict. Med.* 7, 122–128. doi: 10.1097/ADM.0b013e318282475e
- Drollette, E. S., Shishido, T., Pontifex, M. B., and Hillman, C. H. (2012). Maintenance of cognitive control during and after walking in preadolescent children. *Med. Sci. Sports Exerc.* 44, 2017–2024. doi: 10.1249/MSS.0b013e318258bcd5
- Du, J., and Zhao, M. (2014). Harm of amphetamine abuse and related intervention measures. *Shanghai Med. Pharm. J.* 35, 7–9.
- Field, M., Munafo, M. R., and Franken, I. H. A. (2009). A meta-analytic investigation of the relationship between attentional bias and subjective craving in substance abuse. *Psychol. Bull.* 135, 589–607. doi: 10.1037/a0015843
- Fisher, B. E., Petzinger, G. M., Nixon, K., Hogg, E., Bremmer, S., Meshul, C. K., et al. (2004). Exercise-induced behavioral recovery and neuroplasticity in the 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine-lesioned mouse basal ganglia. *J. Neurosci.* 77, 378–390. doi: 10.1002/jnr.20162
- Friedman, N. P., and Miyake, A. (2003). The relations among inhibition and interference control functions: a latent-variable analysis. *J. Exp. Psychol. Gen.* 133, 101–135. doi: 10.1037/0096-3445.133.1.101
- Geng, J. J., Zhu, D., and Xu, D. (2016). Rehabilitation effect of Taiji rehabilitation exercise on compulsory isolation of female drug abusers. *Chin. J. Sports Med.* 35, 1048–1051. doi: 10.16038/j.1000-6710.2016.11.011
- Gong, B., Zhu, Q., Xiao, X., Luo, H. Z., Tang, S. S., Yang, D. L., et al. (2013). Effect of self-control on relapse tendency of heroin Abstinence. *Chinese J. Drug Abuse Prevent. Treat.* 19, 311–314.
- Higgins, E. T. (1987). Self-discrepancy: a theory relating self and affect. *Psychol. Rev.* 3, 319–340. doi: 10.1037//0033-295x.94.3.319
- Huang, C. J., Lin, P. C., Hung, C. L., Chang, Y. K., and Hung, T. M. (2014). Type of physical exercise and inhibitory function in older adults: an event-related potential study. *Psychol. Sport Exerc.* 15, 205–211. doi: 10.1016/j.psychsport.2013.11.005
- Huang, S. B., Bian, Y., Zhu, M. L., Liu, T. T., Lv, H. F., and Ma, L. Z. (2019). Physical health efficiency survey and exercise intervention model building for detoxification addicts under compulsory isolation in Guangdong province. *China Sport Sci. Technol.* 55, 44–55. doi: 10.16470/j.csst.2019041
- Jiang, T. (2006). Research on social support network for drug addicts: a survey of drug rehabilitation institutions in Nan'an district of Chongqing. *Chinese J. Sociol.* 4, 160–172. doi: 10.15992/j.cnki.31-1123/c.2006.04.010
- Jiang, Z. H., and Lin, R. Q. (2000). A study on the effect of cognitive behavior group therapy on the counseling of drug abusers. *J. Criminol.* 5, 277–310.
- Joyce, J., Graydon, J., McMorris, T., and Davranche, K. (2009). The time course effect of moderate intensity exercise on response execution and response inhibition. *Brain Cogn.* 71, 14–19. doi: 10.1016/j.bandc.2009.03.004
- Khantian, E. J. (1997). The self-medication hypothesis of substance use disorders: a recon-sideration and recent applications. *Harv. Rev. Psychiatry* 4, 231–244. doi: 10.3109/10673229709030550
- Kinnunen, T., Leeman, R. F., Korhonen, T., Quiles, Z. N., Terwal, D. M., Garvey, A. J., et al. (2008). Exercise as an adjunct to nicotine gum in treating tobacco dependence among women. *Nicotine Tob. Res.* 10, 689–703. doi: 10.1080/14622200801979043
- Liang, D. Q. (1994). Stress level of college students and its relation with physical exercise. *Chinese Ment. Health J.* 8, 5–6.
- Liang, X. P., Chen, C., Wang, R., and Zhuang, S. M. (2019). Group exercise therapy on quality of life and emotions in female new-type drug addicts. *Chin. Gen. Pract.* 22, 136–141. doi: 10.3969/j.issn.1007-9572.2018.00.189
- Linke, S. E., Ciccolo, J. T., Ussher, M., and Marcus, B. H. (2013). Exercise-based smoking cessation interventions among women. *Women's Health* 9, 69–84. doi: 10.2217/whe.12.63
- Liu, K. F. (2008). *A Study on Drug Desire and Inherent Inhibitory Ability of HIV Inhabitants: A Case Study of Kaohsiung Second Prison, Taiwan, Ministry of Justice*. Ho Chi Minh City: Graduate Institute of Regional Policy and Development, NTTU.
- McMorris, T., and Hale, B. J. (2012). Differential effects of differing intensities of acute exercise on speed and accuracy of cognition: a meta-analytical investigation. *Brain Cogn.* 80, 338–351. doi: 10.1016/j.bandc.2012.09.001
- Muraven, M. (2010). Practicing self-control lowers the risk of smoking lapse. *Psychol. Addict. Behav.* 24, 446–452. doi: 10.1037/a0018545
- Muraven, M., Baumeister, R. F., and Tie, D. M. (1999). Longitudinal improvement of self-regulation through practice: building self-control strength through repeated exercise. *J. Soc. Psychol.* 139, 446–457. doi: 10.1080/00224549909598404
- Musetti, A., Terrone, G., Corsano, P., Magnani, B., and Salvatore, S. (2016). Exploring the link among state of mind concerning childhood attachment, attachment in close relationships, parental bonding, and psychopathological symptoms in substance users. *Front. psychol.* 7:1193. doi: 10.3389/fpsyg.2016.01193
- Nygard, M., Mosti, M. P., Brose, L., Flemmen, G., Stunes, A. K., Sorskar-Venaes, A., et al. (2018). Maximal strength training improves musculoskeletal health in amphetamine users in clinical treatment. *Osteoporos. Int.* 29, 2289–2298. doi: 10.1007/s00198-018-4623-5
- Peterson, A. B., Abel, J. M., and Lynch, W. J. (2014). Dose-dependent effects of wheel running on cocaine-seeking and prefrontal cortex Bdnf exon IV expression in rats. *Psychopharmacology* 231, 1305–1314. doi: 10.1007/s00213-013-3321-4
- Peterson, M., and Johnstone, B. M. (1995). The Atwood hall health promotion program, federal-medical-center, Lexington, KY: effects on drug-involved federal offenders. *J. Subst. Abuse Treat.* 12, 43–48. doi: 10.1016/S0740-5472(99)80001-4
- Rawson, R. A., Chudzynski, J., Mooney, L., Gonzales, R., Ang, A., Dickerson, D., et al. (2015). Impact of an exercise intervention on methamphetamine use outcomes post-residential treatment care. *Drug Alcohol Depend.* 156, 21–28. doi: 10.1016/j.drugalcdep.2015.08.029
- Roberts, V., Maddison, R., Simpson, C., Bullen, C., and Prapavessis, H. (2012). The acute effects of exercise on cigarette cravings, withdrawal symptoms, affect, and smoking behaviour: systematic review update and meta-analysis. *Psychopharmacology* 222, 1–15. doi: 10.1007/s00213-012-2731-z

- Roessler, K. K. (2010). Exercise treatment for drug abuse-A Danish pilot study. *Scand. J. Public Health* 38, 664–669. doi: 10.1177/1403494810371249
- Schachar, R., Mota, V. L., Logan, G. D., Tannock, R., and Klim, P. (2000). Confirmation of an inhibitory control deficit in attention-deficit/hyperactivity disorder. *J. Abnormal Child Psychol.* 28, 227–235. doi: 10.1023/A:1005140103162
- Schimmenti, A., and Bifulco, A. (2015). Toward a better understanding of the relationship between childhood trauma and psychiatric disorders: measurement and impact on addictive behaviors. *Psychiatry Invest.* 12, 415–416. doi: 10.4306/pi.2015.12.3.415
- Sinyor, D., Brown, T., and Rostant, P. (1982). The role of a physical fitness program in the treatment of alcoholism. *J. Stud. Alcohol Drugs* 43, 380–386. doi: 10.15288/jsa.1982.43.380
- Strickland, J. C., Abel, J. M., Lacy, R. T., Beckmann, J. S., Witte, M. A., Lynch, W. J., et al. (2016). The effects of resistance exercise on cocaine self-administration, muscle hypertrophy, and BDNF expression in the nucleus accumbens. *Drug Alcohol Depend.* 163, 186–194. doi: 10.1016/j.drugalcdep.2016.04.019
- Tarantino, N., Lamis, D. A., Ballard, E. D., Masuda, A., and Dvorak, R. D. (2015). Parent-child conflict and drug use in college women: a moderated mediation model of self-control and mindfulness. *J. Couns. Psychol.* 62, 303–313. doi: 10.1037/cou0000013
- Taylor, A. H., Ussher, M. H., and Faulkner, G. (2007). The acute effects of exercise on cigarette cravings, withdrawal symptoms, affect and smoking behavior: a systematic review. *Addiction* 102, 534–543. doi: 10.1111/j.1360-0443.2006.01739.x
- Tomporowski, P. D., Davis, C. L., and Miller, P. H. (2008). Exercise and children's intelligence, cognition, and academic achievement. *Educ. Psychol. Rev.* 20, 111–131. doi: 10.1007/s10648-007-9057-0
- Wang, D. S., Zhou, C. L., and Chang, Y. K. (2015). Acute exercise ameliorates craving and inhibitory deficits in methamphetamine: an ERP study. *Physiol. Behav.* 147, 38–46. doi: 10.1016/j.physbeh.2015.04.008
- Wang, D. S., and Zhu, T. (2017). Effects of aerobic exercise on physical fitness, desire and emotional state of methamphetamine dependents. *China Sport Sci.* 37, 50–59. doi: 10.16469/j.css.201707007
- Wang, D. S., Zhu, T., Zhou, C. L., and Chang, Y. K. (2017). Aerobic exercise training ameliorates craving and inhibitory control in methamphetamine dependencies: a randomized controlled trial and event-related potential study. *Psychol. Sport Exerc.* 30, 82–90. doi: 10.1016/j.psychsport.2017.02.001
- Wang, T. Y., Bao, Y. P., Liu, Z. M., Lian, Z., Li, S. X., Sun, S. X., et al. (2015). Symptoms and withdrawal symptoms of amphetamine-type stimulants and K-powder abusers in China. *Chinese J. Drug Depend.* 24, 377–386. doi: 10.13936/j.cnki.cjdd.1992.2015.05.012
- Wang, Y. Y., and Zhou, C. L. (2014). Dose-dependent relationship between intensity of acute aerobic exercise and inhibition ability: evidence from ERP. *China Sport Sci.* 34, 42–49. doi: 10.16469/j.css.2014.11.001
- Washton, M. A. (1986). Relapse prevention: maintenance strategies in the treatment of addictive behaviors. *J. Stud. Alcohol* 47, 260–261. doi: 10.15288/jsa.1986.47.260
- Yang, B., Liu, X., Yang, S. Y., An, S. S., and Ying, L. H. (2007). The influence of personality, social support and irrational beliefs on drug craving of male drug rehabilitation workers. *J. Psychol. Sci.* 30, 1413–1417. doi: 10.16719/j.cnki.1671-6981.2007.06.037
- Yang, C. H. (2010). New Drug Addiction is Stronger. Science and Technology Daily. (Version 001). Available at: <http://www.stdaily.com/> (accessed May, 2019).
- Yerkes, R. M., and Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *J. Comp. Neurol. Psychol.* 18, 459–482. doi: 10.1002/cne.920180503
- Yuan, K., Qin, W., Liu, J. X., Guo, Q. A., Dong, M. H., Sun, J. B., et al. (2010). Altered small-world brain functional networks and duration of heroin use in male abstinent heroin-dependent individuals. *Neurosci. Lett.* 477, 37–42. doi: 10.1016/j.neulet.2010.04.032
- Zhang, X. H., Xia, Y. W., Wu, G. W., and Lin, Y. Y. (2016). On the influence of Shanghai drug treatment service and social assistance on the effect of drug treatment and correction. *Chinese J. Drug Depend.* 25, 291–296. doi: 10.13936/j.cnki.cjdd.1992.2016.03.009
- Zhang, Z. L., Xu, D., Zhang, M. Z., and Zhu, D. (2018). The relationship between psychological craving and physical and mental health of addicts with amphetamine stimulants. *Chin. J. Drug Depend.* 27, 129–134. doi: 10.13936/j.cnki.cjdd.1992.2018.02.010
- Zhao, F. Y., Zhou, C. L., and Liu, T. Z. (2018). Neurobiological mechanism of exercise inhibiting drug addicts' psychological craving and relapse behavior: based on the regulation of exercise on neurotransmitters, hormones and peptides. *China Sport Sci.* 38, 33–41. doi: 10.16469/j.css.201807016
- Zhao, Q., Yang, Q. Q., Deng, Y. Q., and Zhou, C. L. (2017). Research on the effects of physical activity on improving brain function damage in drug addicts withdrawn from drug addiction: evidence from inhibition of processing and resting state of brain function. *J. Wuhan Instit. Phys. Educ.* 51, 88–94. doi: 10.15930/j.cnki.wtxb.2017.05.015
- Zhu, D., Dai, G., Xu, D., Xu, X., Geng, J., Zhu, W., et al. (2018). Long-term effects of tai chi intervention on sleep and mental health of female individuals with dependence on amphetamine-type stimulants. *Front. Psychol.* 9:1476. doi: 10.3389/fpsyg.2018.01476
- Zhu, F. S., Zhou, C. L., and Wang, B. Y. (2014). Physical exercise reduces smoking dependence of College students: mediating role of self-control. *Sports Sci.* 35, 109–113. doi: 10.13598/j.issn1004-4590.2014.06.020

Conflict of Interest Statement: 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 © 2019 Wang, Luo, Zhang, Ouyang, Zhou and Lu. 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.



Maladaptive Personality Functioning and Psychopathological Symptoms in Problematic Video Game Players: A Person-Centered Approach

Alessandro Musetti^{1*}, Tiziana Mancini¹, Paola Corsano¹, Gianluca Santoro², Maria Clara Cavallini³ and Adriano Schimmenti²

¹ Department of Humanities, Social Sciences and Cultural Industries, University of Parma, Parma, Italy, ² Faculty of Human and Social Sciences, UKE – Kore University of Enna, Enna, Italy, ³ Department of Psychology, Catholic University of Milan, Milan, Italy

OPEN ACCESS

Edited by:

Damien Breviers,
University of Luxembourg,
Luxembourg

Reviewed by:

Deokjong Lee,
National Health Insurance Service
Ilisan Hospital, South Korea
Wan-Sen Yan,
Guizhou Medical University (GMU),
China

*Correspondence:

Alessandro Musetti
alessandro.musetti@unipr.it

Specialty section:

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

Received: 26 August 2019

Accepted: 29 October 2019

Published: 19 November 2019

Citation:

Musetti A, Mancini T, Corsano P,
Santoro G, Cavallini MC and
Schimmenti A (2019) Maladaptive
Personality Functioning
and Psychopathological Symptoms
in Problematic Video Game Players:
A Person-Centered Approach.
Front. Psychol. 10:2559.
doi: 10.3389/fpsyg.2019.02559

Background: A need exists to increase our understanding of the association between maladaptive personality traits, psychopathological symptoms, game preference, and different types of video game use. In the present study, we used a person-centered approach to identify different subtypes of video game players and we explored how they differ in personality profiles, clinical symptoms, and video game usage.

Methods: We assessed problematic gaming via the nine-item Internet Gaming Disorder Scale and self-reported screen time playing video games in a sample of 366 adolescents and young adult gamers. Participants also completed measures on maladaptive personality domains (Personality Inventory for DSM-5 Brief Form), alexithymia (Toronto Alexithymia Scale—20 items), and psychopathological symptoms (DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure) and reported which genre of video games they preferred.

Results: Using a person-centered, cluster-analytic approach, we identified four clusters of video game players (Occasional, Passionate, Preoccupied, and Disordered) presenting peculiar combinations of problematic gaming scores and time spent online playing video games. Non-problematic gamers (Occasional and Passionate) represented the majority of the sample (62.3% of the participants). Highly involved gamers who exhibited excessive screen time playing video games (Disordered gamers) presented the highest level of maladaptive personality traits and psychopathological symptoms, and were characterized by the greatest use of Multiplayer Online Battle Arena (MOBA) games.

Conclusion: These results have clinical implications on suggesting the importance to determining whether or not problematic gaming activities reflect a dysfunctional emotion-focused coping strategy to avoid inner unpleasant emotional or a more generally compromised emotional and social functioning.

Keywords: problematic gaming, maladaptive personality traits, alexithymia, psychopathology, cluster analysis

INTRODUCTION

In the last two decades, an extensive amount of research has been carried out on Internet addiction disorder (IAD), a presumptive new clinical condition that has proved to be an umbrella term including different Internet-related psychopathologies (Schimmenti et al., 2014a,b; Musetti et al., 2016, 2017; Starcevic and Billieux, 2017). Among the latter, Internet gaming disorder (IGD) was included in Section 3 (“Emerging Measures and Models”) of the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association [APA], 2013), and more recently, WHO experts recommended including Gaming disorder (GD) in the ICD-11, in the section of disorders due to addictive behaviors (World Health Organization, 2018). Actually, problematic gaming is an issue that deserves the utmost attention given the increasing number of video gamers (2.5 billions, according to Newzoo Games, 2016).

However, there is still a lack of consensus on criteria, definition, and conceptualization of problematic gaming patterns as a specific psychiatric disorder (Aarseth et al., 2017; Schimmenti and Starcevic, 2019). In fact, the video game use has been associated with both adjustment (e.g., De Freitas and Griffiths, 2007; Achtman et al., 2008; Hussain and Griffiths, 2008; Zhong, 2011; Giner-Bartolomé et al., 2015) and maladjustment (e.g., Smyth, 2007; Gentile, 2009; Hussain and Griffiths, 2009), so conceptualizing problematic gaming in terms of an addiction to video games might be an oversimplification—or another umbrella term—for a set of heterogeneous activities with different functions and causes (Billieux et al., 2015). As well as for the different uses of the Internet, distinguishing among different uses and, more importantly, different motives and functions of video game uses in an individual's life is useful (Lee et al., 2017). It would be misleading to consider problematic online behaviors, like video gaming, isolated from the psychosocial context in which these behaviors are situated (Musetti and Corsano, 2018) and from the psychosocial needs that the players try to satisfy (Kardefelt-Winther, 2014a) by taking advantage of the opportunities that the game offers, for example, in terms of satisfying identity needs (Mancini and Sibilla, 2017; Sibilla and Mancini, 2018; Mancini et al., 2019).

According to Kardefelt-Winther (2014a,b) compensatory approach, problematic online gaming could be intended as a dysfunctional coping strategy to satisfy psychological needs and to compensate for psychosocial problems, including exposure to difficult life experiences (Schimmenti and Caretti, 2010) and a perceived discrepancy between actual and ideal self (e.g., Klimmt et al., 2009; Mancini et al., 2019). According to this compensatory approach, an individual could use video games for entertainment or escapism purposes, depending on the degree of life problems experienced. Therefore, gamers with high psychological maladjustment, in comparison to gamers with low psychological maladjustment, should be more likely to play video games to thwart negative feelings, thereby starting a vicious circle and ending up with a higher degree of problematic outcomes. In fact, literature shows that problematic video gaming is associated with a wide range of psychological factors.

Personality Traits and Problematic Video Gaming

Personality traits are specific patterns of behavior, emotion, and thought that are relatively stable over time and situations. Some personality traits have been positively associated with problematic video gaming: neuroticism (Cao and Su, 2007; Mehroof and Griffiths, 2010; Collins et al., 2012; Dalbudak et al., 2013; Yan et al., 2014; Billieux et al., 2015; Lehenbauer-Baum et al., 2015; Müller et al., 2015; Braun et al., 2016), aggressiveness (Kim et al., 2008; Collins et al., 2012; Braun et al., 2016; impulsivity (Billieux et al., 2015; Norbury and Husain, 2015; Starcevic and Aboujaoude, 2017), psychoticism (Cao and Su, 2007; Dalbudak et al., 2013; Laier et al., 2018), and sensation seeking (Mehroof and Griffiths, 2010; Lorains et al., 2011; Jiménez-Murcia et al., 2014; Hodgins and Holub, 2015; Mestre-Bach et al., 2016). Other personality traits have been negatively associated with problematic video gaming: extraversion (Landers and Lounsbury, 2006; Müller et al., 2015; Öztürk et al., 2015), conscientiousness, and openness (Wang et al., 2015). Generally, research suggests that maladaptive personality traits could be vulnerability factors for developing problematic video gaming (Gervasi et al., 2017). More specifically, researchers who have differentiated between different types of players have found that regular gamers, in contrast to problematic gamers, showed low maladaptive personality traits (Braun et al., 2016).

Alexithymia and Problematic Video Gaming

Difficulty with emotion regulation could be a general risk factor for developing problematic video game use (Billieux et al., 2011; Gaetan et al., 2016; Estévez et al., 2017; Yen et al., 2018; Blasi et al., 2019). Alexithymia is one of the most studied psychological constructs connected to affect dysregulation. It refers to difficulty identifying and describing feelings and is marked by a concrete, externally oriented, cognitive style (Taylor and Bagby, 2013). The association between alexithymia and addictive behaviors has been extensively investigated (Stasiewicz et al., 2012; Bonnaire et al., 2017). However, the literature on the association between alexithymic characteristics and problematic video game use is still scarce (Baysan-Arslan et al., 2016; Zastrow, 2017). In a recent study, Bonnaire and Baptista (2019) found that being alexithymic almost doubled the risk of being a problematic gamer. Similarly, Maganuco et al. (2019) found that increased difficulty identifying and describing feelings was predictive of an excessive Internet use among video game players. From a psychodynamic perspective it can be stated that, for some individuals who spend time playing video games, problematic gaming could be a coping strategy (albeit dysfunctional) to manage temporary or chronic emotional distress (Seay and Kraut, 2007; Schimmenti and Caretti, 2010; Schimmenti et al., 2012; Blasi et al., 2019; Mancini et al., 2019).

Psychopathological Symptoms and Problematic Video Gaming

In regard to related psychopathological symptoms, problematic gaming has been associated with a wide number of clinical conditions (Müller et al., 2015) such as depression, ADHD,

anxiety, and social phobia (Cole and Hooley, 2013; Hyun et al., 2015; Laconi et al., 2017; Wang et al., 2018), mood and anxiety symptoms (Gentile et al., 2011; Lemola et al., 2011; Mentzoni et al., 2011; Wei et al., 2012; Brunborg et al., 2014; Van Rooij et al., 2014; Lobel et al., 2017), somatic symptoms (Biolcati, 2010), dissociation (Hussain and Griffiths, 2009; Guglielmucci et al., 2019), and suicidal ideation (Rehbein et al., 2010). However, the direction of these associations are not yet clear (Dong et al., 2011).

As recommended in recent literature on problematic gaming and behavioral addictions more generally, it is important not to pathologize common behaviors (Kardefelt-Winther et al., 2017; Tunney and James, 2017; Starcevic et al., 2018). As proof of this, a study of Konkoly Thege et al. (2015) showed that several activities often considered behavioral addictions, including problematic video gaming, are frequently context-dependent and transient for most individuals. Therefore, more studies are needed to assess the association between psychopathological symptoms and specific types of problematic and non-problematic gamers (Billieux et al., 2015).

Video Game Types and Problematic Video Gaming

Different types of video games have different addictive potential (King et al., 2011). Problematic gaming has frequently been associated with specific video game types, namely Multiplayer online role-playing games (MMORPGs) and Multiplayer Online Battle Arena (MOBA). MMORPGs are virtual worlds in which players extensively cooperate to explore the environment, fight enemies and resolve quests. Problematic MMORPGs use has been reported as the most frequent Internet-related problem in some studies (e.g., Thorens et al., 2014), and several studies have also reported that problematic gaming is more frequent in players who use MMORPGs (Ng and Wiemer-Hastings, 2005; Chuang, 2006; Peters and Malesky, 2008; Collins et al., 2012; Eichenbaum et al., 2015a,b; Lemmens et al., 2015).

In MOBA games, two teams composed of different players compete each other. Differently to MMORPGs, MOBA games do not develop in never-ending worlds; yet they provide extensive feedbacks to the players, stimulating competition and social interaction. MOBA games have also been associated with problematic gaming in research (Fuster et al., 2016; Triberti et al., 2018).

The addictive potential of other game genres and typologies is still under debate. While there is some evidence that an excessive use of first-person shooter (FPS) is related to increased clinical symptoms (Na et al., 2017), it remains unclear if other types of video games (e.g., casual games) and single-play video games are associated with psychopathology.

The Present Study

In this study, we aimed to explore the relationships among maladaptive personality domains, alexithymia, psychopathological symptoms, game preference, and problematic gaming in adolescents and young adults. In fact,

individuals within these age groups use video games the most (Griffiths et al., 2004) and more frequently display symptoms of problematic gaming (Gentile, 2009; Kuss and Griffiths, 2012). In line with the literature, we expected positive associations among problematic gaming, time spent online playing video games, psychopathological symptoms, maladaptive personality traits, and alexithymia. However, in the present research we also used a person-centered approach to identify different groups of video game players presenting peculiar combinations of problematic gaming scores and time spent online playing video games.

A person-centered approach treats the person as the unit of analysis, by identifying meaningful subgroups (e.g., clusters) of participants characterized by distinct pattern of relationship on the variables of interest that differentiate them from other subgroups of participants. This allows researchers to relate these clusters to meaningful other variables (e.g., Zuber et al., 2015). According to Bergman and Trost (2006) “a ‘person-oriented’ approach is one in which the focus is to understand development at the individual level by regarding the individual as a functioning whole with processes operating at a system level and its components jointly contributing to what happens in development. By ‘components’, we mean, for example, behaviors, biological factors, perceptions, goals, and values, among other aspects that make up the structure of the individual” (p. 604). In our view, this approach could stimulate the development of a more comprehensive understanding of the association between the behavioral and the psychological components of problematic gaming. Differently from variable-centered approaches which focus on the stability of the variables, person-centered approaches focus on inter-individual differences and similarities among participants, thus providing a complementary perspective on the relationships among variables (Morin and Wang, 2016). By adopting this approach, we aimed to overcome the distinction most classically present in the literature (and frequently based on cut-off scores of measures used for the screening of problematic gaming) between pathological and non-pathological players, and thus to potentially discover different specific subgroups of gamers, whose screen time playing video games and scores on problematic gaming might reflect further differences in personality features, clinical symptoms, and preference for specific video game types.

In line with previous research, we expected to identify a subset of problematic gamers with increased time spent online playing video games and high scores on IGD. Moreover, we expected that the video game players identified as problematic gamers would present higher levels of maladaptive personality traits (Amendola et al., 2019), psychopathological symptoms (Müller et al., 2015), and alexithymia (Bonnaire et al., 2017; Maganuco et al., 2019) than the other players. Finally, we hypothesized that this subgroup of highly involved gamers would use more immersive games such as Multiplayer Online Role-Playing Game (MMORPGs) (Eichenbaum et al., 2015a,b) and Multiplayer Online Battle Arena (MOBA) games (Fuster et al., 2016; Triberti et al., 2018).

MATERIALS AND METHODS

Participants

The study involved 366 Italian adolescents and young adults (311 males, 85%; 55 females, 15%) aged from 15 to 30 years ($M = 21.64$ years, $SD = 3.77$) recruited via an online survey. An advertisement was shared on different video game platforms, such as video game forums, Facebook video game groups and web-pages dedicated to video games. Out of 400 participants who accessed the online survey, 366 (91.5%) accepted to participate and signed the electronic informed consent. All questions in the online survey were mandatory, so there were no missing cases. The socio-demographic characteristics of the sample are described in **Table 1**.

There was no significant association between participants' gender and age ($t_{(364)} = -1.98$, $p = 0.98$) or gender and years of education ($t_{(364)} = -0.09$, $p = 0.77$). The mean number of hours spent daily on video games was 3.58 on average ($SD = 1.79$, range 1–10), which is comparable to the findings of other studies (Billieux et al., 2015).

Procedures

Ethical clearance was obtained from the Internal Review Board for Psychological Research of the UKE–Kore University of Enna. The inclusion criteria were being in the middle or late adolescence or emerging-adulthood life stage (i.e., between 15 and 30 years old), self-identifying as a “gamer”, and reporting no use of psychotropic medications. All of the participants gave their informed consent and completed an anonymous questionnaire containing socio-demographic information (age, gender, years

of education, marital status, employment), the number of daily hours they used video games, the type of video games used, and self-reported scales on IGD, maladaptive personality domains, alexithymia, and psychopathological symptoms. Anonymity of the participants was guaranteed (no data on the gamers' identification were collected, including their Internet Protocol address). Participants did not take any compensation for their involvement in the study. The study was carried out according to the Ethical Code of the Italian Association of Psychology (AIP) and the American Psychological Association (APA).

Measures

Sociodemographics

The questionnaire included questions concerning gender, age, marital status, educational level, and employment to obtain a profile of the respondents' demographic features.

Video Games Genres

Participants were asked to indicate (yes/no) which genre of video games they play among Massively Multiplayer Online Role-Playing Games (MMORPG), Multiplayer Online Battle Arena (MOBA), browser games, first-person shooter (FPS) games, real time strategy (RTS) games, or simulation games.

Internet Gaming Disorder

The Italian nine-item Internet Gaming Disorder Scale (IGD-9; Pontes and Griffiths, 2015; Italian version by Monacis et al., 2016) was used to assess the severity of IGD by examining gaming activities occurring over a 12-month period. The scale includes nine items corresponding to the nine core criteria defined by the DSM-5 (American Psychiatric Association [APA],

TABLE 1 | Socio-demographic characteristics the participants.

		1	2	3	4
	<i>N</i> = 366	Passionate 142	Occasional 86	Preoccupied 76	Disordered 62
Gender					
Males	311 (85%)	117 (82.4%)	74 (86.0%)	68 (89.5%)	52 (83.9%)
Females	55 (15%)	25 (17.6%)	12 (14.0%)	8 (10.5%)	10 (16.1%)
Marital status					
Not married	319 (87.2%)	126 (88.7%)	72 (83.7%)	65 (85.5%)	56 (90.3%)
Domestic partner	39 (10.7%)	13 (9.2%)	11 (12.8%)	9 (11.8%)	6 (9.7%)
Married	7 (1.9%)	3 (2.1%)	2 (2.3%)	2 (2.6%)	0 (0.0%)
Widow	1 (0.3%)	0 (0.0%)	1 (1.2%)	0 (0.0%)	0 (0.0%)
Education					
Secondary lower education	110 (30.1%)	49 (34.5%)	21 (24.4%)	21 (27.6%)	19 (30.6%)
Secondary upper education	206 (56%)	76 (53.5%)	48 (55.8%)	48 (63.2%)	34 (54.8%)
Bachelor's degree	39 (10.7%)	16 (11.3%)	11 (12.8%)	5 (6.6%)	7 (11.3%)
Master's degree	11 (3.0%)	1 (0.7%)	6 (7.0%)	2 (2.6%)	2 (3.2%)
Working status					
Students	194 (53.0%)	63 (44.4%)	53 (61.3%)	43 (56.6%)	35 (56.5%)
Employees	69 (18.9%)	36 (25.4%)	14 (16.3%)	10 (13.2%)	9 (14.5%)
Student-workers	46 (12.6%)	18 (12.7%)	9 (10.5%)	15 (19.7%)	4 (6.5%)
Unemployed	38 (10.4%)	19 (13.4%)	5 (5.8%)	3 (3.9%)	11 (17.7%)
Freelancers	18 (4.9%)	6 (4.2%)	4 (4.7%)	5 (6.6%)	3 (4.8%)
Other	1 (0.3%)	0 (0.0%)	1 (1.2%)	0 (0.0%)	0 (0.0%)

2013). Subjects were asked to answer on a 5-point Likert-type scale ranging from 1 (never) to 5 (very often), rather than on the original scale comprising dichotomous items (yes/no), to improve the psychometric properties and reliability of the assessment (Comrey, 1988; Haladyna, 1992). An examples of IGD-9 items is “Have you lost interest in previous hobbies and other entertainment activities as a result of your engagement with the games?”. Higher scores indicate higher symptoms of IGD. Cronbach's alpha of the IGD-9 in this study was.79.

Personality Domains

The Italian version of the Personality Inventory for DSM-5 Brief Form (PID-5-BF; Krueger et al., 2012; Italian adaptation by Fossati et al., 2013) was administered to assess participants' personality features. The PID-5-BF includes 25 items assessing five maladaptive personality domains: negative affect (5 items; e.g., “I fear being alone in life more than anything else”; Cronbach's $\alpha = 0.61$); detachment (5 items; e.g., “I often feel like nothing I do really matters”; Cronbach's $\alpha = 0.69$); antagonism (5 items; e.g., “It's no big deal if I hurt other peoples' feelings”; Cronbach's $\alpha = 0.66$); disinhibition (5 items; e.g., “I feel like I act totally on impulse”; Cronbach's $\alpha = 0.56$); and psychoticism (5 items; e.g., “I have seen things that weren't really there”; Cronbach's $\alpha = 0.68$). Items are rated on a 4-point Likert scale ranging from 0 (very false or often false) to 3 (very true or often true). The higher the score, the more dysfunctional the individual's personality is. The Cronbach's alpha for the PID-5-BF total score in this study was.81.

Alexithymia

The Italian Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994; Italian version by Bressi et al., 1996) was administered to assess alexithymia. The TAS-20 includes 20 items rated on a 5-point Likert-type scale, and responses range from strongly disagree (1) to strongly agree (5). Total scores range from 20 to 100, with higher scores indicating higher levels of alexithymia. The TAS-20 has a three-factor structure (Haviland, 1996): difficulty identifying feelings (DIF; 7 items; e.g., “I am often confused about what emotion I am feeling”; Cronbach's $\alpha = 0.81$); difficulty describing feelings (DDF; 5 items; e.g., “It is difficult for me to find the right words for my feelings”; Cronbach's $\alpha = 0.77$); and externally oriented thinking (EOT; 8 items; e.g., “I prefer talking to people about their daily activities rather than their feelings” Cronbach's $\alpha = 0.53$), which was also confirmed in adolescent populations (Säkkinen et al., 2007; Parker et al., 2010). In this study, the Cronbach's alpha of the entire TAS-20 scale was.79.

Clinical Symptoms

The DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure (American Psychiatric Association [APA], 2013) was used to assess psychopathological symptoms. This measure includes 23 items rated on a 4-point Likert-type scale ranging from 0 (very false or often false) to 3 (very true or often true). Each item investigates how often an individual has suffered from specific symptoms in the last 2 weeks. The following are the 13 psychopathological domains: depression (2 items; e.g., “Feeling

down, depressed, or hopeless”; Cronbach's $\alpha = 0.70$); anger (1 item: “Feeling more irritated, grouchy, or angry than usual?”); mania (2 items; e.g., “Sleeping less than usual, but still have a lot of energy?”; Cronbach's $\alpha = 0.39$); anxiety (3 items; e.g., “Feeling panic or being frightened?” Cronbach's $\alpha = 0.61$); somatic symptoms (2 items; e.g., “Feeling that your illnesses are not being taken seriously enough?”; Cronbach's $\alpha = 0.67$); suicidal ideation (1 item: “Thoughts of actually hurting yourself?”); psychosis (2 items; e.g., “Hearing things other people couldn't hear, such as voices even when no one was around?”; Cronbach's $\alpha = 0.36$); sleep problems (1 item: “Problems with sleep that affected your sleep quality over all?”); memory (1 item: “Problems with memory [e.g., learning new information] or with location [e.g., finding your way home]?”); repetitive thoughts and behaviors (2 items; e.g., “Unpleasant thoughts, urges, or images that repeatedly enter your mind?”; Cronbach's $\alpha = 0.64$); dissociation (1 item: “Feeling detached or distant from yourself, your body, your physical surroundings, or your memories?”); personality functioning (2 items; e.g., “Not feeling close to other people or enjoying your relationships with them?”; Cronbach's $\alpha = 0.64$); substance use (3 items; e.g., “Using any of the following medicines on your own, that is, without a doctor's prescription, in greater amounts or longer than prescribed [e.g., painkillers (like Vicodin), stimulants (like Ritalin or Adderall), sedatives or tranquilizers (like sleeping pills or Valium), or drugs like marijuana, cocaine or crack, club drugs (like ecstasy), hallucinogens (like LSD), heroin, inhalants or solvents (like glue), or methamphetamine (like speed)]?”; Cronbach's $\alpha = 0.61$).

Data Analyses

Data analyses were aimed to (1) describing video game players' socio-demographic characteristics, personality functioning and psychopathological symptoms, (2) identifying clusters of players based on hours spent on video games and IGD-9 scores, and (3) examining how personality functioning and psychopathological symptoms were related to cluster membership.

Descriptive statistics and Pearson's correlation analysis were performed to explore the associations among the investigated variables. Considering that Pearson's correlation analysis was conducted with a wide number of tests, the Holm's method was used to correct for multiple statistical comparisons. Subsequently, in order to identify subgroups of players similar on IGD scores and on time spent to play with video games (i.e., in order to apply a person-centered approach to the collected data collected), we performed a two-step cluster analysis. This is an exploratory procedure that allows researchers to identify data-driven subgroups (clusters) within sufficiently large data set (i.e., $N \geq 250$; Norušis, 2010). This analysis follows two steps. First, it identifies groups with a clustering algorithm based on a distance measure between the rough scores of the variables. Second, it automatically selects the optimal number of clusters by applying hierarchical methods. A p -value of 0.05 was set as the critical level for statistical significance. As in other studies that used this statistical procedure (e.g., Schimmenti, 2016), a log-likelihood distance measure with Schwarz Bayesian information criterion was used to determine the number of clusters and establish a data-driven classification of video game players. Silhouette measure of

cohesion and separation was evaluated as a measure of validity of the within- and between-cluster distances.

Finally, in order to analyze associations between sociodemographic variables, maladaptive personality domains, alexithymia, psychopathological symptoms, and game preferences in the identified clusters, a series of one-way ANOVAs and Chi-square tests were performed using the clusters as factors. The cluster differences were assessed using *post hoc* Bonferroni test (for ANOVAs) or cell residuals (for Chi-square tests).

RESULTS

Descriptive Statistics

Descriptive statistics of the sample ($N = 366$) are shown in Table 2. Video game players in this sample mostly preferred FPS, MOBA and MMORPG games. They reported increased scores on clinical symptoms and severe alexithymic traits on average.

Associations Between Variables

A pattern of significant and positive associations emerged among IGD-9 scores, time spent online playing video games ($r = 0.31$, $p < 0.001$), maladaptive personality traits ($r_{PID-5-TOT} = 0.27$, $p < 0.001$), and psychopathological symptoms ($r_{DSM-5-LEVEL1} = 0.38$, $p < 0.001$). Unexpectedly, a pattern of significant and negative associations was observed in the relationship between alexithymia and IGD-9 scores ($r_{TAS-20} = -0.22$, $p < 0.01$), maladaptive personality traits ($r_{PID-5-TOT} = -0.54$, $p < 0.01$), and psychopathological symptoms ($r_{DSM-5-LEVEL1} = -0.47$, $p < 0.001$). **Supplementary Table S1** display the correlations among all the investigated variables.

Clusters of Video Game Players

The two-step cluster analysis generated four clusters. The average silhouette measure value of cohesion and separation was 0.5, which is considered a fair to good solution for discriminating the groups (Rousseeuw and Kaufman, 1990).

The first cluster was characterized by a relatively high amount of time spent on video games ($M = 4.01$ h per day, $SD = 1.02$) but a non-problematic gaming use score ($M_{IGD-9} = 13.94$, $SD_{IGD-9} = 2.09$), so we used labeled them Passionate gamers. This was the significantly largest group identified by cluster analysis ($N = 142$; 38.8%), $\chi^2(3) = 40.34$, $p < 0.01$.

The second cluster was labeled Occasional gamers ($N = 86$; 23.5%) because its members used video games for a low amount of time ($M = 1.62$ h per day, $SD = 0.49$) and had non-problematic gaming use ($M_{IGD-9} = 13.76$, $SD_{IGD-9} = 2.66$).

We labeled the members of the third cluster as Preoccupied gamers ($N = 76$; 20.8%), because they played an average number of hours on video games ($M = 2.92$ h per day, $SD = 0.80$) but reported high levels of preoccupations and symptoms concerning their game use ($M_{IGD-9} = 21.75$, $SD_{IGD-9} = 2.82$).

We labeled the members of the fourth cluster as Disordered gamers ($N = 62$; 16.9%) because they were characterized by a very high amount of time on video games ($M = 6.13$ h per

TABLE 2 | Descriptive statistics.

	Frequencies	Percentage	
Preferred games			
MMORPG	197	53.8%	
MOBA	196	53.6%	
Browser games	46	12.6%	
FPS	236	64.5%	
RTS	80	21.9%	
Simulation	166	45.4%	
Spend money for in-game features	190	51.9%	
	Mean	Standard deviation	Observed range
Age	21.64	3.77	15–30
Hours per day spent in videogames	3.58	1.79	1–10
IGD-9	17.40	5.77	9–39
PID-5-BF	24.55	10.08	0–53
Negative affectivity	7.12	3.15	0–14
Detachment	4.75	3.26	0–14
Antagonism	3.67	2.96	0–14
Disinhibition	4.52	2.77	0–13
Psychoticism	4.48	3.00	0–15
TAS-20	70.42	11.66	44–97
Difficulty identifying feelings	26.90	6.03	10–35
Difficulty describing feelings	15.05	4.96	5–25
Externally oriented thinking	28.46	4.86	13–40
Level one	2.69	0.55	0–2.69
Depression	1.47	1.03	0–4
Anger	1.28	1.20	0–4
Mania	1.04	0.93	0–4
Anxiety	1.12	0.92	0–4
Somatic symptoms	0.96	1.08	0–4
Suicidal ideation	0.33	0.84	0–4
Psychosis	0.17	0.45	0–3
Sleep problems	1.02	1.25	0–4
Memory	0.45	0.86	0–4
Repetitive thoughts and behaviors	0.68	0.94	0–4
Dissociation	0.51	0.94	0–4
Personality functioning	1.25	1.10	0–4
Substance use	0.60	0.86	0–4

day, $SD = 1.62$) and reported severe symptoms of problematic game use ($M_{IGD-9} = 25.06$, $SD_{IGD-9} = 6.29$). The four clusters did not differ with respect to gender, $\chi^2(3) = 2.08$, $p = 0.56$; age, $F(3, 262) = 0.49$, $p = 0.69$; and years of education, $F(3, 262) = 1.64$, $p = 0.18$.

Differences Between Clusters

Descriptive statistics for each cluster and the ANOVA results (including results of Bonferroni's *post hoc* analyses) are reported in Table 3.

The ANOVA results showed statistically significant differences between the clusters for the following variables: PID-total score, $p < 0.01$; PID-negative affect, $p < 0.01$; PID-detachment, $p < 0.01$; PID-antagonism, $p < 0.01$; PID-disinhibition, $p < 0.01$;

TABLE 3 | Differences between clusters of videogame players on IGD-9 scores, time spent playing videogames, age, years of education, maladaptive personality traits, alexithymia, and clinical symptoms.

		Clusters				ANOVA		
		1 Passionate	2 Occasional	3 Preoccupied	4 Disordered	<i>F</i> (3, 362)	<i>p</i>	Bonferroni tests
<i>N</i>		142	86	76	62			
IGD-9	<i>M</i>	13.94	13.76	21.75	25.06	226.07	0.000	4 > 1, 2, 3; 3 > 1, 2
	(<i>SD</i>)	(2.09)	(2.66)	(2.82)	(6.29)			
	<i>Observed range</i>	9-19	9-18	18-29	13-39			
Hours per day on videogames	<i>M</i>	4.01	1.62	2.92	6.13	254.73	0.000	4 > 1 > 3 > 2
	(<i>SD</i>)	(1.02)	(0.49)	(0.80)	(1.62)			
	<i>Observed range</i>	3-7	1-2	1-4	3-10			
Age	<i>M</i>	21.48	21.80	21.41	22.06	0.49	0.69	-
	(<i>SD</i>)	(3.83)	(4.18)	(3.61)	(3.25)			
Years of education	<i>M</i>	11.65	12.51	11.95	11.97	1.64	0.18	-
	(<i>SD</i>)	(2.84)	(2.98)	(2.67)	(2.92)			
PID-total score	<i>M</i>	0.87	0.89	1.11	1.20	15.66	0.000	4 > 2, 1; 3 > 2, 1
	(<i>SD</i>)	(0.37)	(0.40)	(0.37)	(0.40)			
PID-negative affect	<i>M</i>	1.29	1.30	1.63	1.64	8.76	0.000	4 > 2, 1; 3 > 2, 1
	(<i>SD</i>)	(0.58)	(0.63)	(0.59)	(0.66)			
PID-Detachment	<i>M</i>	0.82	0.85	1.05	1.26	8.37	0.000	4 > 1, 2
	(<i>SD</i>)	(0.64)	(0.62)	(0.64)	(0.63)			
PID-Antagonism	<i>M</i>	0.60	0.72	0.83	0.94	5.86	0.001	4 > 1; 3 > 1
	(<i>SD</i>)	(0.59)	(0.53)	(0.56)	(0.65)			
PID-Disinhibition	<i>M</i>	0.85	0.79	1.04	1.01	3.96	0.008	3 > 2
	(<i>SD</i>)	(0.56)	(0.51)	(0.54)	(0.58)			
PID-Psychoticism	<i>M</i>	0.78	0.79	1.01	1.17	8.05	0.000	4 > 1, 2; 3 > 1
	(<i>SD</i>)	(0.54)	(0.60)	(0.55)	(0.69)			
TAS-20 total score	<i>M</i>	72.92	72.24	65.82	67.79	8.35	0.000	1 > 4, 3; 2 > 3
	(<i>SD</i>)	(11.38)	(10.77)	(10.78)	(12.52)			
TAS-20 DIF	<i>M</i>	28.60	27.49	24.41	25.23	10.74	0.000	1 > 4, 3; 2 > 3
	(<i>SD</i>)	(5.39)	(5.90)	(5.60)	(6.75)			
TAS-20 DDF	<i>M</i>	15.82	15.50	13.80	14.21	3.66	0.01	1 > 3
	(<i>SD</i>)	(5.36)	(4.75)	(4.24)	(4.78)			
TAS-20 EOT	<i>M</i>	28.49	29.26	27.61	28.35	1.57	0.20	-
	(<i>SD</i>)	(4.79)	(4.91)	(4.81)	(4.95)			
Depression	<i>M</i>	1.19	1.27	1.83	1.98	14.12	0.000	4 > 2, 1; 3 > 2, 1
	(<i>SD</i>)	(0.90)	(0.95)	(1.02)	(1.16)			
Anger	<i>M</i>	1.07	1.03	1.66	1.66	7.59	0.000	4 > 2, 1; 3 > 2, 1
	(<i>SD</i>)	(1.08)	(1.12)	(1.25)	(1.34)			
Mania	<i>M</i>	1.03	1.02	0.97	1.21	0.86	0.46	-
	(<i>SD</i>)	(0.96)	(0.96)	(0.72)	(1.04)			
Anxiety	<i>M</i>	0.92	1.00	1.46	1.31	7.45	0.000	3 > 2, 1; 4 > 1
	(<i>SD</i>)	(0.87)	(0.94)	(0.91)	(0.86)			
Somatic Symptoms	<i>M</i>	0.85	0.80	1.11	1.21	2.82	0.04	—
	(<i>SD</i>)	(1.03)	(1.04)	(1.18)	(1.08)			
Suicidal Ideation	<i>M</i>	0.22	0.29	0.33	0.61	3.29	0.02	4 > 1
	(<i>SD</i>)	(0.74)	(0.75)	(0.79)	(1.15)			
Psychosis	<i>M</i>	0.11	0.13	0.19	0.36	5.15	0.00	4 > 2, 1
	(<i>SD</i>)	(0.31)	(0.33)	(0.47)	(0.73)			
Sleep Problems	<i>M</i>	0.90	0.86	1.16	1.31	2.30	0.08	—
	(<i>SD</i>)	(1.19)	(1.08)	(1.38)	(1.41)			
Memory	<i>M</i>	0.37	0.36	0.49	0.68	2.21	0.09	—
	(<i>SD</i>)	(0.78)	(0.80)	(0.79)	(1.13)			

(Continued)

TABLE 3 | Continued

		Clusters				ANOVA		
		1 Passionate	2 Occasional	3 Preoccupied	4 Disordered	F(3, 362)	p	Bonferroni tests
Repetitive Thoughts and Behaviors	M	0.56	0.60	0.78	0.93	2.82	0.04	—
	(SD)	(0.89)	(0.80)	(1.07)	(1.02)			
Dissociation	M	0.42	0.35	0.66	0.74	3.27	0.02	—
	(SD)	(0.93)	(0.78)	(0.93)	(1.10)			
Personality Functioning	M	0.93	1.06	1.43	2.01	17.30	0.000	4 > 3, 2, 1; 3 > 2, 1
	(SD)	(0.98)	(0.94)	(1.03)	(1.25)			
Substance Use	M	0.61	0.49	0.78	0.51	1.75	0.16	—
	(SD)	(0.90)	(0.68)	(0.97)	(0.87)			

PID-psychoticism, $p < 0.01$; TAS-20 total score, $p < 0.01$; TAS-20 DIR, $p < 0.01$; TAS-20 DDF, $p < 0.05$; depression, $p < 0.01$; anger, $p < 0.01$; anxiety, $p < 0.01$; suicidal ideation, $p < 0.05$; psychosis, $p < 0.01$; personality functioning, $p < 0.01$. Bonferroni's *post hoc* tests were performed to assess the differences between the groups. In regard to maladaptive personality traits, Disordered gamers and Preoccupied gamers showed significantly higher PID-5 total scores and scores on negative affect than Occasional gamers and Passionate gamers, and significantly higher psychoticism and antagonism than Passionate gamers. Disordered gamers showed significantly higher detachment than Occasional gamers and Passionate gamers, and significantly higher psychoticism than Occasional gamers. Preoccupied gamers showed significantly higher disinhibition than Occasional gamers.

Concerning alexithymia, surprisingly, Passionate gamers showed significantly higher TAS-20 total score and significantly higher difficulty identifying feelings scores than Disordered gamers and Preoccupied gamers, and significantly higher difficulty describing feelings than Preoccupied gamers. Occasional gamers showed significantly higher TAS-20 total scores and significantly higher difficulty identifying feelings than Preoccupied gamers. However, it should be noted that all the four clusters showed mean scores above the TAS-20 cutoff of 61 points, revealing high levels of alexithymia (Bagby et al., 1994) in our total sample. Therefore, alexithymia can be considered a common characteristic shared by the group of participants of the present research.

With regard to clinical symptoms, Disordered gamers and Preoccupied gamers showed significantly higher depression and anger than Occasional gamers and Passionate gamers and significantly higher anxiety than Passionate gamers. Preoccupied gamers also showed significantly higher anxiety than Occasional gamers. Disordered gamers showed significantly higher suicidal ideation than Passionate gamers and significantly higher psychosis than Passionate gamers and Occasional gamers. Disordered gamers showed significantly higher disordered personality functioning than the other clusters, and Preoccupied gamers showed a significantly higher disordered personality functioning than Occasional gamers and Passionate gamers. Disordered gamers showed the highest scores for dissociation, but *post hoc* analyses did not reveal specific differences between groups for this variable.

Subsequently, we explored the video games use (preferred genres of games) by the gamers. Frequencies of variables of interest are shown in Table 4. Disordered gamers showed the highest use of MOBA games, $\chi^2(3) = 14.44$, $p < 0.01$, and a moderate, at-the-limit-of-significance use of MMORPG games, $\chi^2(3) = 7.61$, $p = 0.05$, with respect to other players.

DISCUSSION

The first aim of the current study was to explore the associations among problematic gaming, time spent online playing video games, psychopathological symptoms, maladaptive personality traits, and alexithymia in a group of adolescent and young adult video game players. In line with the literature, a pattern of positive associations was found among problematic gaming, time spent online playing video games, psychopathological symptoms, and maladaptive personality traits. Unexpectedly, alexithymia scores were negatively associated with IGD-9 scores, psychopathological symptoms, and maladaptive personality traits.

Subsequently, we aimed to identify different subtypes of video game players presenting peculiar combinations of IGD-9 scores and times of video game use, and to explore the link between different profiles of video gamers and psychological maladjustment.

Two clusters (Occasional gamers and Passionate gamers) likely included non-problematic gamers and represented the majority of the sample (62.3% of the participants). These gamers showed IGD-9 scores below the Italian cutoff point of 21 used to determine the presence of problematic gaming use (Monacis et al., 2016), but only Passionate gamers spent a large amount of time on video games, e.g., according to Kim et al. (2016) more than 4 h per day.

In line with the literature, both kinds of non-problematic players presented low levels of psychological maladjustment (maladaptive personality traits and psychopathological symptoms) regardless of the number of hours spent daily on video games, with respect to the other identified clusters. This result is in line with literature stating that high involvement in gaming is not problematic *per se* (Charlton and Danforth, 2007), but it can represent a passionate use (Billieux et al., 2013; Burnay et al., 2015; Deleuze et al., 2018; Sibilla, 2019). The first

TABLE 4 | Genre of the video games used by the four cluster players.

		Clusters				Chi-square	
		1	2	3	4	$\chi^2(3)$	<i>p</i>
		Passionate	Occasional	Preoccupied	Disordered		
<i>N</i>		142	86	76	62		
MMORPG	<i>N</i>	83	36	40	38	7.61	0.05
	(%)	(58.5%)	(41.9%)	(52.6%)	(61.3%)		
MOBA	<i>N</i>	76	34	42	44	14.74	0.00
	(%)	(53.5)	(39.5)	(55.3%)	(71%)		
Browser games	<i>N</i>	16	11	9	10	9.74	0.81
	(%)	(11.3%)	(12.8%)	(11.8%)	(16.1%)		
FPS	<i>N</i>	94	52	47	43	1.66	0.64
	(%)	(66.2%)	(60.5%)	(61.8%)	(69.4%)		
RTS	<i>N</i>	25	22	17	16	2.78	0.43
	(%)	(17.6%)	(25.6%)	(22.4%)	(25.8%)		
Simulation	<i>N</i>	67	37	38	24	2.15	0.54
	(SD)	(47.2%)	(43%)	(50%)	(38.7%)		

cluster included the largest subtype of gamers in our study, i.e., the Passionate gamers. As shown by previous studies (Sibilla and Mancini, 2018), it is likely that passionate gamers do not play to satisfy specific psychological needs, for example those related to identity needs (Mancini and Sibilla, 2017; Sibilla and Mancini, 2018; Mancini et al., 2019). For them, playing could simply represent a playful activity even if it is demanding in terms of time, but without negative implications on their psychological processes. However, contrary to what was expected, members of this cluster showed the highest level of alexithymia. It is thus possible that these gamers, who spent many hours of their free time using video games, are oriented toward actions and the mission of the game, i.e., in achievement motives (Yee, 2006) rather than on gaming motives associated with self-reflection and introspection (Maganuco et al., 2019). On the other hand, having a poor capacity to identify and describe emotions is a characteristic of all the identified clusters. This result is in line with research by Gaetan et al. (2016), who found that regular gamers have more difficulty identifying and expressing emotions and suggested that video game environments may function as a tool to “curb alexithymic dynamic” (p. 347), transforming chaotic emotions into psychologically meaningful events.

The second subtype of non-problematic gamers is composed of Occasional video game players, who present even less psychological maladjustment, in comparison to Passionate gamers. This subgroup of gamers probably includes those individuals who consider video games as a hobby among others. However, it should be noted that even in this case, high levels of alexithymia were reported. This result must be taken with caution because in the present research we have not taken into consideration non-players of the same cohort. Therefore, other studies are needed to investigate alexithymia in low- and high-engaged gamers.

The other two groups identified by cluster analysis appear as more problematic. Both clusters of gamers showed IGD-9

scores over the Italian cutoff point of 21 used to determine the presence of problematic gaming (Monacis et al., 2016), but only Disordered gamers spent a very high amount of screen time playing video games, by using the cut-off value proposed by Kim et al. (2016) of more than 6 h per day to identify problematic gamers. The third cluster is that of Preoccupied gamers. The members of this group showed high levels of maladjustment although they did not spend a lot of time on video games. Like all the other players in our sample, they were alexithymic on average; moreover, they also presented the highest levels of anxiety, and higher anger and depression than Occasional and Passionate gamers. It is possible that this combination of symptoms describes their difficulty facing a great deal of negative affects without having sufficient capacity for emotional regulation. So, they could represent a group of individuals who display clinical symptoms that are independent of video game use and who play to cope with emotional distress, rather than for an intrinsic motivation to succeed or for leisure (Billieux et al., 2013).

Finally, the last group was composed of Disordered gamers. As expected, these video game players presented the highest level of psychological maladjustment. In particular, they showed the most compromised personality functioning characterized by high levels of psychoticism, psychotic symptoms and suicidal ideation: an overall severe clinical picture that seems to suggest that the virtual world of video games for some of these players could be taken as an alternative to a real social world, as a sort of a “psychic pit” paradoxically protecting these individuals from distressing and perhaps disordered mental states (Schimmenti and Caretti, 2010; Schimmenti et al., 2012). In other words, Disordered gamers could play more to escape from an unbearable real life than to succeed in the game (Deleuze et al., 2019). In addition, the relationship among escapism, psychopathological symptoms and gaming is well known in the literature (Király et al., 2015). This cluster is similar to a cluster of video game players previously described as the “unregulated escapers” by

Billieux et al. (2015), as well as with the cluster labeled Escapist that was found by Schuurman et al. (2008) in their study on video game players, which included individuals for whom escapism was the main motive for playing.

Regarding to the genre of video game used, Disordered gamers are characterized by the highest use of MOBAs and by a moderate, at-the-limit-of-significance use of MMORPGs with respect to other players. This may be explained with the fact that by providing very frequent feedback and updates on international rankings and statistics, MOBA games currently involves much more players than MMORPGs (Bonnaire and Baptista, 2019). On the other hand, MOBAs and MMORPGs, being massive and multiplayer games, have generally more immersive features than other video games. Thus, there could be a relationship between the specific characteristics of the digital environment and the problematic use of video games. Other studies are needed to better explore this relationship, for example, studies that account for the motives for playing specific video games, or studies that explore the role that types of games (multiplayers or single player) or types of avatars (e.g., humanoid or non-humanoid avatars) can play for the disordered gamers. In the light of the current literature and of the results of the present study, it can be hypothesized is that disordered gamers somewhat replace a part of their offline social reality, which is likely full of psychological problems and which is perhaps not responsive to important psychosocial needs (Deleuze et al., 2019), with a specific digital reality that provides a high rate of recognition of their activity and their skill as a gamer.

As with every research, the present study comes with a number of limitations. First, the high percentage of male participants and the limited sample size must be highlighted to avoid generalizations. Furthermore, we used a convenient sample, by recruiting video game players in gaming web-pages and forums so, there is a need to replicate these findings in larger groups of gamers. Second, it is acknowledged that collecting clinical information by means of self-report measures can present relevant bias problems (Podsakoff et al., 2003), although the tools used in this study have displayed good psychometric properties in worldwide research. Probably, a multimethod assessment of personality domains, psychopathological symptoms and gaming use would have led to more valid and reliable findings. Third, Internet Gaming Disorder (IGD) is still a clinical condition in need of further study (American Psychiatric Association [APA], 2013) and its conceptualization and measurement should be further examined and broaden (Van Rooij et al., 2017; Schimmenti and Starcevic, 2019). Qualitative studies (i.e., based on clinical interviews) are needed to gain a better understanding of the nature of problematic gaming. Moreover, specific assessment tools should be built in order not to confuse problematic gaming with high immersion and involvement in the play. Fourth, the cross-sectional design of the study made it impossible to definitively determine the direction of the associations between data and cannot allow us to exclude the possibility that our results were affected by third variables not included in this study (e.g., traumatic experiences, insecure attachment, identity needs).

Therefore, longitudinal studies are greatly needed to advance this line of work.

However, despite these limitations, our cross-sectional findings support the hypothesis that a multidimensional perspective on different type of gaming behaviors may be particularly informative for clinicians dealing with individuals who display problematic video game use. Our findings showed two subgroups of video game players who showed problematic gaming. Highly involved gamers who exhibited excessive screen time playing video games presented the highest level of maladaptive personality traits and psychopathological symptoms. Highly involved gamers who exhibited an average screen time playing video games presented a high level of negative affectivity (anxiety, anger, and depression). Therefore, it appears to be important to determine whether or not problematic gaming activities reflect a dysfunctional emotion-focused coping strategy to avoid inner unpleasant emotional states (e.g., shelter the self from emotional “high voltage”) or a more generally compromised emotional and social functioning (e.g., absorption in the alternative reality of video games to escape from psychosocial stressors). This distinction could help clinicians understand the factors underlying problematic gaming patterns, and this may foster tailored psychological interventions for people with problematic gaming. In fact, our findings suggest that the assessment of the psychological and psychopathological factors underlying problematic gaming could be more informative than an assessment procedure that solely focuses on the likelihood of a diagnosis (e.g., by the use of cut-off scores of measures for the screening of problematic gaming). For example, a preoccupied video game player could benefit from interventions designed to improve emotion regulation and the capacity to reflect on his or her own mental states (e.g., Mentalization-Based Treatment). In contrast, a disordered gamer could benefit from interventions that focus on disordered personality functioning (e.g., Transference-Focused Psychotherapy in the psychodynamic tradition, or Dialectic Behavior Therapy in the cognitive tradition) on one side, and on problematic gaming symptoms on the other side (e.g., behavioral modification techniques, pharmacological treatment) on the other side. Thus, the investigation of the psychological problems and needs of individuals who display excessive game use via a person-centered approach represents a critical opportunity for increasing the scientific understanding of problematic gaming behaviors and, ultimately, for developing tailored and effective treatment.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Internal Review Board for Psychological

Research of the UKE–Kore University of Enna. Written informed consent to participate in this study was provided by participant or their parent or guardian.

AUTHOR CONTRIBUTIONS

AM provided substantial contributions to the conception of the work, deep analysis of the literature, study design, development, and final approval of the manuscript. TM and PC contributed to the development and revision of the work with deep literature analysis and agreement for final approval of the manuscript. GS contributed to the development of the work, with literature

review, data acquisition, and agreement for final approval of the manuscript. MC contributed to the revision of the work and agreement for final approval of the manuscript. AS contributed to the conception and deep revision of the work, with literature analysis, contribution to data analysis, and agreement for final approval of the manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02559/full#supplementary-material>

REFERENCES

- Aarseth, E., Bean, A. M., Boonen, H., Colder Carras, M., Coulson, M., Das, D., et al. (2017). Scholars' open debate paper on the World Health Organization ICD-11 gaming disorder proposal. *J. Behav. Addict.* 6, 267–270.
- Achtman, R. L., Green, C. S., and Bavelier, D. (2008). Video games as a tool to train visual skills. *Restor. Neurol. Neurosci.* 26, 435–446.
- Amendola, S., Spensieri, V., and Cerutti, R. (2019). The use of videogames, personality and emotion regulation in a sample of Italian adolescents. *Med. Bambino* 38:177.
- American Psychiatric Association [APA] (2013). *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*. Arlington, VA: American Psychiatric Association.
- Bagby, R. M., Parker, J. D., and Taylor, G. J. (1994). The twenty-item toronto alexithymia Scale—I. Item selection and cross-validation of the factor structure. *J. Psychosom. Res.* 38, 23–32. doi: 10.1016/0022-3999(94)90005-1
- Baysan-Arslan, S., Cebeci, S., Kaya, M., and Canbal, M. (2016). Relationship between internet addiction and alexithymia among university students. *Clin. Investig. Med.* 39, S111–S115.
- Bergman, L. R., and Trost, K. (2006). The person-oriented versus the variable-oriented approach: are they complementary, opposites, or exploring different worlds? *Merrill Palmer Q.* 1982, 601–632. doi: 10.1353/mpq.2006.0023
- Billieux, J., Chanal, J., Khazaal, Y., Rochat, L., Gay, P., Zullino, D., et al. (2011). Psychological predictors of problematic involvement in massively multiplayer online role-playing games: illustration in a sample of male cybercafe players. *Psychopathology* 44, 165–171. doi: 10.1159/000322525
- Billieux, J., Thorens, G., Khazaal, Y., Zullino, D., Achab, S., and Van der Linden, M. (2015). Problematic involvement in online games: a cluster analytic approach. *Comput. Hum. Behav.* 43, 242–250. doi: 10.1016/j.chb.2014.10.055
- Billieux, J., Van der Linden, M., Achab, S., Khazaal, Y., Paraskevopoulos, L., Zullino, D., et al. (2013). Why do you play *World of Warcraft*? An in-depth exploration of self-reported motivations to play online and in-game behaviours in the virtual world of *Azeroth*. *Computers in Human Behavior* 29, 103–109. doi: 10.1016/j.chb.2012.07.021
- Biolcati, R. (2010). La vita online degli adolescenti: tra sperimentazione e rischio [Adolescents' online life between experimentation and risk]. *Psicol. Clin. dello sviluppo* 14, 267–298.
- Blasi, M. D., Giardina, A., Giordano, C., Coco, G. L., Tosto, C., Billieux, J., et al. (2019). Problematic video game use as an emotional coping strategy: evidence from a sample of MMORPG gamers. *J. Behav. Addict.* 8, 25–34. doi: 10.1556/2006.8.2019.02
- Bonnaire, C., and Baptista, D. (2019). Internet gaming disorder in male and female young adults: the role of alexithymia, depression, anxiety and gaming type. *Psychiatry Res.* 272, 521–530. doi: 10.1016/j.psychres.2018.12.158
- Bonnaire, C., Barrault, S., Aïte, A., Cassotti, M., Moutier, S., and Varescon, I. (2017). Relationship between pathological gambling, alexithymia, and gambling type. *Am. J. Addict.* 26, 152–160. doi: 10.1111/ajad.12506
- Braun, B., Stopfer, J. M., Müller, K. W., Beutel, M. E., and Egloff, B. (2016). Personality and video gaming: comparing regular gamers, non-gamers, and gaming addicts and differentiating between game genres. *Comput. Hum. Behav.* 55, 406–412. doi: 10.1016/j.chb.2015.09.041
- Bressi, C., Taylor, G., Parker, J., Bressi, S., Brambilla, V., Aguglia, E., et al. (1996). Cross validation of the factor structure of the 20-item toronto alexithymia scale: an Italian multicenter study. *J. Psychosom. Res.* 41, 551–559. doi: 10.1016/s0022-3999(96)00228-0
- Brunborg, G. S., Mentzoni, R. A., and Frøyland, L. R. (2014). Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? *J. Behav. Addict.* 3, 27–32. doi: 10.1556/JBA.3.2014.002
- Burnay, J., Billieux, J., Blairy, S., and Larøi, F. (2015). Which psychological factors influence Internet addiction? Evidence through an integrative model. *Comput. Hum. Behav.* 43, 28–34. doi: 10.1016/j.chb.2014.10.039
- Cao, F., and Su, L. (2007). Internet addiction among Chinese adolescents: prevalence and psychological features. *Child Care Health Dev.* 33, 275–281. doi: 10.1111/j.1365-2214.2006.00715.x
- Charlton, J. P., and Danforth, I. D. (2007). Distinguishing addiction and high engagement in the context of online game playing. *Comput. Hum. Behav.* 23, 1531–1548. doi: 10.1016/j.chb.2005.07.002
- Chuang, Y. C. (2006). Massively multiplayer online role-playing game-induced seizures: a neglected health problem in internet addiction. *Cyber Psychol. Behav.* 9, 451–456. doi: 10.1089/cpb.2006.9.451
- Cole, S. H., and Hooley, J. M. (2013). Clinical and personality correlates of MMO gaming: anxiety and absorption in problematic internet use. *Soc. Sci. Comput. Rev.* 31, 424–436. doi: 10.1177/0894439312475280
- Collins, E., Freeman, J., and Chamarro-Premuzic, T. (2012). Personality traits associated with problematic and non-problematic massively multiplayer online role playing game use. *Pers. Individ. Diff.* 52, 133–138. doi: 10.1016/j.paid.2011.09.015
- Comrey, A. L. (1988). Factor-analytic methods of scale development in personality and clinical psychology. *J. Consult. Clin. Psychol.* 56, 754–761. doi: 10.1037/0022-006x.56.5.754
- Dalbudak, E., Evren, C., Aldemir, S., Coskun, K. S., Ugurlu, H., and Yildirim, F. G. (2013). Relationship of internet addiction severity with depression, anxiety, and alexithymia, temperament and character in university students. *Cyberpsychol. Behav. Soc. Netw.* 16, 272–278. doi: 10.1089/cyber.2012.0390
- De Freitas, S., and Griffiths, M. (2007). Online gaming as an educational tool in learning and training. *Br. J. Educ. Technol.* 38, 535–537. doi: 10.1111/j.1467-8535.2007.00720.x
- Deleuze, J., Long, J., Liu, T.-Q., Maurage, P., and Billieux, J. (2018). Passion or addiction? Correlates of healthy versus problematic use of videogames in a sample of French-speaking regular gamers. *Addict. Behav.* 82, 114–121. doi: 10.1016/j.addbeh.2018.02.031
- Deleuze, J., Maurage, P., Schimmenti, A., Nuyens, F., Melzer, A., and Billieux, J. (2019). Escaping reality through videogames is linked to an implicit preference for virtual over real-life stimuli. *J. Affect. Disord.* 245, 1024–1031. doi: 10.1016/j.jad.2018.11.078
- Dong, G., Lu, Q., Zhou, H., and Zhao, X. (2011). Precursor or Sequela: pathological disorders in people with internet addiction disorder. *PLoS One* 6:e14703. doi: 10.1371/journal.pone.0014703

- Eichenbaum, A., Kattner, F., Bradford, D., Gentile, D. A., Choo, H., Chen, V., et al. (2015a). The role of game genres and the development of internet gaming disorder in school-aged children. *J. Addict. Behav. Ther. Rehabil.* 4, 1–7.
- Eichenbaum, A., Kattner, F., Bradford, D., Gentile, D. A., and Green, C. S. (2015b). Role-playing and real-time strategy games associated with greater probability of Internet gaming disorder. *Cyberpsychol. Behav. Soc. Netw.* 18, 480–485. doi: 10.1089/cyber.2015.0092
- Estévez, A., Jáuregui, P., Sánchez-Marcos, I., López-González, H., and Griffiths, M. D. (2017). Attachment and emotion regulation in substance addictions and behavioral addictions. *J. Behav. Addict.* 6, 534–544. doi: 10.1556/2006.6.20.17.086
- Fossati, A., Krueger, R. F., Markon, K. E., Borroni, S., and Maffei, C. (2013). Reliability and validity of the personality inventory for DSM-5 (PID-5) predicting DSM-IV personality disorders and psychopathy in community-dwelling Italian adults. *Assessment* 20, 689–708. doi: 10.1177/1073191113504984
- Fuster, H., Carbonell, X., Pontes, H. M., and Griffiths, M. D. (2016). Spanish validation of the internet gaming disorder-20 (IGD-20) test. *Comput. Hum. Behav.* 56, 215–224. doi: 10.1016/j.chb.2015.11.050
- Gaetan, S., Bréjard, V., and Bonnet, A. (2016). Video games in adolescence and emotional functioning: emotion regulation, emotion intensity, emotion expression, and alexithymia. *Comput. Hum. Behav.* 61, 344–349. doi: 10.1016/j.chb.2016.03.027
- Gentile, D. (2009). Pathological video-game use among youth ages 8 to 18: a national study. *Psychol. Sci.* 20, 594–602. doi: 10.1111/j.1467-9280.2009.02340.x
- Gentile, D. A., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., et al. (2011). Pathological video game use among youths: a two-year longitudinal study. *Pediatrics* 127, e319–e329. doi: 10.1542/peds.2010-1353
- Gervasi, A. M., La Marca, L., Costanzo, A., Pace, U., Guglielmucci, F., and Schimmenti, A. (2017). Personality and internet gaming disorder: a systematic review of recent literature. *Curr. Addict. Rep.* 4, 293–307. doi: 10.1007/s40429-017-0159-6
- Giner-Bartolomé, C., Fagundo, A. B., Sánchez, I., Jiménez-Murcia, S., Santamaría, J. J., Ladouceur, R., et al. (2015). Can an intervention based on a serious videogame prior to cognitive behavioral therapy be helpful in bulimia nervosa? A clinical case study. *Front. Psychol.* 6:982. doi: 10.3389/fpsyg.2015.00982
- Griffiths, M. D., Davies, M. N., and Chappell, D. (2004). Demographic factors and playing variables in online computer gaming. *Cyberpsychol. Behav.* 7, 479–487. doi: 10.1089/cpb.2004.7.479
- Guglielmucci, F., Monti, M., Franzoi, I. G., Santoro, G., Granieri, A., Billieux, J., et al. (2019). Dissociation in problematic gaming: a systematic review. *Curr. Addict. Rep.* 6, 1–14. doi: 10.1007/s40429-019-0237-z
- Haladyna, T. M. (1992). The effectiveness of several multiple-choice formats. *Appl. Meas. Educ.* 5, 73–88. doi: 10.1207/s15324818ame0501_6
- Haviland, M. G. (1996). Structure of the twenty-item Toronto Alexithymia scale. *J. Pers. Assess.* 66, 116–125. doi: 10.1207/s15327752jpa6601_9
- Hodgins, D. C., and Holub, A. (2015). Components of impulsivity in gambling disorder. *Int. J. Ment. Health Addict.* 13, 699–711. doi: 10.1007/s11469-015-9572-z
- Hussain, Z., and Griffiths, M. D. (2008). Gender swapping and socializing in cyberspace: an exploratory study. *Cyberpsychol. Behav.* 11, 47–53. doi: 10.1089/cpb.2007.0020
- Hussain, Z., and Griffiths, M. D. (2009). Excessive use of massively multi-player online role-playing games: a pilot study. *Int. J. Ment. Health Addict.* 7:563. doi: 10.1007/s11469-009-9202-8
- Hyun, G. J., Han, D. H., Lee, Y. S., Kang, K. D., Yoo, S. K., Chung, U. S., et al. (2015). Risk factors associated with online game addiction: a hierarchical model. *Comput. Hum. Behav.* 48, 706–713. doi: 10.1016/j.chb.2015.02.008
- Jiménez-Murcia, S., Fernández-Aranda, F., Granero, R., Chóliz, M., La Verde, M., Aguglia, E., et al. (2014). Video game addiction in gambling disorder: clinical, psychopathological, and personality correlates. *Biomed Res. Int.* 2014:315062.
- Kardefelt-Winther, D. (2014a). The moderating role of psychosocial well-being on the relationship between escapism and excessive online gaming. *Comput. Hum. Behav.* 38, 68–74. doi: 10.1556/2006.8.2019.34
- Kardefelt-Winther, D. (2014b). A conceptual and methodological critique of internet addiction research: towards a model of compensatory internet use. *Comput. Hum. Behav.* 31, 351–354. doi: 10.1016/j.chb.2013.10.059
- Kardefelt-Winther, D., Heeren, A., Schimmenti, A., van Rooij, A., Maurage, P., Carras, M., et al. (2017). How can we conceptualize behavioural addiction without pathologizing common behaviours? *Addiction* 112, 1709–1715. doi: 10.1111/add.13763
- Kim, E. J., Namkoong, K., Ku, T., and Kim, S. J. (2008). The relationship between online game addiction and aggression, self-control and narcissistic personality traits. *Eur. Psychiatry* 23, 212–218. doi: 10.1016/j.eurpsy.2007.10.010
- Kim, N. R., Hwang, S. S. H., Choi, J. S., Kim, D. J., Demetrovics, Z., Király, O., et al. (2016). Characteristics and psychiatric symptoms of internet gaming disorder among adults using self-reported DSM-5 criteria. *Psychiatry Investig.* 13, 58–66. doi: 10.4306/pi.2016.13.1.58
- King, D. L., Delfabbro, P. H., and Griffiths, M. D. (2011). The role of structural characteristics in problematic video game play: an empirical study. *Int. J. Ment. Health Addict.* 9, 320–333. doi: 10.1007/s11469-010-9289-y
- Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., et al. (2015). The mediating effect of gaming motivation between psychiatric symptoms and problematic online gaming: an online survey. *J. Med. Int. Res.* 17:e88. doi: 10.2196/jmir.3515
- Klimmt, C., Hefner, D., and Vorderer, P. (2009). The video game experience as “true” identification: a theory of enjoyable alterations of players’ self-perception. *Commun. Theory* 19, 351–373. doi: 10.1111/j.1468-2885.2009.01347.x
- Konkolý Thege, B., Woodin, E. M., Hodgins, D. C., and Williams, R. J. (2015). Natural course of behavioral addictions: a 5-year longitudinal study. *BMC Psychiatry* 15:4. doi: 10.1186/s12888-015-0383-3
- Krueger, R. F., Derringer, J., Markon, K. E., Watson, D., and Skodol, A. E. (2012). Initial construction of a maladaptive personality trait model and inventory for DSM-5. *Psychol. Med.* 42, 1879–1890. doi: 10.1017/S0033291711002674
- Kuss, D. J., and Griffiths, M. D. (2012). Online gaming addiction in children and adolescents: a review of empirical research. *J. Behav. Addict.* 1, 3–22. doi: 10.1556/JBA.1.2012.1.1
- Laconi, S., Pirès, S., and Chabrol, H. (2017). Internet gaming disorder, motives, game genres and psychopathology. *Comput. Hum. Behav.* 75, 652–659. doi: 10.1016/j.chb.2017.06.012
- Laier, C., Wegmann, E., and Brand, M. (2018). Personality and cognition in gamers: avoidance expectancies mediate the relationship between maladaptive personality traits and symptoms of Internet-gaming disorder. *Front. Psychiatry* 9:304. doi: 10.3389/fpsyg.2018.00304
- Landers, R. N., and Lounsbury, J. W. (2006). An investigation of Big Five and narrow personality traits in relation to Internet usage. *Comput. Hum. Behav.* 22, 283–293. doi: 10.1016/j.chb.2004.06.001
- Lee, S. Y., Lee, H. K., and Choo, H. (2017). Typology of Internet gaming disorder and its clinical implications. *Psychiatry Clin. Neurosci.* 71, 479–491. doi: 10.1111/pcn.12457
- Lehenbauer-Baum, M., Klaps, A., Kovacovsky, Z., Witzmann, K., Zahlbruckner, R., and Stetina, B. U. (2015). Addiction and engagement: an explorative study toward classification criteria for internet gaming disorder. *Cyberpsychol. Behav. Soc. Netw.* 18, 343–349. doi: 10.1089/cyber.2015.0063
- Lemmens, J. S., Valkenburg, P. M., and Gentile, D. A. (2015). The Internet gaming disorder scale. *Psychol. Assess.* 27, 567–582. doi: 10.1037/pas0000062
- Lemola, S., Brand, S., Vogler, N., Perkinson-Gloor, N., Allemand, M., and Grob, A. (2011). Habitual computer game playing at night is related to depressive symptoms. *Pers. Individ. Differ.* 51, 117–122. doi: 10.1016/j.paid.2011.03.024
- Lobel, A., Engels, R. C., Stone, L. L., Burk, W. J., and Granic, I. (2017). Video gaming and children’s psychosocial wellbeing: a longitudinal study. *J. Youth Adolesc.* 46, 884–897. doi: 10.1007/s10964-017-0646-z
- Lorains, F. K., Cowlishaw, S., and Thomas, S. A. (2011). Prevalence of comorbid disorders in problem and pathological gambling: systematic review and meta-analysis of population surveys. *Addiction* 106, 490–498. doi: 10.1111/j.1360-0443.2010.03300.x
- Maganuco, N. R., Costanzo, A., Midolo, L. R., Santoro, G., and Schimmenti, A. (2019). Impulsivity and alexithymia in virtual worlds: a study on players of world of war craft. *Clinical Neuropsychiatry* 16, 127–134.
- Mancini, T., Imperato, C., and Sibilla, F. (2019). Does avatar’s character and emotional bond expose to gaming addiction? Two studies on virtual self-discrepancy, avatar identification and gaming addiction in massively multiplayer online role-playing game players. *Comput. Hum. Behav.* 92, 297–305. doi: 10.1016/j.chb.2018.11.007

- Mancini, T., and Sibilla, F. (2017). Offline personality and avatar customisation. Discrepancy profiles and avatar identification in a sample of MMORPG players. *Comput. Hum. Behav.* 69, 275–283. doi: 10.1016/j.chb.2016.12.031
- Mehroof, M., and Griffiths, M. D. (2010). Online gaming addiction: the role of sensation seeking, self-control, neuroticism, aggression, state anxiety, and trait anxiety. *Cyberpsychol. Behav. Soc. Netw.* 13, 313–316. doi: 10.1089/cyber.2009.0229
- Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouvrøe, K. J. M., Hetland, J., et al. (2011). Problematic video game use: estimated prevalence and associations with mental and physical health. *Cyberpsychol. Behav. Soc. Netw.* 14, 591–596. doi: 10.1089/cyber.2010.0260
- Mestre-Bach, G., Granero, R., Steward, T., Fernández-Aran-da, F., Baño, M., Aymami, N., et al. (2016). Reward and punishment sensitivity in women with gambling disorder or compulsive buying: implications in treatment outcome. *J. Behav. Addict.* 5, 658–665. doi: 10.1556/2006.5.2016.074
- Monacis, L., de Palo, V., Griffiths, M. D., and Sinatra, M. (2016). Validation of the internet gaming disorder scale- short form (IGDS9-SF) in an Italian-speaking people. *J. Behav. Addict.* 5, 683–690. doi: 10.1556/2006.5.2016.083
- Morin, A. J. S., and Wang, J. C. K. (2016). “A gentle introduction to mixture modeling using physical fitness data,” in *An Introduction to Intermediate and Advanced Statistical Analyses for Sport and Exercise Scientists*, eds N. Ntoumanis, and N. Myers, (Chichester: Wiley), 183–210.
- Müller, K. W., Janikian, M., Dreier, M., Wölfling, K., Beutel, M. E., Tzavara, C., et al. (2015). Regular gaming behavior and internet gaming disorder in European adolescents: results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. *Eur. Child Adolescent Psychiatry* 24, 565–574. doi: 10.1007/s00787-014-0611-2
- Musetti, A., Cattivelli, R., Giacobbi, M., Zuglian, P., Ceccarini, M., Capelli, F., et al. (2016). Challenges in internet addiction disorder: is a diagnosis feasible or not? *Front. Psychol.* 7:842. doi: 10.3389/fpsyg.2016.00842
- Musetti, A., Cattivelli, R., Zuglian, P., Terrone, G., Pozzoli, S., Capelli, F., et al. (2017). Internet addiction disorder or internet related psychopathology? [Internet Addiction Disorder or Internet Related Psychopathology?]. *Giornale italiano di Psicol.* 44, 359–382.
- Musetti, A., and Corsano, P. (2018). The internet is not a tool: reappraising the model for internet-addiction disorder based on the constraints and opportunities of the digital environment. *Front. Psychol.* 9:558. doi: 10.3389/fpsyg.2018.00558
- Na, E., Choi, I., Lee, T.-H., Lee, H., Rho, M. J., Cho, H., et al. (2017). The influence of game genre on Internet gaming disorder. *J. Behav. Addict.* 6, 248–255. doi: 10.1556/2006.6.2017.033
- Newzoo Games (2016). *Global Games Market Report: An Overview of Trends and Insights*. Available at: https://cdn2.hubspot.net/hubfs/700740/Reports/Newzoo_Free_2016_Global_Games_Market_Report.pdf (accessed October 10, 2019).
- Ng, B. D., and Wiemer-Hastings, P. (2005). Addiction to the internet and online gaming. *Cyberpsychol. Behav.* 8, 110–113. doi: 10.1089/cpb.2005.8.110
- Norbury, A., and Husain, M. (2015). Sensation-seeking: dopaminergic modulation and risk for psychopathology. *Behav. Brain Res.* 288, 79–93. doi: 10.1016/j.bbr.2015.04.015
- Norušis, M. J. (2010). *SPSS 19.0 Guide to Data Analysis*. Upper Saddle River, NJ: Prentice-Hall, Inc.
- Öztürk, C., Bektas, M., Ayar, D., Öztornacı, B. Ö., and Yağcı, D. (2015). Association of personality traits and risk of internet addiction in adolescents. *Asian Nurs. Res.* 9, 120–124. doi: 10.1016/j.anr.2015.01.001
- Parker, J. D., Eastabrook, J. M., Keefer, K. V., and Wood, L. M. (2010). Can alexithymia be assessed in adolescents? Psychometric properties of the 20-item Toronto Alexithymia Scale in younger, middle, and older adolescents. *Psychol. Assess.* 22, 798–808. doi: 10.1037/a0020256
- Peters, C. S., and Malesky, L. A. Jr. (2008). Problematic usage among highly-engaged players of massively multiplayer online role playing games. *Cyberpsychol. Behav.* 11, 481–484. doi: 10.1089/cpb.2007.0140
- 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
- Pontes, H. M., and Griffiths, M. D. (2015). Measuring DSM-5 internet gaming disorder: development and validation of a short psychometric scale. *Comput. Hum. Behav.* 45, 137–143. doi: 10.1016/j.chb.2014.12.006
- Rehbein, F., Psych, G., Kleimann, M., Mediasci, G., and Mößle, T. (2010). Prevalence and risk factors of video game dependency in adolescence: results of a German nationwide survey. *Cyberpsychol. Behav. Soc. Netw.* 13, 269–277. doi: 10.1089/cyber.2009.0227
- Rousseeuw, P. J., and Kaufman, L. (1990). *Finding Groups in Data*. Hoboken, NY: Wiley Online Library.
- Säkinen, P., Kaltiala-Heino, R., Ranta, K., Haataja, R., and Joukamaa, M. (2007). Psychometric properties of the 20-item Toronto Alexithymia scale and prevalence of alexithymia in a Finnish adolescent population. *Psychosomatics* 48, 154–161. doi: 10.1176/appi.psy.48.2.154
- Schimmenti, A. (2016). Dissociative experiences and dissociative minds: exploring a nomological network of dissociative functioning. *J. Trauma Dissociation* 17, 338–361. doi: 10.1080/15299732.2015.1108948
- Schimmenti, A., and Caretti, V. (2010). Psychic retreats or psychic pits?: unbearable states of mind and technological addiction. *Psychoanal. Psychol.* 27, 115–132. doi: 10.1037/a0019414
- Schimmenti, A., Caretti, V., and La Barbera, D. (2014a). Internet gaming disorder or internet addiction? A plea for conceptual clarity. *Clin. Neuropsychiatry* 11, 145–146.
- Schimmenti, A., Passanisi, A., Gervasi, A. M., Manzella, S., and Famà, F. I. (2014b). Insecure attachment attitudes in the onset of problematic Internet use among late adolescents. *Child Psychiatry Hum. Dev.* 45, 588–595. doi: 10.1007/s10578-013-0428-0
- Schimmenti, A., Guglielmucci, F., Barbasio, C., and Granieri, A. (2012). Attachment disorganization and dissociation in virtual worlds: a study on problematic Internet use among players of online role playing games. *Clin. Neuropsychiatry* 9, 195–203.
- Schimmenti, A., and Starcevic, V. (2019). Logical fallacies in justifying problematic gaming as a mental disorder. *Aust. N. Z. J. Psychiatry* 53, 604–605. doi: 10.1177/0004867418821431
- Schuurman, D., De Moor, K., De Marez, L., and Van Looy, J. (2008). “Fanboys, competitors, escapists and time-killers: a typology based on gamers’ motivations for playing video games,” in *Proceedings of the 3rd International Conference on Digital Interactive Media in Entertainment and Arts*, (New York: ACM), 46–50.
- Seay, A. F., and Kraut, R. E. (2007). “Project massive: self-regulation and problematic use of online gaming,” in *ACM Conference on Human Factors in Computing Systems*, New York: ACM Press. doi: 10.1145/1240624
- Sibilla, F. (2019). *Psychosocial Implications of the use of Massively Multiplayer Online Role-Playing Games: The Relationship Between the Game Modes, the Self and Well-Being*. Ph.D. thesis, University of Parma, Parma.
- Sibilla, F., and Mancini, T. (2018). I am (not) my avatar: a review of the user-avatar relationships in massively multiplayer online worlds. *Cyberpsychol. J. Psychosoc. Res. Cyberspace* 12:4. doi: 10.5817/CP2018-3-4
- Smyth, J. M. (2007). Beyond self-selection in video game play: an experimental examination of the consequences of massively multiplayer online role-playing game play. *Cyberpsychol. Behav.* 10, 717–721. doi: 10.1089/cpb.2007.9963
- Starcevic, V., and Aboujaoude, E. (2017). Internet gaming disorder, obsessive-compulsive disorder, and addiction. *Curr. Addict. Rep.* 4, 317–322. doi: 10.1007/s40429-017-0158-7
- Starcevic, V., and Billieux, J. (2017). Does the construct of Internet addiction reflect a single entity or a spectrum of disorders? *Clin. Neuropsychiatry* 14, 5–10.
- Starcevic, V., Billieux, J., and Schimmenti, A. (2018). Selfitis, selfie addiction, Twitteritis: irresistible appeal of medical terminology for problematic behaviours in the digital age. *Aust. N. Z. J. Psychiatry* 52, 408–409. doi: 10.1177/000486741863532532
- Stasiewicz, P. R., Bradizza, C. M., Gudleski, G. D., Coffey, S. F., Schlauch, R. C., Bailey, S. T., et al. (2012). The relationship of alexithymia to emotional dysregulation within an alcohol dependent treatment sample. *Addict. Behav.* 37, 469–476. doi: 10.1016/j.addbeh.2011.12.011
- Taylor, G. J., and Bagby, R. M. (2013). Psychoanalysis and empirical research: the example of alexithymia. *J. Am. Psychoanal. Assoc.* 61, 99–133. doi: 10.1177/0003065112474066
- Thorens, G., Achab, S., Billieux, J., Khazaal, Y., Khan, R., Pivin, E., et al. (2014). Characteristics and treatment response of self-identified problematic Internet

- users in a behavioral addiction outpatient clinic. *J. Behav. Addict.* 3, 78–81. doi: 10.1556/JBA.3.2014.008
- Triberti, S., Milani, L., Villani, D., Grumi, S., Peracchia, S., Curcio, G., et al. (2018). What matters is when you play: investigating the relationship between online video games addiction and time spent playing over specific day phases. *Addict. Behav. Rep.* 8, 185–188. doi: 10.1016/j.abrep.2018.06.003
- Tunney, R. J., and James, R. J. E. (2017). Criteria for conceptualizing behavioural addiction should be informed by the underlying behavioural mechanism. *Addiction* 112, 1720–1721. doi: 10.1111/add.13831
- Van Rooij, A. J., Kuss, D. J., Griffiths, M. D., Shorter, G. W., Schoenmakers, T. M., and Van De Mheen, D. (2014). The (co-) occurrence of problematic video gaming, substance use, and psychosocial problems in adolescents. *J. Behav. Addict.* 3, 157–165. doi: 10.1556/JBA.3.2014.013
- Van Rooij, A. J., Van Looy, J., and Billieux, J. (2017). Internet gaming disorder as a formative construct: implications for conceptualization and measurement. *Psychiatry Clin. Neurosci.* 71, 445–458. doi: 10.1111/pcn.12404
- Wang, C. W., Ho, R. T., Chan, C. L., and Tse, S. (2015). Exploring personality characteristics of Chinese adolescents with internet-related addictive behaviors: trait differences for gaming addiction and social networking addiction. *Addict. Behav.* 42, 32–35. doi: 10.1016/j.addbeh.2014.10.039
- Wang, H. R., Cho, H., and Kim, D. J. (2018). Prevalence and correlates of comorbid depression in a nonclinical online sample with DSM-5 internet gaming disorder. *J. Affect. Disord.* 226, 1–5. doi: 10.1016/j.jad.2017.08.005
- Wei, H. T., Chen, M. H., Huang, P. C., and Bai, Y. M. (2012). The association between online gaming, social phobia, and depression: an internet survey. *BMC Psychiatry* 12:92. doi: 10.1186/1471-244X-12-92
- World Health Organization (2018). *ICD-11 Beta Draft—Mortality and Morbidity Statistics*. Available at: <https://icd.who.int/browse11/l-m/en> (accessed July 12, 2019).
- Yan, W., Li, Y., and Sui, N. (2014). The relationship between recent stressful life events, personality traits, perceived family functioning and internet addiction among college students. *Stress Health* 30, 3–11. doi: 10.1002/smi.2490
- Yee, N. (2006). Motivations for play in online games. *Cyberpsychol. Behav.* 9, 772–775. doi: 10.1089/cpb.2006.9.772
- Yen, J. Y., Yeh, Y. C., Wang, P. W., Liu, T. L., Chen, Y. Y., and Ko, C. H. (2018). Emotional regulation in young adults with Internet gaming disorder. *Int. J. Environ. Res. Public Health* 15:30. doi: 10.3390/ijerph15010030
- Zastrow, M. (2017). News feature: is video game addiction really an addiction? *Proc. Natl. Acad. Sci. U.S.A.* 114, 4268–4272. doi: 10.1073/pnas.1705077114
- Zhong, Z. J. (2011). The effects of collective MMORPG (Massively Multiplayer Online Role-Playing Games) play on gamers' online and offline social capital. *Comput. Hum. Behav.* 27, 2352–2363. doi: 10.1016/j.chb.2011.07.014
- Zuber, C., Zibung, M., and Conzelmann, A. (2015). Motivational patterns as an instrument for predicting success in promising young football players. *J. Sports Sci.* 33, 160–168. doi: 10.1080/02640414.2014.928827

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 © 2019 Musetti, Mancini, Corsano, Santoro, Cavallini and Schimmenti. 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 Potential Role of the Early Maladaptive Schema in Behavioral Addictions Among Late Adolescents and Young Adults

Matteo Aloï¹, Valeria Verrastro², Marianna Rania¹, Raffaella Sacco¹,
Fernando Fernández-Aranda^{3,4,5}, Susana Jiménez-Murcia^{3,4,5}, Pasquale De Fazio¹ and
Cristina Segura-García^{2*}

¹ Department of Health Sciences, University "Magna Graecia" of Catanzaro, Catanzaro, Italy, ² Department of Medical and Surgical Sciences, University "Magna Graecia" of Catanzaro, Catanzaro, Italy, ³ Department of Psychiatry, Bellvitge University Hospital, IDIBELL, Barcelona, Spain, ⁴ CIBER Fisiopatología de la Obesidad y Nutrición, Instituto de Salud Carlos III, Barcelona, Spain, ⁵ Department of Clinical Sciences, School of Medicine and Health Sciences, University of Barcelona, Barcelona, Spain

OPEN ACCESS

Edited by:

Adriano Schimmenti,
Kore University of Enna, Italy

Reviewed by:

Silvia Casale,
University of Florence, Italy
Marco Di Nicola,
Agostino Gemelli University Policlinic,
Italy

*Correspondence:

Cristina Segura-García
segura@unicz.it

Specialty section:

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

Received: 11 October 2019

Accepted: 20 December 2019

Published: 21 January 2020

Citation:

Aloï M, Verrastro V, Rania M,
Sacco R, Fernández-Aranda F,
Jiménez-Murcia S, De Fazio P and
Segura-García C (2020) The Potential
Role of the Early Maladaptive Schema
in Behavioral Addictions Among Late
Adolescents and Young Adults.
Front. Psychol. 10:3022.
doi: 10.3389/fpsyg.2019.03022

Background: Behavioral addiction (BA) is a recent concept in psychiatry. Few studies have investigated the relationship between BA and early maladaptive schemas (EMSs). EMS is the core of Schema Therapy (ST). According to the ST model, psychiatric disorders result from the development of EMSs in response to unmet emotional needs in childhood. Bach et al. (2018) grouped the 18 EMSs into four domains: (1) *disconnection and rejection*; (2) *impaired autonomy and performance*; (3) *excessive responsibility and standards*; and (4) *impaired limits*. This study aims to assess the possible association of the most frequent BAs with EMSs in a large group of late adolescents and young adults and to evaluate their self-perceived quality of life (QoL).

Methods: A battery of psychological tests assessing food addiction (FA), gambling disorder (GD), internet addiction (IA), and QoL was administered to 1,075 late adolescents and young adults ($N = 637$; 59.3% women). A forward-stepwise logistic regression model was run to identify which variables were associated with BAs.

Results: Food addiction was more frequent among women and GD among men, while IA was equally distributed. Regarding the EMSs, participants with FA or IA showed significantly higher scores on all four-schema domains, whereas those with GD exhibited higher scores on *impaired autonomy and performance* and *impaired limits*. Besides, average scores of all domains increased with the association of two or more comorbid BAs. Self-perceived QoL was lower for participants with FA and IA, but not for those with GD; the presence of comorbid BAs was associated with lower Physical Component Summary (PCS) and Mental Component Summary (MCS) scores. Finally, specific EMS domains and demographic variables were associated with each BA.

Conclusion: Late adolescents and young adults with FA or IA have a lower perception of their mental and physical health. The most striking result is that FA appears to be

associated with the *disconnection and rejection* schema domain, IA with all the schema domains (except for *impaired autonomy and performance*), and GD with *impaired autonomy and performance* schema domain. In conclusion, our findings suggest that EMS should be systematically assessed during psychotherapy of patients with BAs.

Keywords: behavioral addiction, early maladaptive schemas, food addiction, internet addiction, gambling disorder, adolescents

INTRODUCTION

The construct of behavioral addictions (BAs) is a recent concept in psychiatry. In fact, it was first included in 2013 in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as an official psychiatric diagnosis. So, in clinical practice, it is necessary to distinguish between substance and BAs. In fact, even if BAs do not appear in the DSM-5, except for gambling disorder (GD) and Internet gaming disorder (IGD, which is included in Section III among the “Conditions for Further Study”), they share the following characteristics with substances addiction: the age of onset in adolescence and early adulthood, the specific features (i.e., impaired control, functional impairment, and persisting engagement in the behavior despite negative consequences), and the clinical course (Sussman et al., 2017).

Other problematic behaviors, such as food addiction (FA) and Internet addiction (IA), have aroused interest in recent years (Jiménez-Murcia et al., 2017; Romero et al., 2019). Although there are still insufficient data to allocate these disorders into the diagnostic category of psychiatric disorders, they seem to share many clinical characteristics with BAs (Meule and Gearhardt, 2014; Petry et al., 2018). The notion of FA theorizes that individuals experience addictive-like symptoms related to the consumption of high calorie/palatable foods, which leads to clinically significant impairment or distress on several areas of functioning (Gearhardt et al., 2011). Recently, researchers in the field of eating disorders (EDs) have claimed that FA should be comprised within the spectrum of EDs (Wiss and Brewerton, 2017; Fernandez-Aranda et al., 2018; Jiménez-Murcia et al., 2019); on the contrary, others believe that FA does not yet have enough evidence to be an independent nosographic category (Hebebrand et al., 2014). Regarding IA, it may be considered an autonomous nosographic entity from IGD given that the problematic or excessive use of the Internet is not necessarily related to gaming for many people (Griffiths and Pontes, 2014). Recent findings demonstrate that even if IGD and IA can share online gaming, distinctive characteristics of IA are online chatting and social networking, while male gender is distinctive of IGD (Király et al., 2014). Consequently, data seem to support the notion that IA and IGD are distinct nosological entities.

All of these addictions, however, are associated with a pattern of emotional dysregulation and cognitive distortions, which are typical of behaviors that people use to seek immediate gratification. It has been hypothesized that dysfunctional behavior could be a maladaptive strategy for dealing with negative emotions and feelings, such as frustration, inadequacy,

and isolation (Zeeck et al., 2010). Furthermore, many studies have reported poor quality of life (QoL) among people with BAs because they are associated with physical comorbidities (i.e., withdrawal symptoms), social problems (i.e., isolation and social withdrawal, problems at work or at home), psychiatric disorders (i.e., depression, anxiety), and lower life satisfaction (Hoseinifar et al., 2011; Lu et al., 2018; Wang et al., 2019). For this reason, behavioral addicts need much help and support. Besides, gender seem to moderate the link between BAs and their clinical phenotype. In fact, recent findings showed that while GD was more frequent among males than females (Fröberg et al., 2015; Di Nicola et al., 2017; Carneiro et al., 2019), IA did not show a gender-related trend (McNicol and Thorsteinsson, 2017; Li et al., 2019) and FA was more frequent among females (Aloi et al., 2017; Borisenkov et al., 2018; Magyar et al., 2018).

Perhaps the most relevant point to highlight is that research has mainly focused on the presence/absence of symptoms of BAs, whereas the etiological processes and peculiar characteristics of BAs have rarely been investigated. Moreover, some of these symptoms, such as withdrawal and tolerance, are difficult to apply and measure in relation to behaviors (Starcevic, 2016; Kardefelt-Winther et al., 2017).

According to the theoretical model of Schema Therapy (ST), psychiatric disorders might result from the formation of early maladaptive schemas (EMSs) in response to unmet needs in childhood. EMSs are defined as “extremely stable and enduring themes, comprised of memories, emotions, cognitions, and bodily sensations regarding oneself and one’s relationship with others, that develop during childhood and are elaborated on throughout the individual’s lifetime, and that are dysfunctional to a significant degree” (Young et al., 2003). The new proposed model (Bach et al., 2018) grouped 18 EMSs into four specific domains: (1) *disconnection and rejection*: All the schemas of this domain are associated with a lack of security, safety, and stability in interpersonal relationships; (2) *impaired autonomy and performance*: People with schemas of this domain perceive themselves as insecure and suffer from a lack of autonomy, i.e., they are afraid that autonomous decisions may damage important relationships, or they expect to fail in situations where they must provide a performance; (3) *excessive responsibility and standards*: People with patterns in this domain typically put the needs, desires and wishes of others before their own, and, as a result, many of their efforts are directed toward satisfying the wishes of others; and (4) *impaired limits*: A lack of internal limits, an inability to form long-term goals, and a lack of responsibility to others.

Many studies have found that EMSs are associated with the development of personality disorders (Sempértegui et al., 2013) and other psychopathological conditions (Basile et al., 2017; Aloi et al., 2019; Rania et al., 2019). EMSs have also recently been investigated in samples with GD (Shorey et al., 2012) and substance-use disorders (SUDs) (Shorey et al., 2013, 2014), but only a few studies have investigated the relationship between BAs and EMSs (Elmqvist et al., 2016; Shajari et al., 2016; Imperatori et al., 2017). From the literature, it appears that GD patients are characterized by numerous EMSs, in particular by the schema domain *impaired autonomy and performance* (Shorey et al., 2012). IA seems to be associated with all the schema domains (Shajari et al., 2016). Finally, researchers found that the *disconnection/rejection* schema domain was independently associated with FA severity, suggesting that this domain may be a crucial factor for the development of FA (Imperatori et al., 2017).

Based on the above, this study has two aims:

- (1) To assess the possible association of specific BAs (i.e., FA, IA, and GD) with EMSs and gender in a large group of late adolescents and young adults. More in detail, according to the previous research, we expect to find: FA associated with the *disconnection and rejection* schema domain; IA associated with all the schema domains; and, GD associated with *impaired autonomy and performance* schema domain. Regarding the possible role of gender in the development of BAs, we suppose to find the male gender associated with GD, the female gender with FA, and no gender difference on IA.
- (2) To evaluate their self-perceived QoL; in particular, we expect to find a worse QoL among participants with any BAs.

MATERIALS AND METHODS

Participants and Procedure

First- and third-year university students and senior high school students from the same catchment area in southern Italy participated in the research.

Through an anonymous online survey, the participants completed an informed consent form and the questionnaires, and they also provided their heights and weights. Answers of participants who did not complete all items were dropped from the electronic database automatically. Anonymity was guaranteed through the use of nicknames (formed by at least eight alphanumeric and symbol characters). No grant or economic compensation was offered to participants.

The final sample consisted of 1,075 participants ($N = 637$; 59.3% women) with a mean age of 19.69 ± 1.7 (17–24) years old; 810 (80.5%) participants had middle school diplomas while 210 (19.5%) had high school diplomas. All participants were Caucasian. The present study was carried out in accordance with the latest version of the Declaration of Helsinki and was approved by the local Ethical Committee. All participants provided informed consent before participating and parental consent was sought for those younger than 18 years of age.

Measures

Young Schema Questionnaire Short Form-3

The Young Schema Questionnaire Short Form-3 (YSQ-S3) is a self-report instrument that consists of 90 items rated on a six-point scale (from “completely untrue of me” to “describes me perfectly”) that accounts for 18 EMSs (Young, 2005). Different validations of YSQ-S3 in various languages suggest that the YSQ-S3 is a sound instrument for measuring schemas, including factorial validity and test–retest stability as well as convergent and discriminant validity.

These EMSs are grouped together into four domains: *disconnection and rejection*, *excessive responsibility and standards*, *impaired autonomy and performance*, and *impaired limits* (Bach et al., 2018). Internal consistency of the four domains were: *disconnection and rejection* 0.919, *impaired autonomy and performance* 0.904, *excessive responsibility and standards* 0.791, and *impaired limits* 0.834, indicating very good reliability.

Internet Addiction Test

The Internet Addiction Test (IAT) is a self-report test that assesses problematic Internet use and consists of 20 items on 5-point Likert-type (Young, 1998; Servidio, 2017). The total scores range from 20 to 100. According to Young's criteria, total IAT scores of from 20 to 49 denote an average internet user, who can sometimes use the web a little too long without losing control of the situation; scores 50–79 denote over-users with frequent problems due to their Internet usage; scores 80–100 denote a use of the Internet that is very intense and causes significant problems for the person. In the current study, we used the cut-off 80–100 to diagnose IA. Cronbach's alpha in this study was 0.879.

South Oaks Gambling Screen

South Oaks Gambling Screen (SOGS) is the most widely known and used questionnaire for the screening of GDs and is composed of 16 questions, including 37 items, which ask the subjects about their gambling activity and associated behaviors throughout their lifetime. There are 20 scoring items, all equally weighed, requiring a “yes” or “no” answer, so scores range from 0 to 20 (Lesieur and Blume, 1987; Barbaranelli et al., 2013). Scores 3 to 4 indicate at-risk gambling, scores ≥ 5 indicate problematic gambling and ≥ 9 indicate a serious GD. In this study, we used the cut-off SOGS ≥ 9 to diagnose GD. Cronbach's alpha in the present research was 0.848.

Yale Food Addiction Scale 2.0

The Yale Food Addiction Scale 2.0 (YFAS 2.0) evaluates addiction-like eating behavior over the preceding 12 months (Gearhardt et al., 2016; Aloi et al., 2017). It consists of 35 items, which are scored on an eight-point scale ranging from never (score = 0) to every day (score = 7) to assess symptoms related to the 11 diagnostic criteria for substance-related and addictive disorders (SRAD) of DSM-5. The 11 symptoms of FA following the DSM-5 criteria of SRAD are: overeating (Criterion 1), desire to cut down (Criterion 2), time spent (Criterion 3), craving (Criterion 4), related impairment (work/school, family, social relationship) (Criteria 5–7), risky use (physically hazardous, detrimental physical/psychological

consequences) (Criteria 8–9), tolerance (Criterion 10), and withdrawal (Criterion 11).

Each of the 11 diagnostic criteria was considered present if one or more of the relevant questions for each criterion reached the threshold. For the specific threshold of each item, it is possible to recover them in the validation of the scale¹. Two types of scoring are possible: (1) a final symptom-count score can be calculated by adding up all of the endorsed symptoms; (2) the severity level is described according to the diagnostic thresholds for SRAD in DSM-5: mild FA (2–3 symptoms), moderate FA (4–5 symptoms), and severe FA (≥ 6 symptoms). Finally, every FA “diagnosis” requires the presence of the distress or impairment criteria. In this study, we used the cut-off ≥ 6 symptoms (severe FA) to diagnose FA. Kuder–Richardson’s alpha for dichotomous variables was run and in this study was 0.880.

Short Form-12 Health Survey

The Short Form-12 Health Survey (SF-12) is a widely used instrument for assessing QoL and consists of 12 items derived from the SF-36 (Ware et al., 1996; Apolone et al., 2001). These items are grouped into two domains, named Physical Component Summary (PCS) and Mental Component Summary (MCS), both including six items. Responses to questions are dichotomous (yes/no), ordinal (excellent to poor), or expressed by a frequency (always to never). The total score ranges from 0 to 100, with higher scores referring to higher QoL. In this study, Cronbach’s alpha coefficient for the PCS-12 and MCS-12 scores were 0.84 and 0.81, respectively.

Statistical Analysis

Data analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 21.0 (SPSS 21.0; SPSS Inc., Chicago, IL, United States). Descriptive statistics included frequencies and percentages, and means and standard deviations, as appropriate. Differences between groups were assessed with chi-squared for categorical variables and *t*-tests or ANOVA for continuous data, as appropriate. Additionally, Cohen’s *d* or η^2 were, respectively, calculated for significant results in *t*-tests or ANOVA as measures of effect size (ES). Values of 0.2, 0.6, 1.2, and > 1.2 can be, respectively, categorized into slight, small, moderate, and large ES for Cohen’s *d* (Cohen, 1988). In the case of η^2 values of 0.01, 0.06, and 0.14 indicate small, medium, and large ES (Levine and Hullett, 2002). A forward-stepwise logistic regression model was run to identify which variables were associated with BAs. In all cases, differences were considered to be significant when $p < 0.05$.

RESULTS

Table 1 describes the differences between males and females. Average scores of questionnaires assessing dysfunctional behaviors are as follows: YFAS total present criteria = 1.25 ± 2.3 (0–11); SOGS = 0.6 ± 1.7 (0–16); IAT = 40.1 ± 11.4 (20–85). Overall, 88 (8.2%) participants were positive to YFAS 2.0,

184 (17.1%) to IAT, and 73 (6.8%) to SOGS; besides, among these, 50 participants were positive to two tests (20 IAT/YFAS, 20 IAT/SOGS, 10 SOGS/YFAS) and only 3 participants were simultaneously positive to all measures. FA was more frequent among women, and GD was more frequent among men, while IA was equally distributed (**Table 1**).

Table 2 summarizes the results of the comparison between BAs and YSQ-S3 domains. Participants who had positive scores with the YFAS 2.0 and the IAT showed significantly higher scores on all four-schema domains, whereas participants who were positive on the SOGS exhibited higher scores on the *impaired autonomy and performance* and *impaired limits* schema domains. As displayed on the last row of the table, average scores of all domains increased with the association of two or more comorbid BAs.

Table 3 displays the findings of the comparison of SF-12 dimensions between participants with and without each BA. Individuals who were positive to the YFAS 2.0 and the IAT showed significantly lower scores on both PCS and MCS. No differences in self-perceived QoL was evident between participants who were positive and negative to the SOGS. The presence of comorbid BAs was associated to lower PCS and MCS scores.

The results of the logistic regression models are shown in **Table 4**. Female gender, higher BMI, and the *disconnection and rejection* schema domain scores were associated with YFAS 2.0 positivity. Younger age and higher scores in the *disconnection and rejection*, *excessive responsibility and standards*, and *impaired limits* schema domains were associated with IAT positivity. Finally, male gender and impaired autonomy and performance were associated with being positive to the SOGS.

DISCUSSION

The study aimed to assess the possible association of some BAs (i.e., FA, IA, and GD) with EMS and at evaluating their self-perceived QoL. To the best of our knowledge, this is the first study regarding the investigation of EMSs on BA in a very large sample of young people ($n = 1075$) according to the new four schema domains model proposed by Bach et al. (2018).

Thirty-two percent of participants had positive results to at least one BA. IA was the most frequent (17.1%), followed by FA (8.1%), and then GD (6.8%).

Regarding gender distribution, in our study we found a different distribution between participants who scored positively to BAs. GD was more likely to occur among males, as previous reports have indicated (Kristiansen and Jensen, 2011; Fröberg et al., 2015). The present results are in line with another Italian study that assessed GD together with other addictions among adolescents (Di Nicola et al., 2017). FA was more frequent among females. Other authors have previously found the same trend at a lower rate (5.5% for females versus 0.8% for males) in young adults without obesity or other comorbidities (Aloi et al., 2017), which agrees with most recent investigations (Pursey et al., 2014; Mies et al., 2017; Borisenkov et al., 2018; Magyar et al., 2018). On the other hand, IA did not show a

¹https://static-content.springer.com/esm/art%3A10.1007%2F840519-017-0421-x/MediaObjects/40519_2017_421_MOESM1_ESM.docx

TABLE 1 | Sample demographics and distribution of behavioral addictions.

		Females		Males		Statistics	<i>p</i>	<i>d</i> / ϕ^c
Age ^a		18.8	(1.7)	18.6	(1.7)	$t = 1.491$	0.136	
BMI ^a		21.6	(3.6)	23.2	(3.7)	$t = -7.389$	< 0.001	0.44
YFAS 2.0 ^b	Negative	576	(90.4)	411	(93.8)	$\chi^2 = 4.020$	0.045	0.06
	Positive	61	(9.6)	27	(6.2)			
SOGS ^b	Negative	625	(98.2)	377	(86.1)	$\chi^2 = 59.471$	< 0.001	0.24
	Positive	12	(1.8)	61	(13.9)			
IAT ^b	Negative	533	(83.7)	358	(81.7)	$\chi^2 = 0.687$	0.407	
	Positive	104	(16.3)	80	(18.3)			

^aResults are presented as means (SD). ^bResults are presented as frequencies (%). BMI, Body Mass Index; YFAS 2.0, Yale Food Addiction Scale 2.0; SOGS, South Oaks Gambling Screen; IAT, Internet Addiction Test. ^cOnly effect sizes of significant differences are displayed. Cohen's *d* for continuous variables and ϕ for categorical variables.

TABLE 2 | Comparison between behavioral addictions and YSQ-S3 domains.

		Disconnection and Rejection		Impaired autonomy and performance		Excessive responsibility and standards		Impaired limits	
YFAS 2.0 ^a	Negative	2.1	(0.9)	1.8	(0.7)	2.8	(0.9)	2.4	(0.9)
	Positive	3.3	(1.1)	2.7	(1.0)	3.5	(0.9)	3.1	(0.9)
	<i>t</i>	-11.414		-9.933		-6.743		-6.866	
	<i>p</i>	<0.001		<0.001		<0.001		<0.001	
	<i>d</i> ^b	1.19		1.04		0.78		0.78	
SOGS ^a	Negative	2.2	(1.0)	1.9	(0.8)	2.8	(0.9)	2.4	(0.9)
	Positive	2.4	(1.2)	2.2	(1.1)	2.9	(1.2)	2.8	(1.1)
	<i>t</i>	-1.806		-3.491		-0.547		-3.258	
	<i>p</i>	0.071		0.001		0.584		0.001	
	<i>d</i> ^b			0.31				0.40	
IAT ^a	Negative	2.1	(0.9)	1.8	(0.8)	2.8	(0.9)	2.3	(0.9)
	Positive	2.7	(1.1)	2.3	(0.9)	3.0	(1.0)	2.9	(1.0)
	<i>t</i>	-7.786		-8.142		-2.836		-7.172	
	<i>p</i>	<0.001		<0.001		0.005		0.001	
	<i>d</i> ^b	0.60		0.59		0.21		0.63	
BA comorbidity	Negative	2.1	(0.9)	1.8	(0.7)	2.8	(0.9)	2.3	(0.9)
	Positive 1 BA	2.6	(1.1)	2.3	(0.9)	3.0	(1.0)	2.8	(1.0)
	Positive > 1 BA	3.2	(1.2)	2.7	(1.0)	3.2	(1.1)	3.1	(1.1)
	<i>F</i>	64.539		68.984		13.466		46.332	
	<i>p</i>	<0.001		<0.001		<0.001		<0.001	
	η^2	0.107		0.114		0.025		0.080	

^aResults are presented as means (SD). ^bOnly effect sizes of significant differences are displayed. YSQ-S3, Young Schema Questionnaire Short Form 3; YFAS 2.0, Yale Food Addiction Scale 2.0; IAT, Internet Addiction Test; SOGS, South Oaks Gambling Screen; BA, Behavioral Addiction.

TABLE 3 | Comparison between behavioral addictions and SF-12 dimensions.

		SF-12 PCS		Statistics	<i>p</i>	ES ^b	SF-12 MCS		Statistics	<i>p</i>	ES ^b
YFAS 2.0 ^a	Negative	52.5	(6.4)	$t = 3.246$	0.001	$d = 0.34$	43.2	(10.8)	$t = 7.823$	<0.001	$d = 0.87$
	Positive	50.1	(7.5)				33.8	(10.9)			
SOGS ^a	Negative	52.3	(6.4)	$t = 0.960$	0.337		42.3	(11.1)	$t = -1.098$	0.272	
	Positive	51.6	(7.7)				43.8	(10.1)			
IAT ^a	Negative	52.5	(6.3)	$t = 2.597$	0.010	$d = 0.21$	43.1	(11.0)	$t = 4.859$	<0.001	$d = 0.39$
	Positive	51.1	(7.2)				38.8	(10.8)			
BA comorbidity	Negative	52.7	(6.2)	$F = 7.023$	0.001	$\eta^2 = 0.013$	43.9	(10.7)	$F = 27.504$	<0.001	$\eta^2 = 0.049$
	Positive 1 BA	51.6	(6.9)				38.1	(11.2)			
	Positive > 1 BA	49.6	(8.2)				37.7	(11.3)			

^aResults are presented as means (SD). ^bOnly effect sizes of significant differences are displayed. SF-12 PCS, Short Form-12 Health Survey Physical Component Summary; SF-12 MCS, Short Form-12 Health Survey Mental Component Summary; YFAS 2.0, Yale Food Addiction Scale 2.0; SOGS, South Oaks Gambling Screen; IAT, Internet Addiction Test; ES, Effect size; BA, Behavioral Addiction.

TABLE 4 | Results of logistic regression analysis.

Dependent variable	Independent variables	B	Standard Error	Wald	p	Exp(B)
YFAS 2.0 ^a	Categorical BMI	0.118	0.026	19.898	< 0.001	1.125
	YSQ-S3 Disconnection and Rejection	0.986	0.110	79.960	< 0.001	2.680
	Gender	−0.668	0.268	6.218	0.013	0.513
IAT ^b	YSQ-S3 Disconnection and Rejection	0.445	1.270	7.270	0.007	1.560
	YSQ-S3 Excessive responsibility and standards	−0.698	0.154	20.441	< 0.001	0.498
	YSQ-S3 Impaired limits	0.492	0.150	10.743	0.001	1.635
	Age	−0.166	0.068	5.936	0.015	0.847
SOGS ^c	YSQ-S3 Impaired autonomy and performance	0.484	0.127	14.460	< 0.001	1.623
	Gender	2.199	0.325	45.724	< 0.001	9.016

YFAS 2.0, Yale Food Addiction Scale 2.0; IAT, Internet Addiction Test; SOGS, South Oaks Gambling Screen; BMI, Body Mass Index; YSQ-S3, Young Schema Questionnaire Short Form 3. ^aModel 1. Dependent variable: YFAS 2.0; $-2\log$ Likelihood = 487.566; Nagelkerke $R^2 = 0.246$. ^bModel 2. Dependent variable: IAT; $-2\log$ Likelihood = 890,515; Nagelkerke $R^2 = 0.138$. ^cModel 3. Dependent variable: SOGS; $-2\log$ Likelihood = 458,896; Nagelkerke $R^2 = 0.171$.

gender-related trend, with similar frequency results among males and females. Another recent cross-cultural study of problematic Internet usage in Europe described significantly higher scores in women (26%) than among men (22%). This higher trend for women was explained with the assumption that women are more prone to use online activities and social networks (Laconi et al., 2018). Nevertheless, data regarding the Italian sample showed similar rates of IA between males and females as in the present study.

Participants who were screened positive to BAs expressed significantly higher values in their schema-domain scores. All four schema-domains results were more expressed in participants who were positive to FA and IA. Instead, a more specific pattern in maladaptive schemas emerged in people who were affected by GD. *Impaired autonomy and performance and impaired limits* were the schemas that had significantly higher scores among adolescents and young adults with gambling addictions.

According to previous studies that have investigated the association between EMSs and eating psychopathology (Pugh, 2015; Imperatori et al., 2017), our findings showed that participants with FA had higher scores in all four schema domains of the YSQ-S3. Additionally, in our sample, the scores of the *impaired limits* domain were higher in the group of participants who were positive to all three of the investigated BAs. This is consistent with Young and Klosko's (1993) study, which considered the impaired limits domain to be the most closely related to externalizing behavioral problems, such as BAs. We found an association between IA and all EMS domains, as did Shajari et al. (2016). All the above mentioned gains of interest as the association of more than one BA resulted in higher EMS domains.

Regarding QoL, we found that participants with IAs and FAs had low scores in physical and mental health, which was unlike those with high GD scores.

Our data corroborate the results of previous research about impaired QoL among IA subjects (Fatehi et al., 2016; Karacic and Oreskovic, 2017). IA impairs physical functions as it implies neglecting usual, daily life functioning and the acquisition of some other behaviors that can lead to physical consequences.

Literature on QoL reports poorer values in all dimensions both among normal-weight and obese adolescents with FA

(Tompkins et al., 2017; Nunes-Neto et al., 2018; Wiedemann et al., 2018; Zhao et al., 2018). There is no controversy in the association between FA and the impaired physical and psychological domains, even if previous studies used different instruments to assess QoL dimensions, reporting much more discriminant subdimensions, such as emotional, school, and social functioning (Nunes-Neto et al., 2018; Zhao et al., 2018). We only took into consideration the dimensions of PCS and MCS, so we can only confirm poorer levels in these dimensions.

Quality of life was not found to be impaired among pathological gamblers. On the contrary, other studies found a stronger association with poorer mental health among gamblers than among non-gamblers (Castrén et al., 2013; Ekholm et al., 2018). Our explanation could be the different age among gambling addicts, in fact, somehow, younger gamblers tend to still be in the honeymoon phase of this addiction, while older gamblers have already developed the long-lasting side-effects with the negative physical and psychological consequences. Another explanation of this result could be found in Jiménez-Murcia et al. (2013) study. These authors clustered young pathological gamblers and concluded that three different clusters exist, with differences in terms of gambling severity, and personality and psychopathological measures. According to this clustering, it is possible that the present sample fits with the "High General Functioning (Type I)" phenotype that is characterized by a lower severity of the disorder, general psychopathology, and healthier personality traits. On the other hand, Blaszczynski and Nower (2002) described a subtype of pathological gamblers with an earlier age of onset and lower insight of illness. A final explanation is that adolescents seem to be less able to perceive gambling as a problem, with a discrepancy between self-perception and the objective problematic behaviors of gambling (Cronce et al., 2007).

Interestingly, QoL resulted is affected by the comorbidity between two or more BAs, especially the mental component. In other words, there is a summative effect of behavioral additions on the mental and physical health of young people.

Logistic regression was performed to ascertain if demographic variables or schema domains were candidates for predicting the occurrence of BAs.

Internet addiction was associated with younger people and almost all EMS domains (with the exception of *impaired autonomy and performance*). Many studies have demonstrated its increasingly young age of onset (Durkee et al., 2012; El Asam et al., 2019). This association could be explained by the self-determination theory where people apply some behaviors in order to satisfy three core needs: competence, autonomy, and relatedness (Deci and Ryan, 2000). In fact, children and adolescents could use the Internet as a coping strategy for depressive feelings (Horwitz et al., 2011) resulting from few physical social interactions, which lead them not to feel emotions and mental states such as shame, shyness, inadequacy, and failure (Chak and Leung, 2004). For this reason, it is not surprising that, in our study, almost all the EMS domains were associated with IA. To our knowledge, our results are in line with the only study that investigated the relationship between EMS and IA (Shajari et al., 2016). It found a significant relationship between the five domains of EMS and IA in students.

Food addiction correlated with the female gender, higher BMI, and the *disconnection and rejection* schema domain. This is in line with the only study that investigated the relationship between EMSs and FAs (Imperatori et al., 2017). The authors found that the *disconnection and rejection* schema was associated with FA, suggesting that this domain may play a key role for the development of FA. Additionally, several studies have highlighted how FA positively correlated with the female gender (Aloi et al., 2017; Carr et al., 2017; Rogers, 2017) and BMI (Aloi et al., 2017; Granero et al., 2018). In fact, a higher prevalence of FA was found among obese patients (Gearhardt et al., 2014).

The occurrence of GD was associated with the male gender and with the *impaired autonomy and performance* domain. To our knowledge, only one study has investigated the relationship between potential GD and EMSs in a sample of alcohol-dependent men (Shorey et al., 2012). Shorey et al. (2012) found that many EMSs were associated with gambling – more specifically, the *insufficient self-control* schema was one of the most significant schema among gamblers. This is in line with our results. In fact, the *insufficient self-control* schema falls within the domain of *impaired autonomy and performance*. Concerning the association between the male gender and pathological gambling, several studies have yielded solid results showing how the male gender was more likely to be associated with GD (Potenza et al., 2002; Villeda et al., 2011; Di Nicola et al., 2017).

From the results of the regression analysis, we might think that EMSs could play an important role not only in the development, but also in the maintenance, of BAs. In fact, if by definition, the EMSs are stable and perpetuated over time, when patients with BAs experience emotional triggers, they will reactivate specific EMSs, and this will continue the vicious circle. Just as we said in the introduction, the EMSs are “comprised of memories, emotions, cognitions and bodily sensations regarding oneself and one’s relationship with others,” it could be assumed that many alterations in cognition, in self-perceptions of emotions (i.e., alexithymia), and in the experience of pleasure (i.e., anhedonia), repeatedly reported in the literature among patients with BAs (Guillot et al., 2016; Moccia et al., 2017, 2018), may be associated with the development and perpetuation of EMSs.

Limitations

Although this study has many strengths (i.e., large sample size, assessment of EMSs in a young population with and without Bas, according to the new model proposed by Bach et al., 2018), some limitations must be acknowledged. First, some BAs, such as compulsive buying or compulsive sexual behavior, were not investigated in our research. Second, this is a cross-sectional study, so our conclusions could just infer an association and not causation. Third, the results cannot be generalized to clinical samples because ours was a sample from the general population. Fourth, the presence or absence of BAs was carried out on the basis of self-reported questionnaires, but these data were not confirmed with face-to-face interviews; nevertheless, in order to reduce the possible high rate of false positive participants, we have used the extreme cut-off values of measures to diagnose each BA. Finally, the participants’ personality features were not evaluated and it is known that addictive disorders are often comorbid with personality disorders (i.e., borderline personality disorders) (Brown et al., 2015).

CONCLUSION

Our findings partially confirmed our hypotheses. In fact, mental and physical health perceptions were impaired in IAs and FAs, but not in GDs. Nevertheless, the most striking result is that FA appears to be associated with the *disconnection and rejection* schema domain, IA with all the schema domains (except for *impaired autonomy and performance*), and GD with *impaired autonomy and performance* schema domain. For this reason, EMSs should be systematically assessed within psychotherapy of patients with BAs.

A priori, in line with the concept of personalized and precision medicine, ST could provide a real tailor-made therapy addressing the EMSs that seem to underpin the addictive behavior.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethical Committee of Azienda Ospedaliera Universitaria Mater Domini. Written informed consent to participate in this study was provided by the participants’ legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

CS-G and PD contributed to the conception and design of the study. MA, MR, and RS organized the database. MA and CS-G performed the statistical analysis. MA wrote the first draft of the

manuscript. MR and VV wrote sections of the manuscript. CS-G, PD, SJ-M, and FF-A critically revised the manuscript. All authors contributed to manuscript revision, and read and approved the submitted version.

FUNDING

This manuscript and research was supported by grants from the Ministerio de Economía y Competitividad (PSI2015-68701-R), Instituto de Salud Carlos III (ISCIII) (FIS PI14/00290) and

funded by Delegación del Gobierno para el Plan Nacional sobre Drogas (2017/I067) and co-funded by FEDER Funds/European Regional Development Fund (ERDF), a way to build Europe. CIBERObn is an initiative of ISCIII.

ACKNOWLEDGMENTS

The authors are grateful to all partakers who accepted to participate in this research. FF-A and SJ-M thank CERCA Programme/Generalitat de Catalunya for institutional support.

REFERENCES

- Aloi, M., Rania, M., Caroleo, M., Carbone, E. A., Fazio, G., Calabrò, G., et al. (2019). How are early maladaptive schemas and DSM-5 personality traits associated with the severity of binge eating? *J. Clin. Psychol.* doi: 10.1002/jclp.22900 [Epub ahead of print].
- Aloi, M., Rania, M., Rodríguez Muñoz, R. C., Jiménez-Murcia, S., Fernández-Aranda, F., De Fazio, P., et al. (2017). Validation of the Italian version of the Yale food addiction scale 2.0 (I-YFAS 2.0) in a sample of undergraduate students. *Eat. Weight Disord.* 22, 527–533. doi: 10.1007/s40519-017-0421-x
- Apolone, G., Mosconi, P., Quattrociochi, L., Gianicolo, E. A. L., Groth, N., and Ware, J. J. E. (2001). *Questionario Sullo Stato di Salute Sf-12. Versione Italiana*. Milano: Guerini e Associati Editore.
- Bach, B., Lockwood, G., and Young, J. E. (2018). A new look at the schema therapy model: organization and role of early maladaptive schemas. *Cogn. Behav. Ther.* 47, 328–349. doi: 10.1080/16506073.2017.1410566
- Barbaranelli, C., Vecchione, M., Fida, R., and Podio-Guidugli, S. (2013). Estimating the prevalence of adult problem gambling in Italy with SOGS and PGSI. *J. Gambl. Issues* 1, 1–24. doi: 10.4309/jgi.2013.28.3
- Basile, B., Tenore, K., Luppino, O. I., Mancini, F., and Basile, B. (2017). Schema therapy model applied to OCD. *Clin. Neuropsychiatry* 14, 407–414.
- Błaszczynski, A., and Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction* 97, 487–499. doi: 10.1080/02705060.1995.9663428
- Borisenkov, M. F., Tserne, T. A., and Bakutova, L. A. (2018). Food addiction in Russian adolescents: associations with age, sex, weight, and depression. *Eur. Eat. Disord. Rev.* 26, 671–676. doi: 10.1002/erv.2644
- Brown, M., Allen, J. S., and Dowling, N. A. (2015). The application of an etiological model of personality disorders to problem gambling. *J. Gambl. Stud.* 31, 1179–1199. doi: 10.1007/s10899-014-9504-z
- Carneiro, E., Tavares, H., Sanches, M., Pinsky, I., Caetano, R., Zaleski, M., et al. (2019). Gender differences in gambling exposure and at-risk gambling behavior. *J. Gambl. Stud.* doi: 10.1007/s10899-019-09884-7 [Epub ahead of print].
- Carr, M. M., Catak, P. D., Pejsa-Reitz, M. C., Saules, K. K., and Gearhardt, A. N. (2017). Measurement invariance of the Yale Food Addiction Scale 2.0 across gender and racial groups. *Psychol. Assess.* 29, 1044–1052. doi: 10.1037/pas0000403
- Castrén, S., Basnet, S., Salonen, A. H., Pankakoski, M., Ronkainen, J.-E., Alho, H., et al. (2013). Factors associated with disordered gambling in Finland. *Subst. Abuse Treat. Prev. Policy* 8:24. doi: 10.1186/1747-597X-8-24
- Chak, K., and Leung, L. (2004). Shyness and locus of control as predictors of internet addiction and internet use. *Cyber Psychol. Behav.* 7, 559–570. doi: 10.1089/cpb.2004.7.559
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale: Lawrence Erlbaum Associates Inc.
- Cronce, J. M., Corbin, W. R., Steinberg, M. A., and Potenza, M. N. (2007). Self-perception of gambling problems among adolescents identified as at-risk or problem gamblers. *J. Gambl. Stud.* 23, 363–375. doi: 10.1007/s10899-006-9053-9051
- Deci, E. L., and Ryan, R. M. (2000). The “What” and “Why” of goal pursuits: human needs and the self-determination of behavior. *Psychol. Inq.* 11, 227–268. doi: 10.1207/S15327965PLI1104_01
- Di Nicola, M., Ferri, V. R., Moccia, L., Panaccione, I., Strangio, A. M., Tedeschi, D., et al. (2017). Gender differences and psychopathological features associated with addictive behaviors in adolescents. *Front. Psychiatry* 8:256. doi: 10.3389/fpsy.2017.00256
- Durkee, T., Kaess, M., Carli, V., Parzer, P., Wasserman, C., Floderus, B., et al. (2012). Prevalence of pathological internet use among adolescents in Europe: demographic and social factors. *Addiction* 107, 2210–2222. doi: 10.1111/j.1360-0443.2012.03946.x
- Ekholm, O., Davidsen, M., Larsen, C. V. L., and Juel, K. (2018). A nationwide study of health-related quality of life, stress, pain or discomfort and the use of medicine among problem gamblers. *Scand. J. Public Health* 46, 514–521. doi: 10.1177/1403494817739501
- El Asam, A., Samara, M., and Terry, P. (2019). Problematic internet use and mental health among British children and adolescents. *Addict. Behav.* 90, 428–436. doi: 10.1016/j.addbeh.2018.09.007
- Elmqvist, J., Shorey, R. C., Anderson, S., and Stuart, G. L. (2016). A preliminary investigation of the relationship between early maladaptive schemas and compulsive sexual behaviors in a substance-dependent population. *J. Subst. Use* 21, 349–354. doi: 10.3109/14659891.2015.1029021
- Fatehi, F., Monajemi, A., Sadeghi, A., Mojtahedzadeh, R., and Mirzazadeh, A. (2016). Quality of life in medical students with internet addiction. *Acta Med. Iran.* 54, 663–667.
- Fernández-Aranda, F., Karwautz, A., and Treasure, J. (2018). Food addiction: a transdiagnostic construct of increasing interest. *Eur. Eat. Disord. Rev.* 26, 536–540. doi: 10.1002/erv.2645
- Fröberg, F., Rosendahl, I. K., Abbott, M., Romild, U., Tengström, A., and Hallqvist, J. (2015). The incidence of problem gambling in a representative cohort of Swedish female and male 16–24 Year-Olds by socio-demographic characteristics, in comparison with 25–44 Year-Olds. *J. Gambl. Stud.* 31, 621–641. doi: 10.1007/s10899-014-9450-9459
- Gearhardt, A. N., Boswell, R. G., and White, M. A. (2014). The association of “food addiction” with disordered eating and body mass index. *Eat. Behav.* 15, 427–433. doi: 10.1016/j.eatbeh.2014.05.001
- Gearhardt, A. N., Corbin, W. R., and Brownell, K. D. (2016). Development of the Yale food addiction scale version 2.0. *Psychol. Addict. Behav.* 30, 113–121. doi: 10.1037/adb0000136
- Gearhardt, A. N., Davis, C., Kuschner, R., and Brownell, K. D. (2011). The addiction potential of hyperpalatable foods. *Curr. Drug Abuse. Rev.* 4, 140–145. doi: 10.2174/1874473711104030140
- Granero, R., Jiménez-Murcia, S., Gearhardt, A. N., Agüera, Z., Aymami, N., Gómez-Peña, M., et al. (2018). Corrigendum: validation of the Spanish version of the Yale food addiction scale 2.0 (YFAS 2.0) and clinical correlates in a sample of eating disorder, gambling disorder and healthy control participants. *Front. Psychiatry* 9:321. doi: 10.3389/fpsy.2018.00321
- Griffiths, M. D., and Pontes, H. M. (2014). Internet addiction disorder and internet gaming disorder are not the same. *J. Addict. Res. Ther.* 5:e124. doi: 10.4172/2155-6105.1000e124
- Guillot, C. R., Bello, M. S., Tsai, J. Y., Huh, J., Leventhal, A. M., and Sussman, S. (2016). Longitudinal associations between anhedonia and internet-related addictive behaviors in emerging adults. *Comput. Human Behav.* 62, 475–479. doi: 10.1016/j.chb.2016.04.019
- Hebebrand, J., Albayrak, Ö., Adan, R., Antel, J., Dieguez, C., de Jong, J., et al. (2014). Eating addiction, rather than “food addiction”, better captures addictive-like

- eating behavior. *Neurosci. Biobehav. Rev.* 47, 295–306. doi: 10.1016/j.neubiorev.2014.08.016
- Horwitz, A. G., Hill, R. M., and King, C. A. (2011). Specific coping behaviors in relation to adolescent depression and suicidal ideation. *J. Adolesc.* 34, 1077–1085. doi: 10.1016/j.adolescence.2010.10.004
- Hoseinifar, J., Zirak, S. R., Shaker, A., Meamar, E., Moharami, H., and Siedkalan, M. M. (2011). Comparison of quality of life and mental health of addicts and non-addicts. *Procedia Soc. Behav. Sci.* 30, 1930–1934. doi: 10.1016/j.sbspro.2011.10.375
- Imperatori, C., Innamorati, M., Lester, D., Continisio, M., Balsamo, M., Saggino, A., et al. (2017). The association between food addiction and early maladaptive schemas in overweight and obese women: a preliminary investigation. *Nutrients* 9:1259. doi: 10.3390/nu9111259
- Jiménez-Murcia, S., Agüera, Z., Paslakis, G., Munguia, L., Granero, R., Sánchez-González, J., et al. (2019). Food addiction in eating disorders and obesity: analysis of clusters and implications for treatment. *Nutrients* 11:2633. doi: 10.3390/nu11112633
- Jiménez-Murcia, S., Granero, R., Stinchfield, R., Fernández-Aranda, F., Penelo, E., Savvidou, L. G., et al. (2013). Typologies of young pathological gamblers based on sociodemographic and clinical characteristics. *Compr. Psychiatry* 54, 1153–1160. doi: 10.1016/j.comppsy.2013.05.017
- Jiménez-Murcia, S., Granero, R., Wolz, I., Baño, M., Mestre-Bach, G., Steward, T., et al. (2017). Food addiction in gambling disorder: frequency and clinical outcomes. *Front. Psychol.* 8:473. doi: 10.3389/fpsyg.2017.00473
- Karacic, S., and Oreskovic, S. (2017). Internet addiction and mental health status of adolescents in Croatia and Germany. *Psychiatr. Danub.* 29, 313–321. doi: 10.24869/psyd.2017.313
- Kardefelt-Winther, D., Heeren, A., Schimmenti, A., van Rooij, A., Maurage, P., Carras, M., et al. (2017). How can we conceptualize behavioural addiction without pathologizing common behaviours? *Addiction* 112, 1709–1715. doi: 10.1111/add.13763
- Király, O., Griffiths, M. D., Urbán, R., Farkas, J., Kökönyei, G., Elekes, Z., et al. (2014). Problematic internet use and problematic online gaming are not the same: findings from a large nationally representative adolescent sample. *Cyberpsychol., Behav. Soc. Netw.* 17, 749–754. doi: 10.1089/cyber.2014.0475
- Kristiansen, S., and Jensen, S. M. (2011). Prevalence of gambling problems among adolescents in the Nordic countries: an overview of national gambling surveys 1997–2009. *Int. J. Soc. Welf.* 20, 75–86. doi: 10.1111/j.1468-2397.2009.00701.x
- Laconi, S., Kaliszewska-Czeremska, K., Gnisci, A., Sergi, I., Barke, A., Jeromin, F., et al. (2018). Cross-cultural study of Problematic Internet Use in nine European countries. *Comput. Human Behav.* 84, 430–440. doi: 10.1016/j.chb.2018.03.020
- Lesieur, H. R., and Blume, S. B. (1987). The South Oaks gambling screen (SOGS): a new instrument for the identification of pathological gamblers. *Am. J. Psychiatry* 144, 1184–1188. doi: 10.1176/ajp.144.9.1184
- Levine, T. R., and Hullett, C. R. (2002). Eta Squared, Partial Eta Squared, and Misreporting of Effect Size in Communication Research. *Hum. Commun. Res.* 28, 612–625. doi: 10.1111/j.1468-2958.2002.tb00828.x
- Li, Q., Dai, W., Zhong, Y., Wang, L., Dai, B., and Liu, X. (2019). The mediating role of coping styles on impulsivity, behavioral inhibition/approach system, and internet addiction in adolescents from a gender perspective. *Front. Psychol.* 10:2402. doi: 10.3389/fpsyg.2019.02402
- Lu, L., Xu, D.-D., Liu, H.-Z., Zhang, L., Ng, C. H., Ungvari, G. S., et al. (2018). Internet addiction in Tibetan and Han Chinese middle school students: prevalence, demographics and quality of life. *Psychiatry Res.* 268, 131–136. doi: 10.1016/j.psychres.2018.07.005
- Magyar, É.E., Tényi, D., Gearhardt, A., Jeges, S., Abaliget, G., Tóth, Á.L., et al. (2018). Adaptation and validation of the Hungarian version of the Yale Food addiction scale for children. *J. Behav. Addict.* 7, 181–188. doi: 10.1556/2006.7.2018.03
- McNicol, M. L., and Thorsteinsson, E. B. (2017). Internet addiction, psychological distress, and coping responses among adolescents and adults. *Cyberpsychology. Behav. Soc. Netw.* 20, 296–304. doi: 10.1089/cyber.2016.0669
- Meule, A., and Gearhardt, A. (2014). Food addiction in the light of DSM-5. *Nutrients* 6, 3653–3671. doi: 10.3390/nu6093653
- Mies, G. W., Treur, J. L., Larsen, J. K., Halberstadt, J., Pasman, J. A., and Vink, J. M. (2017). The prevalence of food addiction in a large sample of adolescents and its association with addictive substances. *Appetite* 118, 97–105. doi: 10.1016/j.appet.2017.08.002
- Moccia, L., Mazza, M., Di Nicola, M., and Janiri, L. (2018). The experience of pleasure: a perspective between neuroscience and psychoanalysis. *Front. Hum. Neurosci.* 12:359. doi: 10.3389/fnhum.2018.00359
- Moccia, L., Pettorruso, M., De Crescenzo, F., De Risio, L., di Nuzzo, L., Martinotti, G., et al. (2017). Neural correlates of cognitive control in gambling disorder: a systematic review of fMRI studies. *Neurosci. Biobehav. Rev.* 78, 104–116. doi: 10.1016/j.neubiorev.2017.04.025
- Nunes-Neto, P. R., Köhler, C. A., Schuch, F. B., Solmi, M., Quevedo, J., Maes, M., et al. (2018). Food addiction: prevalence, psychopathological correlates and associations with quality of life in a large sample. *J. Psychiatr. Res.* 96, 145–152. doi: 10.1016/j.jpsychires.2017.10.003
- Petry, N. M., Zajac, K., and Ginley, M. K. (2018). Behavioral addictions as mental disorders: to be or not to be? *Annu. Rev. Clin. Psychol.* 14, 399–423. doi: 10.1146/annurev-clinpsy-032816-045120
- Potenza, M. N., Fiellin, D. A., Heninger, G. R., Rounsaville, B. J., and Mazure, C. M. (2002). Gambling. *J. Gen. Intern. Med.* 17, 721–732. doi: 10.1046/j.1525-1497.2002.10812.x
- Pugh, M. (2015). A narrative review of schemas and schema therapy outcomes in the eating disorders. *Clin. Psychol. Rev.* 39, 30–41. doi: 10.1016/j.cpr.2015.04.003
- Pursey, K., Stanwell, P., Gearhardt, A., Collins, C., and Burrows, T. (2014). The prevalence of food addiction as assessed by the Yale food addiction scale: a systematic review. *Nutrients* 6, 4552–4590. doi: 10.3390/nu6104552
- Rania, M., Aloi, M., Caroleo, M., Carbone, E. A., Fazio, G., Calabrò, G., et al. (2019). ‘Impaired Autonomy and Performance’ predicts binge eating disorder among obese patients. *Eat. Weight Disord.* doi: 10.1007/s40519-019-00747-z
- Rogers, P. J. (2017). Food and drug addictions: similarities and differences. *Pharmacol. Biochem. Behav.* 153, 182–190. doi: 10.1016/j.pbb.2017.01.001
- Romero, X., Agüera, Z., Granero, R., Sánchez, I., Riesco, N., Jiménez-Murcia, S., et al. (2019). Is food addiction a predictor of treatment outcome among patients with eating disorder? *Eur. Eat. Disord. Rev.* 27, 700–711. doi: 10.1002/erv.2705
- Sempértégui, G. A., Karreman, A., Arntz, A., and Bekker, M. H. J. (2013). Schema therapy for borderline personality disorder: a comprehensive review of its empirical foundations, effectiveness and implementation possibilities. *Clin. Psychol. Rev.* 33, 426–447. doi: 10.1016/j.cpr.2012.11.006
- Servidio, R. (2017). Assessing the psychometric properties of the internet addiction test: a study on a sample of Italian university students. *Comput. Human Behav.* 68, 17–29. doi: 10.1016/j.chb.2016.11.019
- Shajari, F., Sohrabi, F., and Jomehri, F. (2016). Relationship between early maladaptive schema and internet addiction: a cross-sectional study. *Asian J. Pharm. Res. Heal. Care* 8:84. doi: 10.18311/ajprhc/2016/4334
- Shorey, R. C., Anderson, S., and Stuart, G. L. (2012). Gambling and early maladaptive schemas in a treatment-seeking sample of male alcohol users. *Addict. Disord. Their Treat.* 11, 173–182. doi: 10.1097/ADT.0b013e31823eda8f
- Shorey, R. C., Anderson, S., and Stuart, G. L. (2013). Early maladaptive schemas of substance abusers and their intimate partners. *J. Psychoactive Drugs* 45, 266–275. doi: 10.1080/02791072.2013.805982
- Shorey, R. C., Stuart, G. L., and Anderson, S. (2014). Differences in early maladaptive schemas between a sample of young adult female substance abusers and a non-clinical comparison group. *Clin. Psychol. Psychother.* 21, 21–28. doi: 10.1002/cpp.1803
- Starcevic, V. (2016). Tolerance and withdrawal symptoms may not be helpful to enhance understanding of behavioural addictions. *Addiction* 111, 1307–1308. doi: 10.1111/add.13381
- Sussman, S., Rozgonjuk, D., and van den Eijnden, R. J. J. M. (2017). Substance and behavioral addictions may share a similar underlying process of dysregulation. *Addiction* 112, 1717–1718. doi: 10.1111/add.13825
- Tompkins, C. L., Laurent, J., and Brock, D. W. (2017). Food addiction: a barrier for effective weight management for obese adolescents. *Child. Obes.* 13, 462–469. doi: 10.1089/chi.2017.0003
- Villella, C., Martinotti, G., Di Nicola, M., Cassano, M., La Torre, G., Gliubizzi, M. D., et al. (2011). Behavioural addictions in adolescents and young adults: results from a prevalence study. *J. Gambl. Stud.* 27, 203–214. doi: 10.1007/s10899-010-9206-9200

- Wang, W., Zhou, D. D., Ai, M., Chen, X. R., Lv, Z., Huang, Y., et al. (2019). Internet addiction and poor quality of life are significantly associated with suicidal ideation of senior high school students in Chongqing. *China. PeerJ* 7:e7357. doi: 10.7717/peerj.7357
- Ware, J., 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
- Wiedemann, A. A., Lawson, J. L., Cunningham, P. M., Khalvati, K. M., Lydecker, J. A., Ivezaj, V., et al. (2018). Food addiction among men and women in India. *Eur. Eat. Disord. Rev.* 26, 597–604. doi: 10.1002/erv.2613
- Wiss, D. A., and Brewerton, T. D. (2017). Incorporating food addiction into disordered eating: the disordered eating food addiction nutrition guide (DEFANG). *Eat. Weight Disord. - Stud. Anorexia, Bulim. Obes.* 22, 49–59. doi: 10.1007/s40519-016-0344-y
- Young, J. E. (2005). *Young Schema Questionnaire – Short form 3 (YSQ-S3)*. New York, NY: Cognitive Therapy Center.
- Young, J. E., and Klosko, J. S. (1993). *Reinventing Your Life*. New York, NY: Plume.
- Young, J. E., Klosko, J. S., and Weishaar, M. E. (2003). *Schema Therapy: A Practitioner's Guide*. New York, NY: The Guilford Press.
- Young, K. S. (1998). Internet addiction: the emergence of a new clinical disorder. *CyberPsychology Behav.* 1, 237–244. doi: 10.1089/cpb.1998.1.237
- Zeeck, A., Stelzer, N., Linster, H. W., Joos, A., and Hartmann, A. (2010). Emotion and eating in binge eating disorder and obesity. *Eur. Eat. Disord. Rev.* 19, 426–437. doi: 10.1002/erv.1066
- Zhao, Z., Ma, Y., Han, Y., Liu, Y., Yang, K., Zhen, S., et al. (2018). Psychosocial correlates of food addiction and its association with quality of life in a non-clinical adolescent sample. *Nutrients* 10:E837. doi: 10.3390/nu10070837

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 Aloi, Verrastro, Rania, Sacco, Fernandez-Aranda, Jiménez-Murcia, De Fazio and Segura-Garcia. 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.



Video Game Addiction and Emotional States: Possible Confusion Between Pleasure and Happiness?

Lucio Gros^{1,2*}, Nicolas Debue¹, Jonathan Lete¹ and Cécile van de Leemput¹

¹ Research Center for Work and Consumer Psychology, Université Libre de Bruxelles, Brussels, Belgium, ² Department of Psychiatry and Neurosciences, Maastricht University, Maastricht, Netherlands

OPEN ACCESS

Edited by:

Adriano Schimmenti,
Kore University of Enna, Italy

Reviewed by:

Kai Müller,
Johannes Gutenberg University
Mainz, Germany
Valentina Boursier,
University of Naples Federico II, Italy

*Correspondence:

Lucio Gros
lucgros@gmail.com

Specialty section:

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

Received: 03 July 2019

Accepted: 06 December 2019

Published: 27 January 2020

Citation:

Gros L, Debue N, Lete J and
van de Leemput C (2020) Video
Game Addiction and Emotional
States: Possible Confusion Between
Pleasure and Happiness?
Front. Psychol. 10:2894.
doi: 10.3389/fpsyg.2019.02894

Internet gaming disorder is characterized by a severely reduced control over gaming, resulting in an increasing gaming time and leading to negative consequences in many aspects of the individual life: personal, family, social, occupational and other relevant areas of functioning (World Health Organization). In the last years, the significant boom in using video games has been raising health issues that remain insufficiently understood. The extent of this phenomenon (the estimated prevalence is between 1.7 and 10% of the general population) has led the mentioned Organization to include gaming disorders in the list of mental health conditions (2018). Several studies show converging findings that highlight the common brain activities between substance use disorders and behavioral addictions (i.e., gaming disorders). Addiction specialists observed that addict subjects tend to confuse pleasure with happiness when linking emotional states to their addictive activities. As far as we know, beyond the mentioned observations, distinguishing the perception of these two emotional states in the frame of an addiction has not been yet the object of formal research. This study aims at examining the possible confusion between pleasure and happiness within the addiction sphere. Video game addiction has been chosen to explore the possible occurrence of this perceptual distortion. A mixed design lab-based study was carried out to compare between video games addicts and non-addicts (between-subjects), and video games-related activities and neutral activities (within-subject). Emotional reactions were gauged by self-reported scales and physiological data acquired through a range of biosensors: Relaxation and Heart Rate. From a therapeutic standpoint, this research intends to explore alternatives to deal with this sort of disorders. More specifically, at the cognitive level, the idea is elaborating guidelines to develop patients' insights into these emotional states and thus increasing their ability to handle them. Overall, several indices resulting from this study constitute a bundle of arguments that argue in favor of the confusion between pleasure and happiness made by addict users when associating their affective states to video gaming. Furthermore, this approach illustrates how reappraising emotions may contribute to reducing the perceptual distortion of these emotional states.

Keywords: video games, addiction, confusion, pleasure and happiness, emotional states

Abbreviations: AU, addict users; EEG, Electroencephalogram; ETR, Emotions Regulation Therapy; GAS, Gaming Addiction Scale; H, happiness; HR, heart rate; I.G.D., Internet Gaming Disorders; NAU, non-addict users; OHQ, Oxford Happiness Questionnaire; P, pleasure; SHAPS, Snaith-Hamilton Pleasure Scale; VG, video games.

INTRODUCTION

In the last years, the significant boom in using video games (VG) has been raising health issues that remain insufficiently understood (Khazaal et al., 2016). The World Health Organization [WHO] (2018) has recently included “gaming disorders” in the list of mental health conditions. According to WHO this affliction is a “persistent or recurrent behavior pattern of sufficient severity to result in significant impairment in personal, family, social, educational, occupational or other important areas of functioning.”

The fifth revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) considers the ‘Internet Gaming Disorder’ as a potential new diagnosis that requires further research (Petry et al., 2015). The prevalence of problematic gaming is estimated to range from 1.7% to over 10% among general population (Griffiths et al., 2012).

Compared to the core topics of research in neuroscience such as stress, depression, etc., the chronic use of VG is a rather recent field of investigation. Yet, a growing number of studies have been produced in this field in the last two decades (Andreassen et al., 2016). Indeed, several research projects have been exploring VG addiction from a behavioral, emotional, brain circuits and genetic perspectives (Griffiths et al., 2012; Dong et al., 2017).

There seems to be converging findings that highlight the common brain activities between VG disorders (belonging to the cluster of behavioral addictions) and substance use disorders (SUD). It has been shown that the dorsolateral prefrontal cortex, orbital frontal cortex, para-hippocampal gyrus and thalamus were activated in both disorders (Han et al., 2011). The limbic structures appear to be the key circuits linked with reward and addiction (Cooper et al., 2017). In subjects suffering from these disorders, cues associated with SUD and with behavioral addiction can trigger craving, which is connected with the dopamine reward system (Ko et al., 2009; Han et al., 2011). In addition, it has been observed that the level of dopamine released in the ventral striatum when playing a competition like video game is comparable to that provoked by psycho-stimulant drugs (Koepp et al., 1998; Yau et al., 2012). Few studies have been carried out on the genetic aspects of this topic. Some of them indicate that there would be genetic background similarities between these two disorders. For example, the homozygous short allelic variant of the 5HTTLPR gene (encoding the serotonin transporter) is more prevalent among the excessive Internet user, which is also linked with increased drug consumption (Serretti et al., 2006, as cited in Yau et al., 2012; Lee et al., 2008, as cited in Yau et al., 2012).

As described later, studying the confusion between pleasure and happiness in the frame of addiction requires as clear a demarcation as possible between these two emotional states. Although a consensus among scientists on how to define and distinguish pleasure and happiness remains to be reached (see next section *Pleasure and Happiness*), in this research we have adopted the following distinctive traits to describe and to work with these two emotional states: *pleasure* relates to a transient emotional state resulting from the satisfaction of a desire, a craving, and *happiness* refers to a lasting emotional state of contentment, euthymia (Pollard, 2003; Lustig, 2017).

According to Lustig (2017), addictions together with depression are two rampant afflictions in the last decades and constitute the harmful extremes of pleasure (associated with the dopaminergic system) and happiness (associated with the serotonergic system) respectively (Üstün et al., 2004; Lepine and Briley, 2011; Szalavitz, 2011; Whiteford et al., 2013; Gowing et al., 2015; Keyes et al., 2015). Based on his long practice on addiction issues, this author argues that confusing pleasure (in the sense of longing, craving, strongly driven by a short term reward) with happiness is linked with SUD and with behavioral addictions (i.e., gambling, eating disorders, excessive use of technology like for example social media and VG, etc.), which could lead to depression (Lawrence et al., 2014). According to the author, confusing pleasure with happiness is related to the growth rate of this disorder insofar as it would encourage seeking immediate gratifications perceived as sources of happiness, which in turn triggers the reward system with the risk to sink into the vicious circle of addiction (Pollard, 2003). Besides, the significant industrial development, through its commercial campaigns, probably tended to lead individuals to equate consumption with happiness (Schmidt, 2016; Lustig, 2017). From a physiological standpoint, the author highlights that an over excited reward system engenders an excess of dopamine (DA) release from the ventral tegmental area, which in return decreases serotonin (5HT) level (associated with depression) (Pollard, 2003; MacNicol, 2016).

Moreover, Lustig underlines that DA and 5HT amino acids (needed for the production of DA and 5HT) share the amino acid transporters, which poses a problem in case of DA amino acid over presence: that is to say, the more amino acids for DA, the less amino acids transporters are available for 5HT amino acids. In short, this DA-5HT unbalance illustrates one of the facets of the DA-5HT interaction in which the low 5HT level, associated with depression, prevents the serotonergic system to exert its inhibitory role to impede the over drive of the dopaminergic system (Esposito et al., 2008).

Chronic stress and anxiety may further aggravate this problem by increasing the cortisol level and thus creating a loop with dopamine activating the sympathetic nerve system and reinforcing the reward seeking behavior while down-regulating 5HT 1α receptor, which decreases the serotonin signaling and increases the depression likelihood (Lustig, 2017). These findings are in line with studies that associate stress, anxiety and depression with Internet gaming disorders (Wenzel et al., 2009; Griffiths et al., 2012).

Fundamentally, from a phylogenetic standpoint, it is likely that pleasure has contributed more than happiness (Pollard, 2003; Lustig, 2017), which could explain the stronger drive of the short term gratifications over the quest for medium and long term euthymia. In sum, this suggests that identifying the possible confusion between the mentioned emotional states associated with the addictive activities may contribute to deepen the understanding of this sort of disorders and consequently to explore new therapeutic options.

The emotional states (and their consequences) associated with VG as felt and perceived by chronic users led to thorough interrogations of health professionals. Several studies intended

to explore this issue by focusing on the individual characteristics of addict players. For instance, the general level of happiness appears to be a firm candidate to predict addiction to VG playing (Hull et al., 2013). In effect, it has been shown that gaming disorders are positively correlated with depression and loneliness and negatively correlated with well-being (Lemmens et al., 2011; Sarda et al., 2016). These two studies relied on a eudaimonic notion of well-being (i.e., life satisfaction, a life well lived). Thus, based on the mentioned definitions of pleasure and happiness, on the semantic net (see **Annex**) and on the analysis made in the next section (Pleasure and Happiness), in this research well-being is assimilated to happiness due to the considerable common ground shared between these two concepts. In line with these findings, another study highlights the association between high frequency of online gaming with depression and social phobia (Wei et al., 2012). Similar results were found in a study in which, compared with no addict Internet user, Internet addict subjects used to play online games reported significantly more depressive symptoms (Geisel et al., 2015).

From a psychological symptoms standpoint, it has also been observed that when playing VG, addict gamers have a sense of well being or euphoria while playing VG, inability to stop the activity, craving more time at playing VG, feeling empty, depressed, irritable when not playing VG, with all the pernicious consequences these symptoms have on the private, social and professional life (Griffiths, 2008). At glance, the coexistence of well being and craving might come across as paradoxical, although the mentioned work (Lustig, 2017) on this issue provides some elements of answer to this finding.

Using a video game clip as a stimulation trial, it has been studied (Kim et al., 2018) the craving state of chronic users when playing VG through measures resulting from addiction questionnaires and several bio signals such as eye blinking, eye saccadic movements, skin conductance and respiratory rate. The results of this work showed that during the stimulation trial video game there was a decrease of eye blinking rate, eye saccadic movement rate and mean amplitude of the skin conductance response whereas there was a significant increase of the mean respiratory rate.

Another study (Lu et al., 2010; as cited in Kim et al., 2018) focused on a group of individuals with high risks of developing Internet gaming disorders (IGD) and their sympathetic nervous system responses. When using Internet in this experiment, increases were observed in blood volume, body temperature and respiratory rate. Heart rate (HR) has also been used as a reliable indicator of craving in subjects with SUD (Kennedy et al., 2015).

Pleasure and Happiness

The psychophysiological and brain mechanisms of *pleasure* and *happiness* are quite complex and probably more research is required to better discerning these processes. Some studies have underlined that the hedonic system includes *wanting* and *liking* and each of these two emotional states may operate in a conscious and unconscious mode (Berridge and Kringelbach, 2011). Studies indicate that unconscious *wanting* would function as a conditioned desire involving the nucleus accumbens, ventral tegmental area, hypothalamus

and dopamine; on the other hand the unconscious *liking* would relate to a sensory hedonic dimension associated with the nucleus accumbens, ventral pallidum, periaqueductal gray, amygdala, opioids and cannabinoids (Kringelbach and Berridge, 2009; Berridge and Kringelbach, 2013). The same studies show that conscious *wanting* would relate to cognitive incentives, subjective desires and dopamine whereas conscious *liking* would be linked with subjective pleasures, opioids and cannabinoids; both would involve the orbitofrontal cortex, anterior cingulate and insular.

It has been shown that the level of activation of some of the mentioned areas would be altered in subjects with Internet gaming disorders: sensing craving for gaming is associated with an increased activation of the left orbitofrontal cortex (correlated with desire for VG play) and with a decreased activation in the anterior cingulate cortex (probably linked with the reduced capacity to inhibit craving for gaming) (Wang et al., 2017).

There might be a relation between the complexity of these brain circuits linked to these emotional states and the polysemy of these two terms, *happiness* and *pleasure*, which may contribute to the possible confusion between them. Indeed, the intense interrelation between them finds expression in subtle distinctive features and in some connotations with vague borders, to the extent that these words might be regarded as almost synonyms. The semantic analysis of these two terms produced in this research intends to show their core meanings, their nuances and the possible intersections between them (Procter, 1985). Trying to unravel and to understand these two emotional states is not a recent endeavor. For instance, Greek thinkers approached the notion of *happiness* as a state constituted by two components: *Hedonia* (pleasure) and *Eudaimonia* (a life well lived) (Kringelbach and Berridge, 2009).

Due to its nature, defining and studying *happiness* is a quite uneasy task. Although progress has been made on this rather recent area of study, there is still a lack of consensus when it comes to defining this concept. Some authors distinguish fluctuating happiness (self centered) from durable, authentic happiness (self-transcendent) (Dambrun et al., 2012). Another study uses the value-arousal model on emotions to define it, according to which *happiness* results from a positive valence, high arousal and engaged and satisfied in life (Cipresso et al., 2014). Lustig (2017) emphasizes the time perspective as one of the distinguishing traits between these two emotional states by opposing the short-term logic of *pleasure* to the longer-term characteristics of *happiness*.

These last two studies are quite illustrative of the differences with regard to defining *happiness*, in particular when it comes to including or not *pleasure* in it. Whilst there seems to be a consensus on “life satisfaction,” “connecting with others” and “contentment” as the main traits of *happiness*, it is less clear whether *pleasure* is part of it. Usually, in the literature there are two understandings to articulate these emotional states: either both (*happiness* and *pleasure*) are seen as inseparable concepts or *happiness* is regarded as a state free from distress (‘liking’ without ‘wanting’) (Kringelbach and Berridge, 2010; Berridge and Kringelbach, 2011; Loonen and Ivanova, 2016; Lustig, 2017). Whether or not *pleasure* is included in the definition of *happiness*,

to the best of our knowledge there is no study that includes *craving* (intense desire, longing) as a trait of *happiness*.

Thus, based on the mentioned definitions and on the association between craving and arousal (Kennedy et al., 2015), craving for playing VG may subscribe itself within the realm of *pleasure*, but stands outside of the *happiness*' sphere.

Within the frame of this research, *Pleasure* refers to the hedonic reward processes driven by a desire to obtain a gratification that can lead to *craving* in certain circumstances (Berridge and Kringelbach, 2011). *Pleasure* has been associated with the dopaminergic circuit which can, in certain circumstances, function in an addictive mode and can affect also habits, conditioning, motivation and executives functions such as decision making, inhibitory control, etc. (Volkow et al., 2011).

Happiness is understood as contentment and euthymic state, in line with a happy emotional state defined by a positive valence and low arousal (Jatupaiboon et al., 2013). Physiologically, this state implies a reposed mind; akin to the relaxation state measured through the brain electrical activity (Teplan and Krakovská, 2009). In the literature this mood is related to the serotonergic circuit (Lustig, 2017).

To the best of our knowledge, there is no existing questionnaire focusing on the association between VG and pleasure/happiness. Thus, our study required a preliminary phase to design such self-report tool whose aim is to explore the perceived emotional states (pleasure/happiness) associated with VG play.

As far as we know, distinguishing the perception of these two emotional states in the frame of an addiction has not been yet the object of formal research, hence the reduced literature on this specific issue, in particular the experimental one.

Consequently this research may be seen as a preliminary study, which aims at examining the possible confusion between pleasure and happiness within the addiction sphere. VG addiction has been chosen to explore the possible occurrence of this perceptual distortion. Emotional reactions of VG addicts and VG non-addicts were gauged via self-report scales and physiological data (Heart rate and Relaxation state) acquired by a range of biosensors.

Resulting from the mentioned background, it is hypothesized that addict VG users:

Are likely to confuse the notions of *pleasure* with that of *happiness* when associating their emotional states to VG play.

The results of this study are expected to show that addict VG users associate happiness with VG activities while feeling craving for playing accompanied by an increased HR and a low relaxation level. Given the shortage of previous researches on the specific issue related to the confusion between pleasure and happiness in VG addiction, the outcome of this study is approached in an exploratory manner.

From a therapy standpoint, this project intends to explore alternatives to deal with this kind of scenarios. More specifically, at the cognitive level, the idea is finding means to develop patients' insights into these emotional states and thus increasing their ability to handle them.

MATERIALS AND METHODS

Preliminary Phase: Design of the "Pleasure and/or Happiness and VG" Questionnaire

Participants

In total 105 VG players participated in this survey, out of which 61 filled all the questionnaires required for the design of the "Pleasure and/or Happiness and VG" questionnaire. The mean age of these 61 participants was 24.28 and the standard deviation 5.48. There were 33 males (54.1%) and 28 females (45.9%). The mean of playtime during working days was 4.49 h and the standard deviation 6.82, and during holidays and weekends 4.68 h and the standard deviation 3.13.

Procedure

An online survey was run via video game forum and Reddit site (network of communities with common interests). The purpose of this survey was to evaluate the internal coherence of our self-report tool (Pleasure and/or Happiness and VG) relative to two validated questionnaires (on Hedonic tone and Happiness). Thus the survey consisted in filling the three questionnaires. Participants completed anonymously and voluntarily the questionnaires through their online gamers groups.

Measures

Two validated and known questionnaires were used to construct the 'Pleasure and/or Happiness and VG' questionnaire through which the emotional states associated with VG activities were evaluated: the Snaith-Hamilton Pleasure Scale (SHAPS) (Snaith et al., 1995), an assessment tool of hedonic tone, and the Oxford Happiness Questionnaire (OHQ) (Hills and Argyle, 2002). The French version of these two questionnaires was used (Loas et al., 1997; Bruchon-Schweitzer and Boujut, 2014).

The abbreviated SHAPS is composed of 14 items to assess the hedonic tone and the absence of it. The answer scale for each item offers four possible options ranging from 'Definitely agree' to 'Strongly disagree.' The OHQ is extensively used to evaluate the individual level of happiness. For each of its 29 items, the answer scale has 6 options going from 'Strongly disagree' to 'Strongly agree.'

Several items of the SHAPS and the OHQ are quite adapted to the VG paradigm and lend themselves to be contextualized. For example, the first item of the SHAPS questionnaire is formulated as: "I would enjoy my favorite television or radio program." In this case "television or radio program" is replaced by "video game." An example of OHQ concerns the item "I am very happy," which became "I am very happy when playing VG." So, these kinds of items constitute the questionnaire whose aim is identifying the emotional states that users associate with VG. Initially, eight items were adapted to VG from these two questionnaires: four items from SHAPS and four items from OHQ. The answer scale provides with six possible options ranging from 'fully disagree' to 'fully agree.'

Statistical Analysis

In order to ensure the usefulness of the designed self-report tool, an Alpha Cronbach test was run on the results of this survey to measure the internal coherence between the 'VG and Pleasure/Happiness' and the two other questionnaires (SHAPS and OHQ). Moreover, it has been examined whether there is a correlation between VG play frequency and the two areas explored in this survey: the general happiness level (OHQ) and the emotional states associated with VG ('Pleasure and/or Happiness and VG').

The Experiment

Participants

The study was announced through the Université Libre de Bruxelles (ULB) scientific social media as well as via leaflets available in public cyber games centers in Brussels. Gamers interested to participate in this study had to answer an on-line survey ($N = 163$), in which the following data was gathered: age, play frequency, name of VG played and a validated test to assess the gaming addiction level (Gaming Addiction Scale, Lemmens et al., 2009). The French version of this scale was used (Gaetan et al., 2014). Being used to play to at least one of these five popular VG (Fornite, Overwatch, League of Legends, Counter-Strike or Rocket League) and an age ranging from 18 to 70 years old were the inclusion criteria. Competing against another team and playing in groups are the common characteristics of these VG. The exclusion criteria were having vision impairments and neurological problems.

Two groups of gamers were invited to participate in this study: addict users (AU) and non-addict users (NAU). None of the invitees met the exclusion criteria. The selection and recruitment were based on the score obtained in the test on gaming addiction, resulting in: AU ($N = 12$) and NAU ($N = 17$) (7 females and 22 males, ranging from 19 to 29 years old). They were all French speakers Belgian residents. The mean age was 23 and the standard deviation of 3. The difference between sexes in terms of VG addiction is not statistically significant (3/7 AU females and 9/22 AU males, $U = 45.5$, $p = 0.130$).

Procedure

This experiment took place within the frame in the usability laboratory of the Research Centre of Work and Consumer Psychology, Université Libre de Bruxelles (ULB).

Before the experiment all the procedures were explained to participants and their consent was asked on formal basis. They were informed that:

- This experiment aims at better understanding the video game phenomenon (without mentioning the issue relative to the emotional states and VG).
- They have to fill several questionnaires (in French).
- Some non-invasive artifacts are set to gather measurements on physiological signals while they watch video clips.
- The Ethical Committee of ULB approved this study in accordance with the Declaration of Helsinki.

The participants were welcome into the testing room of the laboratory by the examiner. They were seated and given an

informed consent form. Once the form was read and signed, the study procedure was explained. Then, the Electroencephalogram (EEG) headset was placed onto the participant's head and an impedance check was run.

Before the beginning of the experiment, each participant chose his/her favorite VG he/she uses to play among the five initially proposed. During the experiment, the examiner observed the participant through a one-way-glass, avoiding interference.

Finally, participants were thanked for their participation, compensated and given information on obtaining the results of the study. The whole experimental run took around 1 h.

Prior to starting the operational phases of the experiment, all devices are set to initiate the baseline recording of all the physiological signals.

Six phases compose this experiment (**Figure 1**). In each phase of the experiment the emotional states associated with VG were examined either through self-report questionnaires or via physiological measures. The physiological measures were recorded during the visioning of two sorts of video clips: VG clips whose aim was to induce craving and neutral video clips (documentaries on nature) intending to reduce craving.

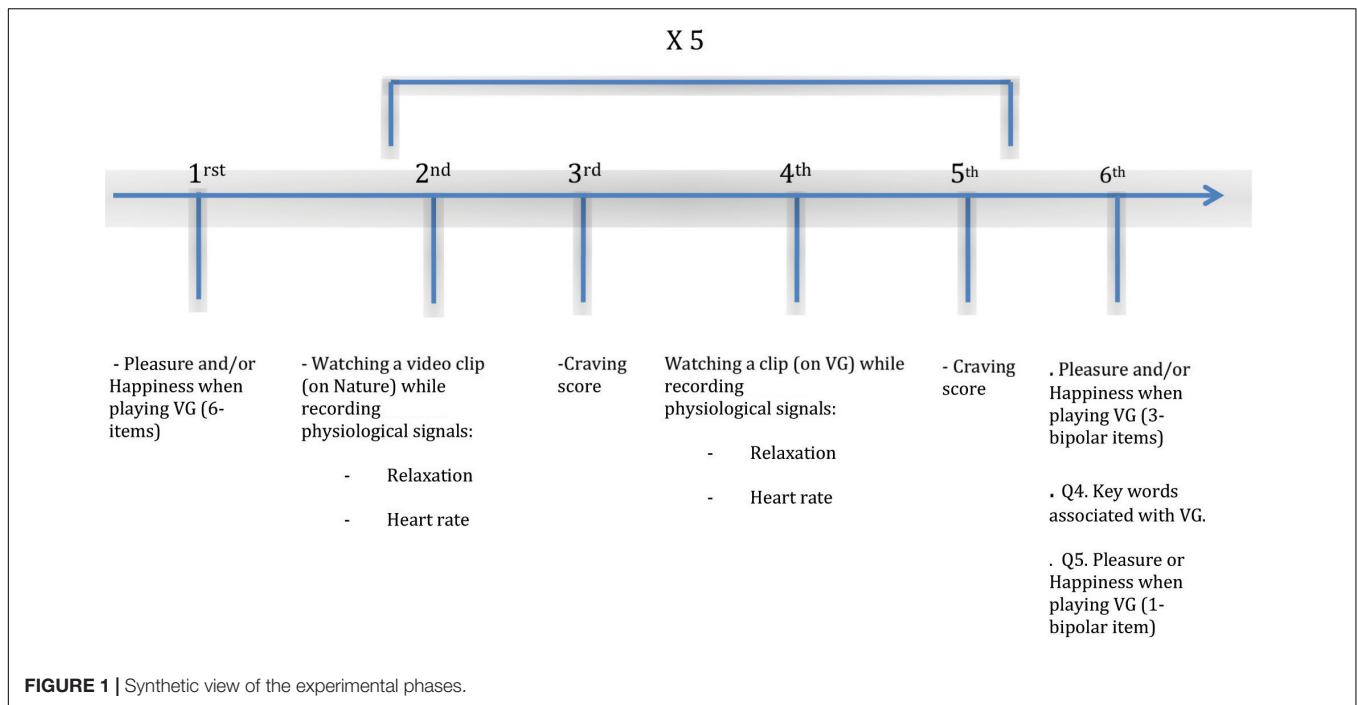
The six experimental phases:

- (1) "Pleasure and/or Happiness and VG" (six items): Participants were invited to fill the self-report questionnaire designed in the preliminary phase.
- (2) Watching a neutral clip during 2 min while recording physiological signals related the mentioned two emotional states. This phase intends to decrease craving in participants.
- (3) Craving score: Participants were asked to express their craving state to play their favorite VG via a one item self-report questionnaire.
- (4) Watching a VG clip during 2 min while recording the same physiological signals as in phase two related to the mentioned emotional states. The objective of this phase is to increase craving in participants.
- (5) Craving score: the same procedure and self-report tool as in phase 3 were applied.
- (6) Submission of three self-report questionnaires:
 - (6.1) "Pleasure and/or Happiness and VG" (Three bipolar items).
 - (6.2) "Key words and VG": participants were invited to associate a list of words to VG activities.
 - (6.3) "Pleasure and VG or Happiness and VG" (one bipolar item): participants were asked to associate one of the two emotional states to VG play.

The cycle from the 2nd phase to the 5th phase was repeated five times for each participant. In each of these five cycles, different episodes of video clips (the chosen VG and the neutral clip) were shown randomly so as to avoid the habituation phenomenon and minimize the influence that the order of the sequence of episodes could have on participants' responses.

Measures

- Experimental groups: AU and NAU



The Gaming Addiction Scale (GAS) (Lemmens et al., 2009; Gaetan et al., 2014) was used to constitute these groups. As a tool to measure game addiction, GAS possesses significant assets. Lemmens et al. (2009) showed the validity of this scale from a cross population point of view and its one-dimensional characteristic resulting from the factorial analysis. In addition, in the same study it has been shown the concurrent validity of GAS insofar as this scale is associated with play frequency as well as with psychological features related with game addiction, namely decreased level of social competence and of well being, and high level of aggression and of loneliness. Moreover, high scores in GAS are also linked with attentional deficiencies in response inhibition when perceiving game cues (van Holst et al., 2012; in Khazaal et al., 2016), which converges with results produced by other researches associating impulsivity and cue reactivity with other addictive behaviors (Billieux et al., 2011; Khazaal et al., 2012; Torres et al., 2013). Relative to other game addiction measurements, GAS has the most complete covering of the Internet gaming disorder criteria of the DSM-5 (Petry et al., 2014). Although it was initially designed for adolescents, there are substantial evidences to state that GAS is applicable for young adults too (Khazaal et al., 2016).

Each of the seven items of this scale starts with the question “How often in the last 6 months...?” to explore the impact of video gaming on different aspects of the subject’s life. The possible answers are: never, rarely, sometimes, often and very often. The first two answers score 0, the last three answers score 1. If the total sum of these scores is 4 or higher, the subject is considered an AU according to this scale.

– The experiment

In the first phase, participants were asked to fill the “*Pleasure and/or Happiness and VG*” questionnaire composed by six items: three items that tie Pleasure (P) and VG, three items that tie Happiness (H) and VG (six-items in total).

The answer scale for each item was composed of six options ranging from ‘Fully disagree’ to ‘fully agree.’ Each of these six items is answered separately, thus the overall possible results of this questionnaire can be: (1) P and VG > H and VG or (2) H and VG < P and VG or, (3) P and VG = H and VG.

In the second phase (Neutral video clip), two physiological signals related to Pleasure and Happiness were recorded. Based on the correlates found between HR and craving, this physiological signal is used as an indicator of arousal (Kennedy et al., 2015).

Despite the difficulty in defining and in measuring *happiness*, the brain electrical activity is recorded (Electroencephalogram, EEG) mainly to detect the *relaxation* state. This state appears close to the notion of happiness; in the literature it is accepted that the increase of alpha waves is correlated with mental and physical rest (Teplan and Krakovská, 2009).

In the third phase, participants were asked to express their *craving* state to play his/her favorite VG. The statement employed in this self-report tool was: “State your present craving for gaming.” Participants have to choose the answer that best fitted their self-assessment among six possible answers offered by the scale ranging from “I do not feel any craving for gaming” to “I feel a very strong craving for gaming.”

In the fourth phase (VG clip), the same physiological signals as in the second phase were measured.

In the fifth phase, the same procedure to assess craving for gaming as in the third phase was employed.

In the sixth phase, three other self-report questionnaires were submitted to participants and used to evaluate the association between the mentioned emotional states and VG:

- “Pleasure and/or Happiness and VG” (three bipolar items). The same six items of the “Pleasure and/or Happiness and VG” questionnaire used in phase 1 were presented in a bipolar structure: three items opposing “Pleasure and VG” vs. “Happiness and VG.” For example, if in the six items questionnaire the items “I would enjoy my favorite VG” (Pleasure/VG) and “I am happy when playing VG” (Happiness/VG) are presented separately, in this questionnaire they are part of the same item: “I would enjoy my favorite VG” vs. “I am happy when playing VG.” By doing so, participants are encouraged to choose which of their emotional states (Pleasure, Happiness) is associated with VG playing. That said, the scale has an uneven number of options (five) between the two extremes, the central option representing the equal association of Pleasure and Happiness with VG play. Thus, the overall possible results are identical as in phase 1.
- “Key words and VG”. Participants were asked to choose three words (out of ten) that they associate most with their VG activities. These 10 key words come from the semantic mapping elaborated in this research of the terms used in the formal statements defining *pleasure* and *happiness* in this study. For example, some words from the *happiness* sphere are *contentment* and *well being*, whereas *desire* and *joy* relate to *pleasure*. Besides, they are in line with both definitions Lustig’s (2017). Only the ten words (French version) were shown to participants. Although the possible results are similar to those of six-item “Pleasure and/or Happiness and VG” questionnaire and three-bipolar item “Pleasure and/or Happiness and VG” questionnaire, this time the same association (emotional states and VG) is tackled via key words directly linked to the two studied emotional states (*Pleasure*, *Happiness*) but without mentioning them. This self-report format intends to gain accuracy in the identification of gamers’ emotional states associated with VG.
- “Pleasure and VG or Happiness and VG”. The written definitions of both *pleasure* and *happiness*, based on work Lustig’s (2017), were shown to participants. Then they were asked to read carefully these definitions and to take them into account when answering one bi-polar item

that opposes “Pleasure and VG” vs. “Happiness and VG.” Unlike in the three-bipolar items questionnaire, the answer scale between these this bipolar item has an even number of options (six). This time is an “either/or” choice they are faced with, therefore the possible results are: P and VG < H and VG or P and VG > H and VG. Basically this questionnaire intends to strengthen consistency in participants’ insights into this issue by inviting them to confront their perception of their emotional states associated with VG play with the mentioned formal definitions, comparable to an emotions reappraisal process (Seay and Kraut, 2007).

In short, four self-report questionnaires (see **Annex**) aim at exploring this dependent variable (association between these two emotional states and VG play) by looking at the consistency of participants’ answers to the different formats of questions. The questions’ formats are:

- *Pleasure and/or happiness* can be associated with VG (six independent items);
- *Pleasure and/or happiness* can be associated to VG (three bipolar items);
- *Pleasure and/or happiness* can be associated to VG through key words defining the two emotional states (without mentioning the words *pleasure* and *happiness*);
- *Pleasure or happiness* can be associated to VG (written explicit definitions of *pleasure* and *happiness* are given to participants).

This approach aims at exploring the coherence between the self-reported answers and the physiological signals, as a means to objectivize the perceived emotional states associated with VG play by the two mentioned groups of participants (addict gamers and non-addict gamers).

The previously mentioned theoretical framework indicates that the notion of craving relates to an arousal state that could lead to an addictive pattern and consequently stands out of the realm of *happiness*.

Expected Results

Based on the analysis made on this issue previously as well as on the hypothesis of this study, the expected results could be synthesized as shown in **Table 1**.

- Self-Report Questionnaires

TABLE 1 | Summary of the expected results.

Expected results × group × measurement	Happiness and/or Pleasure associated to VG (6-items)	Self-report Craving and physiological signals (interaction between the two independent variables on the dependent variable)	Happiness and/or Pleasure associated to VG (3 bipolar items)	Key words (Happiness and Pleasure) associated to VG	Happiness or Pleasure associated with VG (1 bipolar item with definitions)
Addict Users (AU)	Happiness and VG > Pleasure and VG	– VG clip increasing effect on craving – VG clip increasing effect on HR – VG clip decreasing effect on relaxation	Happiness and VG > Pleasure and VG	Happiness and VG > Pleasure and VG	Pleasure and VG > Happiness and VG
Non Addict Users (NAU)	Pleasure and VG > Happiness and VG		Pleasure and VG > Happiness and VG	Pleasure and VG > Happiness and VG	Pleasure and VG > Happiness and VG

TABLE 2 | Synthetic view of independent and dependent variables.

Phase 1: Self-report		Phases 2 to 5: Visioning video clips (Neutral and VG) x Craving score and physiological signals	Phase 6: Self-report
– Addict Users (AU)	– Happiness and/or Pleasure associated to VG (6-items)	– Heart Rate and Relaxation	– Happiness and/or Pleasure associated to VG (3-bipolar items)
– Non-Addict Users (NAU)		– Craving score	– Key words associated to VG
			– Happiness or Pleasure associated to VG (1 bipolar item)

For the self-report questionnaires, it is expected that, compared to NAU, the AU group:

- In “Pleasure and/or happiness associated with VG” (six independent items) associates more *happiness* than *pleasure* with VG play.
- Reports more craving for playing after watching VG clip.
- In “Pleasure and/or happiness associated to VG” (three bipolar items) associates more *happiness* than *pleasure* with VG play.
- Associates VG play with key words more related to *happiness* category than to those of *pleasure*.
- In “Pleasure or happiness associated to VG” associates VG play with *pleasure* (like NAU).
- Physiological Signals

It is expected to observe an interaction between the groups (AU, NAU) and the conditions (VG clip, Neutral clip). Namely, it is assumed that visioning the VG clips has an effect on AU increasing HR while decreasing Relaxation.

Statistical Analysis

After verifying the normality of distributions (Kolmogorov–Smirnov), the means comparison between the two groups (NAU, AU) was calculated for self-report questionnaires measuring the association between VG and Pleasure/Happiness (Mann–Whitney *U*) for the six-items “Pleasure and/or Happiness and VG,” the three-bipolar items “Pleasure and/or Happiness and VG” and the one-bipolar item “Pleasure and VG or Happiness and VG.” The Chi square was used for “Key words and VG.” In order to determine whether there are differences between independent groups over time and to identify possible interactions between the two independent variables on the dependent variables, a two-way mixed ANOVA (within and between subjects) was used for the craving scores and the physiological signals recorded (Table 2).

Material

The experiment was run on a desktop computer with an Intel Core i7 quad processor and 8 GB RAM, running Windows 10. Stimuli were displayed on a 22-inch monitor and resolution was set to 1680 × 1050. Participants used standard mouse and keyboard as input devices. EEG measurement includes detecting the fluctuation of voltage potential generated by large group of neurons in the brain. The EEG signal was obtained through the use of EPOC headset. This device allows to remotely getting data of brain activity using a wireless set of fourteen electrodes (AF3, AF4, F3, F4, F7, F8, FC5, FC6, T7, T8, P7, P8, O1, O2) sampled at 128 hertz.

The relaxation state was measured by one of the composite metrics of the Emotiv software. HR was measured by using Schimer 3 (Photoplethysmography). The I. Motions software version 7.1 (Imotions Inc. 2018) was used to recording the mentioned data and presenting stimuli to participants. The statistical analysis was conducted with IBM SPSS statistics v.25.

RESULTS

Design of the “Pleasure and/or Happiness and VG” Questionnaire

The Cronbach’s alpha (0.859) showed a high internal coherence between the SHAPS and three items (out of four) of the “Pleasure and VG” within the “Pleasure and/or Happiness and VG” questionnaire. The fourth item has been disregarded; its presence would have dropped the Cronbach’s alpha to 0.685. The internal coherence obtained between the OHQ and the “Happiness and VG” items within the “Pleasure and/or Happiness and VG” questionnaire was quite high for the four items concerned (alpha 0.901). However, the internal coherence between these four items was too weak due to one item (alpha 0.407). The exclusion of this item raised the alpha significantly (0.836). Consequently, only the consistent items have been kept (six out of the initial eight items: three on “Pleasure and VG,” and three on “Happiness and VG,” see Annex).

Moreover, it has been examined whether there is an association between VG play frequency and the two areas explored in this survey: the general happiness level (OHQ) and the emotional states associated with VG via the “Pleasure and/or Happiness and VG” questionnaire. The constitution of the group of frequent gamers and that of non-frequent gamers was determined by calculated median (18 h per week). In line with several studies linking problematic gaming and well-being and life satisfaction, a moderate negative correlation ($R = -0.249$; $p = 0.056$) was found between VG high play frequency and the OHQ scores (Griffiths, 2008; Lemmens et al., 2011). In addition, there is a marginal significant difference [$T(58) = 1.923$; $p = 0.059$] between frequent VG users and non-frequent VG users relative to the OHQ scores.

The Experiment

The “Pleasure and/or Happiness and VG” Six-Items Questionnaire

The Kolmogorov–Smirnov outcome indicates the need for using a non-parametric test to compare the two groups. The Mann–Whitney test shows that there was no significant difference observed between the AU and NAU relative to association

TABLE 3 | Descriptive statistics of “Pleasure and/or Happiness associated with VG” (6-items): [Pleasure (P), Happiness (H) associated with VG].

	Addiction Bool	N	Mean Rank	Sum of Ranks
Item 1 P/VG	NAU	17	13.69	231.00
	AU	12	17.00	294.00
Item 2 H/VG	NAU	17	11.35	193.00
	AU	12	20.17	242.00
Item 3 P/VG	NAU	17	13.41	228.00
	AU	12	17.25	207.00
Item 4 H/VG	NAU	17	12.18	207.00
	AU	12	19.00	228.00
Item 5 P/VG	NAU	17	14.06	239.00
	AU	12	16.33	196.00
Item 6 H/VG	NAU	17	11.03	187.50
	AU	12	20.63	247.50
Mean P/VG	NAU	17	12.88	219.00
	AU	12	18.00	216.00
Mean H/VG	NAU	17	10.59	180.00
	AU	12	21.25	255.00

between VG play and pleasure (item 1. $U = 78$, $p = 0.30$; item 3. $U = 75$, $p = 0.24$ and item 5 $U = 86$, $p = 0.49$) (Table 3).

In contrast, there is a significant statistical difference in the three items where AU associate VG play with *happiness* (item 2. $U = 40$, $p = 0.005$; item 4. $U = 54$, $p = 0.034$ and item 6. $U = 34$, $p = 0.002$) more than NAU.

Craving Scores

Results in craving (Table 4 and Figure 2) show a statistically significant interaction $F(1,25) = 4.78$ ($p = 0.038$). Indeed, relative to the neutral clip, the VG clip condition has significantly amplified the reported craving difference between the two groups (AU craving score > NAU craving scores).

Physiological Signals Measurements

The AU's relaxation is significantly lower [$F(1,24) = 8.616$; $p = 0.007$] than NAU's in both conditions (Between-Subjects Effects). The relaxation level decreases in both groups during the VG clip. On the other hand, conditions do not influence the relaxation difference between the two groups [$F(1,24) = 0.001$; $p = 0.98$] (Table 5 and Figure 3). Furthermore, there is a significant statistical gender difference in both conditions (Neutral clip: Male 17.36, Female 7.57. $U = 25$, $p = 0.008$ – VG clip: Male 17.09, Female 8.43. $U = 31$, $p = 0.019$).

TABLE 4 | Descriptive statistics for self-report Craving.

Craving/ Clips	Addiction Bool	Mean Craving	Standard Deviation	Skewness	Kurtosis	N
Neutral clips	NAU	2.27	1.09	0.222	−0.954	17
	AU	2.02	0.98	1.617	2.567	10
	Total	2.17	1.03	1.062	1.248	27
VG clips	NAU	4.11	0.82	−0.169	0.135	17
	AU	4.96	0.52	−2.523	7.414	10
	Total	4.42	0.82	−1.271	2.528	27

Concerning the other physiological variable (HR) (Table 6 and Figure 4), there is an effect of VG clips on both groups [$F(1,15) = 20.802$; $p < 0.001$]. Nevertheless, there was no statistically significant interaction [$F(1,15) = 0.028$; $p = 0.86$], nor an effect of addiction on VG clip condition [$F(1,15) = 0.083$; $p = 0.777$]. It is important noting that due to corrupted data the number of valid subjects taken into account was 17 (8 AU and 9 NAU).

The “Pleasure and/or Happiness and VG” Three-Bipolar Items Questionnaire

The descriptive statistics of this three-bipolar items questionnaire (Table 7), indicate that the AU group linked VG activities more with *happiness* than the NAU group. The Mann–Whitney test shows a significant difference between these two associations ($U = 47$; $p = 0.013$).

Key Words and VG

Results state the absence of significant difference between AU and NAU in associating the key words from the Pleasure cluster with VG play, and words from the Happiness cluster with VG (Chi square, $p = 0.942$) (Table 8). When taking words separately, the biggest gap between the two groups relates to the word *well-being* (belonging to the *happiness* cluster) associated to VG play (AU: 25%, NAU: 0%).

“Pleasure and VG or Happiness and VG” (One Bipolar Item Questionnaire With Written Definitions)

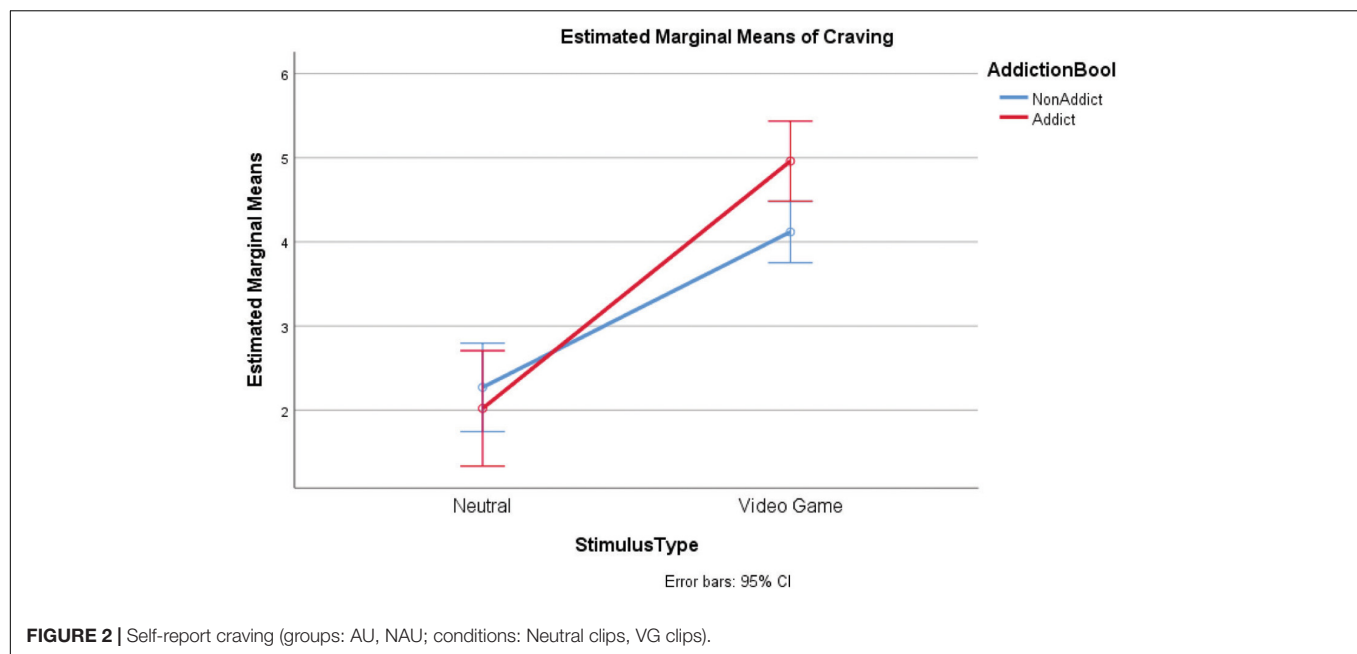
The outcome of this questionnaire indicates that there is no significant difference between AU and NAU ($U = 102$, $p = 1$). Both groups have clearly associated VG play with pleasure (Table 9).

The following scheme summarizes the outcomes of the self-report tools used to evaluate the association between the emotional states (Pleasure and Happiness) with VG play (Table 10).

The following table indicates the mean, standard deviation and Skewness and Kurtosis values of the self-report craving, the HR and the relaxation level for both groups in the two conditions (Table 11).

DISCUSSION

Overall, the results of this study show that AU associate happiness to VG while reporting craving for VG play and having a low relaxation level. These outcomes observed in this experiment constitute a bundle of arguments that argue in favor of the hypothesis of this study (Lustig, 2017). Indeed, in AU, the high self-report craving score and low Relaxation level during VG clips visioning do contrast with their association of VG more with *happiness* than with *pleasure* in the mentioned “Pleasure and/or Happiness and VG” questionnaires (six-items and three-bipolar-items) relative to NAU. Consistent with previous findings in this area, these four measurements highlight the coexistence of the perception of *happiness* linked with VG play combined with elements related to *pleasure* such as craving (*strong desire, wanting*) (Pollard, 2003; Griffiths, 2008; Waterman et al., 2008). Since craving and low Relaxation are rather incompatible with the



mentioned notion of *happiness* (Pollard, 2003; Waterman et al., 2008; Lustig, 2017), these indices may raise the question as to how accurate are AU's insights into their emotional states associated to VG play and may support the idea that AU's perception of their emotional states is somewhat distorted. In the literature, VG addiction would be linked with impairment in the self-regulation process, this finding may be linked with the difficulties AU have to observe and evaluate their own behavior (Seay and Kraut, 2007). Besides, the mentioned results suggest that VG clip effect on self-report craving would depend on the addiction level.

Considering that sensing *happiness* and craving are probably experienced as positive emotions by AU, and that usually negative and positive emotional events are reported to last longer and shorter respectively (Gil and Droit-Volet, 2012; Tian et al., 2018), the arousal triggered by motivating stimuli, may modify the time perception and could mediate the effect of emotions on behavior (Gil and Droit-Volet, 2012). In other words, the level of excitement produced by VG play could make AU underestimate the time spent at this activity, which may be perceived as an alleviating evasion free from stressors and possibly assimilated with the notion of *happiness*. This hypothetic mechanism would match one of the possible motives for online gaming

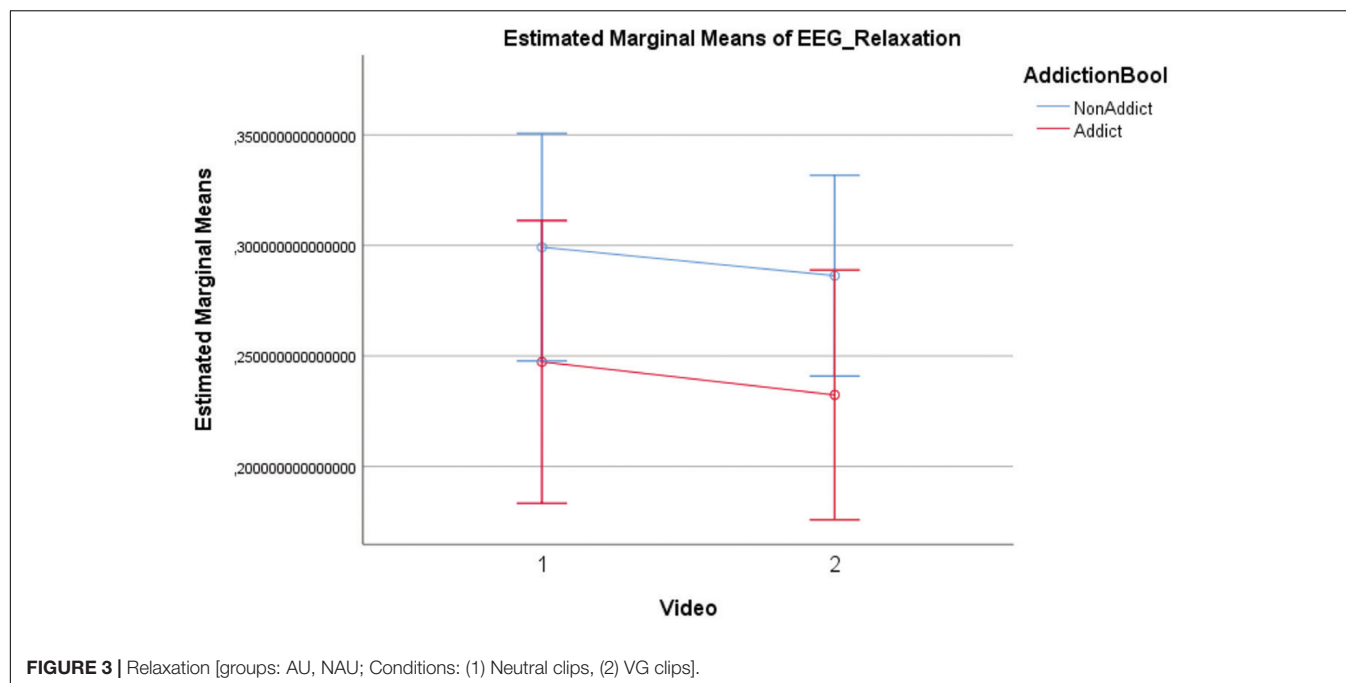
(Demetrovics et al., 2011). In this sort of precognitive process, several studies mentioned the involvement of the amygdala in interaction with the thalamus together with the dopaminergic system and a poor inhibitory control (Gil and Droit-Volet, 2012; Petry et al., 2015).

It is noteworthy underlining that the bipolar structure of the three-items questionnaire increases the relevance of this outcome. In effect, although participants were incited to choose between the two emotional states opposing each other (VG and pleasure vs. VG and happiness), like in the six-items questionnaire, AU again did choose *happiness* as the main emotional state linked with VG play. This outcome would further state the difference between these two groups when it comes to associating the two emotional states to VG play. Besides, this would reveal to an important extent that the possibility whereby *pleasure* and *happiness* were regarded as synonyms could be overcome. In other words, this outcome shows that the similarity of meanings of these two concepts did not prevent these groups to make a clear choice. Finally, the similar scores obtained in the two questionnaires (six-items and three-bipolar items "Pleasure and/or Happiness and VG"), in spite of the different disposition of the same items in these two instances, strengthen the value of the designed scale ("Pleasure and/or Happiness and VG play").

The absence of interaction between the two independent variables on HR may be explained by the fact that a higher arousal would take place in AU when playing VG rather than when watching at VG clips. Moreover, the reduced number of valid subjects when measuring this physiological parameter (due to technical recording problems) could have contributed to this outcome too. The fact that the independent variables did not produce the expected different HR effects on AU and NAU could also be linked with one of the limitations of this study: the difficulty in integrating in this research the interaction between HR and depression (as mentioned, VG addiction is

TABLE 5 | Descriptive statistics: Relaxation index (EEG EPOC, Emotiv software).

Relaxation/ Clips	Addiction Bool	Mean Relaxation	Std. Deviation	Skewness	Kurtosis	N
Neutral clips	NAU	0.33	0.07	-0.873	1.095	15
	AU	0.24	0.09	1.256	3.303	11
	Total	0.29	0.08	0.292	0.460	26
VG clips	NAU	0.31	0.05	-1.380	1.390	15
	AU	0.23	0.07	1.633	4.688	11
	Total	0.28	0.07	0.292	2.630	26



positively correlated with depression) (Griffiths et al., 2012) that may lead to HR index modifications (Cipresso et al., 2014). In sum, this issue illustrates that the difficulty to circumscribe the notion of happiness is also reflected in the complexity to establish physiological correlates so as to objectify this emotional state (Cipresso et al., 2014).

Associating the clusters of key words with VG did not produce the expected results. Since AU linked VG with both *pleasure* and *happiness*, may be these words played a clarification role and facilitated Au's insights into their emotional states when playing VG. It could also suggest the inadequacy of this self-report tool. However, it is probably worthwhile mentioning an index related our hypothesis: when taking words separately, the word "well-being" associated with VG play was chosen by 25% of AU and by 0% of NAU.

The outcome of the binary question in the "Pleasure and VG or Happiness and VG" one-item questionnaire with the definitions of pleasure and happiness (Pollard, 2003; Deci and Ryan, 2008; Waterman et al., 2008; Kashdan et al., 2008; Lustig, 2017) shows that AU ceased associating *happiness* to VG play and instead, like NAU, clearly linked *pleasure* to their cyber activity.

Caution is required in the analysis of these results because the validity of this questionnaire remains to be demonstrated. Having instructed participants to answer the bipolar question by taking into account the written definitions of the two measured emotional states, did modify the result of AU group relative to both questionnaires ("Pleasure and/or Happiness and VG" six-items and three bipolar items). Within the framework of this careful approach, it could be hypothesized that explicit definitions of the two emotional states induced AU to adopting an introspection mode through a more pronounced involvement of cortical brain structures, akin to a therapeutic process in which the appropriate verbalization of *pleasure* and *happiness* facilitates the clarification of one own feeling as a prerequisite to elaborate more adaptive behavior in spite of the constraining psychological characteristics usually associated with VG addicts (Kim et al., 2007; Kashdan et al., 2008; Wenzel et al., 2009).

This may be regarded as an example of emotions reappraisal which would increase accuracy of insights into one-self, reduce distorted perception of emotions and assess the adequacy of the behavioral response to a given stimulus (Compare et al., 2014). In other words, it could be posited that the mentioned explicit definitions have somewhat constrained AU to use a cognitive approach to examine their emotional states related to VG play rather than merely relying on the sensory information as it tends to occur when sensing craving for video gaming (Wang et al., 2017).

Moreover, the result of this one-item binary questionnaire would further support the hypothesis. In effect, the studied interrelation between hedonia and eudaimonia suggests that a highly rated hedonic activity (VG play in this case) is usually related with low rating in eudaimonia (Waterman et al., 2008). This interpretation would fit with the resounding association between depression and gaming disorders (Lemmens et al., 2011;

TABLE 6 | Descriptive statistics: Heart Rate (HR).

Heart Rate/Clips	Addiction Bool	Mean HR	Standard Deviation	Skewness	Kurtosis	N
Neutral clips	NAU	78.36	7.94	0.054	-0.292	9
	AU	79.51	8.36	2.130	5.013	8
	Total	78.90	7.90	0.972	1.530	17
VG clips	NAU	80.29	9.20	-0.502	0.219	9
	AU	81.58	9.34	2.037	4.661	8
	Total	80.89	8.99	0.614	1.535	17

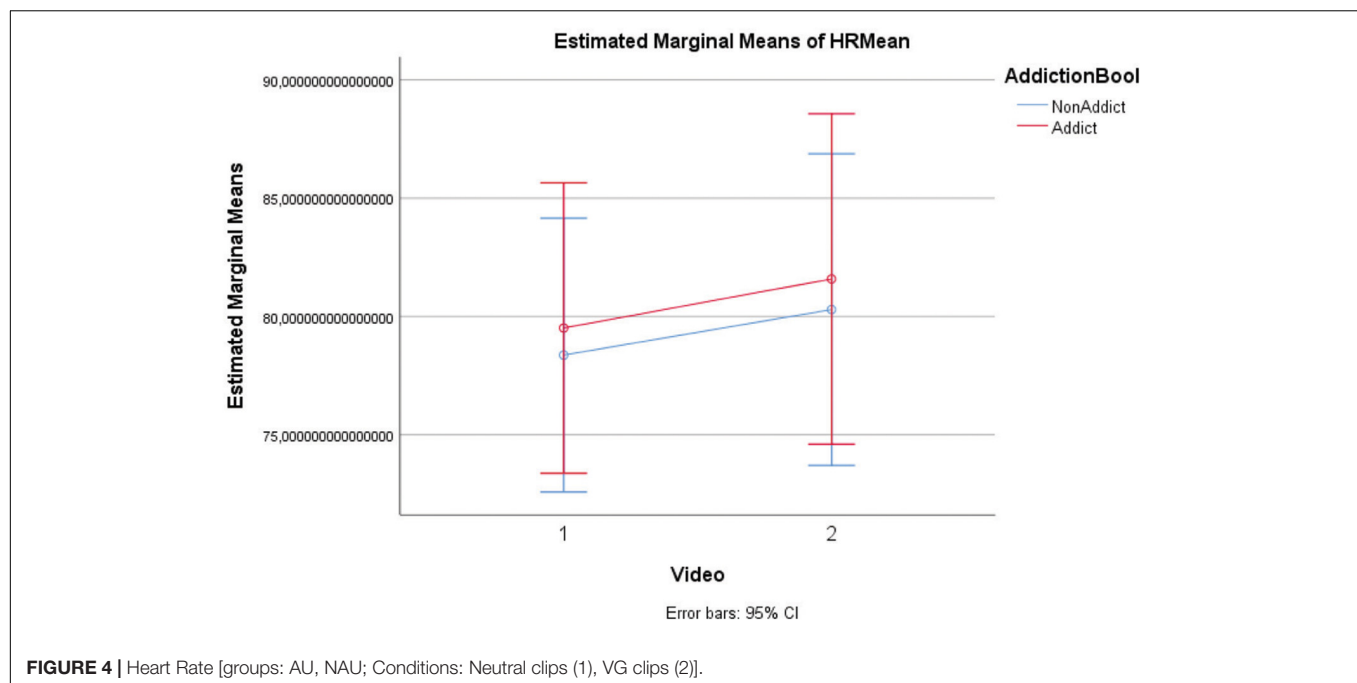


TABLE 7 | Descriptive Statistics: Pleasure/VG vs. Happiness/VG (3 bipolar items).

	Addiction Bool	N	Mean Rank	Sum of Ranks
Mean	NAU	17	11.76	200.00
	AU	12	19.58	235.00
Bipolar item 1	NAU	17	13.29	226.00
	AU	12	17.42	209.00
Bipolar item 2	NAU	17	13.91	236.50
	AU	12	16.54	198.50
Bipolar item 3	NAU	17	13.3	221.50
	AU	12	17.79	213.50

Hull et al., 2013; Sarda et al., 2016; Bonnaire and Baptista, 2019) together with the confusion between pleasure and happiness occurring in addictive activities (AU associated VG with happiness in the first two self-report questionnaires and ended linking pleasure with VG in the last one-item questionnaire) (Pollard, 2003; Lustig, 2017).

Overall, the more explicit the definition of pleasure and happiness and the narrower the choice offered by the self-report questionnaires, the less confusion of emotional states associated with VG occurred in AU group members whereas NAU invariably associated pleasure to VG as illustrated in **Figure 5**.

Based on these results, it could be postulated that the tendency of AU to perceive *happiness* when feeling craving and *pleasure* linked to VG play, might be moderated by a clarifying cognitive process on the meaning of these studied emotional states, which would interfere with the behavioral habits linked to the urge of gaming (Ko et al., 2009).

The findings resulting from “Pleasure and/or Happiness and VG” six-items questionnaire could be regarded as an illustration of the confusion that AU might have when linking the studied

emotional states with VG play. Unlike NAU, the significantly higher association between VG play and *happiness* expressed by AU matches the perceived level of well-being reported by individuals with Internet gaming disorders (Griffiths, 2008). On the other hand, apart from *well-being*, the same author cites *euphoria* as the other main emotional state that addict gamers may report when playing VG. Whilst happiness and well-being rely on each other to define themselves, euphoria would convey the notion of intense excitement, which would rather stand in the pleasure sphere. Moreover, in medical terms, euphoria refers to a feeling of great elation, not necessarily founded (especially when resulting from substances consumption). Since AU also associated VG with pleasure although they did it to a lesser extent than with happiness, it could be hypothesized that the feeling of intense excitement derives, at least partially, from satisfying the craving for VG play, which in turn could engender relieve experienced as a sense of well-being (Loonen and Ivanova, 2016).

The impact of VG clips on AU craving and relaxation scores underlines relevant aspects of this study, which support the hypothesis of this research. First of all, it highlights the incongruent perception of AU’s emotional states whereby both craving and *happiness* coexist as emotional states associated with VG play. Thus, this finding constitutes a relevant component of the confusion that consists in placing a short-term pleasure (VG play) within the sphere of happiness. Besides, the low relaxation state of AU would correspond with their self-reported craving and, therefore, further highlights the contrast between the perceived *happiness* associated with VG play and the indicators measured during the VG clip visioning (high craving level and low relaxation state level). Finally, it is noteworthy mentioning that relaxation was the only measure in this study where gender differences were observed. The lower relaxation level in female

TABLE 8 | Descriptive statistics: number of words per category (Pleasure, Happiness) associated to VG play chosen by NAU and AU.

% of words × category	Addiction Bool	Words × subject	Pleasure governed by desire	Pleasure governing desire	Happiness	Total
%	NAU (N17)	17 × 3 words = 51	19.60	47.05	33.33	100
%	AU (12)	12 × 3 words = 36	22.22	47.22	30.55	100

TABLE 9 | Descriptive statistics: Happiness/VG or Pleasure/VG (1 bipolar item, with Definitions of Pleasure and Happiness shown to subjects).

H/VG or P/VG	Addiction Bool	Mean	Standard Deviation	N
	NAU	4.82	0.636	17
	AU	4.58	1.379	12

gamers in both conditions might be related to the gender expectation about playing VG in society at large and in the gamers' community in particular (Shen et al., 2016). Indeed, since female gamers are a minority in these sorts of VG (Shen et al., 2016) (in line with our sample: 7 females, 22 males), it could be posited that they feel under scrutiny in an activity regarded as male oriented.

Putative Reasons of Distorted Perceptions of Emotional States Associated With VG Addiction

The social dimension of popular VG has been identified as one of the factors that may explain the addiction pattern (Hull et al., 2013). In this kind of competitive games, improving the required abilities and obtaining better results would be part of the key motives for VG play (Demetrovics et al., 2011), that usually generates the appreciation and the acceptance of the other group players. Getting this sort of feedback from others can be motivating indeed, especially when taking into account the correlation between IGD and social isolation, low self-esteem, traumatic experiences, depression and low life satisfaction (Petry et al., 2015; Schimmenti et al., 2017; Bonnaire and Baptista, 2019). In turn, these psychosocial characteristics are probably related also with the high impulsivity level in VG addicts (Billieux et al., 2011), which has been found to be associated with difficulties in interpersonal relationships (Ryu et al., 2018). Thus, it would seem that VG activities are, at least partially, sating the mentioned social and psychological deficiencies. This suggests that AU's emotional states related to VG play may be quite contrasting, in which components of *happiness* (i.e., interacting with others, fellowship and belonging to a group) are intertwined with those of short-term pleasure (i.e., craving for getting quick results, praise from others, etc.) (Loonen and Ivanova, 2016). Now, craving for undertaking these cyber activities to respond to the mentioned social isolation issues places this emotional state much closer to the 'pleasure governed by desire' than to 'atmosphere of good fellowship' (Happiness) (Lawrence et al., 2014; Lustig, 2017).

The flow, defined as the emotional state embracing perception distortion and enjoyment produced by VG activities, is another element that can create confusion in gamers' insights into their emotional states (Chou and Ting, 2003; Hull et al., 2013). As

described in the mentioned study, experiencing flow implies not only losing the notion of time but also merging oneself with the VG actions. In these conditions, the gamer's senses and attention are in the *here and now*, with little or no awareness about sources of stress relative to past, present or future events. In this line, the motivation to experience immersion has been associated with problematic gaming (Billieux et al., 2011). Considering the fact that loneliness and depression have been identified as predictors of VG addiction and of Internet Gaming Disorders (Hull et al., 2013; Sarda et al., 2016), it is understandable why in gamers' mind experiencing flow could equate this feeling with a relieving emotional state (Loonen and Ivanova, 2016). This sense of alleviation could match the notion of *happiness* as free from distress (Kringelbach and Berridge, 2010; Loonen and Ivanova, 2016) if it resulted from the quality of real life being lived. Instead, in AU, this relieving and enjoyable emotional state would be engendered by a virtual activity (VG), possibly used as a means to escape from stress and to forget tensions (Demetrovics et al., 2011; Bonnaire and Baptista, 2019). In the literature, the escaping strategy is a way to find relieve from stressors through the engagement in a pleasant activity, which may end up representing a space of *happiness* (Seay and Kraut, 2007).

In sum, the incongruence lies in the coexistence of regarding VG as a space of *happiness* while using VG to get quick pleasures and relief. Individuals suffering from this disorder tend to pursue short-term pleasures rather than long-term gains (Dong and Potenza, 2015). Being driven by short-term gratifications rather belongs to the reward-seeking realm (Waterman et al., 2008; Lustig, 2017). Thus, this pleasant emotional state could be associated with the arousal linked to a reward seeking behavior through which quick and positive results are obtained, which in turn reinforce the mentioned behavior. Probably, this intense arousal situates itself within the sphere of *pleasure* as a dysfunction in the rewarding system (Pollard, 2003; Berridge and Kringelbach, 2013; Lustig, 2017) and not in that of *happiness* in spite of the relieving benefits it provides.

Another possible reading on why the emotional states generated by these cyber activities are linked with happiness may be related to the way in interpreting the experienced sensations. This representation is probably shaped by the individual background, experiences, culture, etc. From a brain mechanism stand point, conscious liking does not limit it self to a sensory outcome, it is also translated into a subjective liking through the recruitment of cognitive processes (Berridge and Kringelbach, 2013). Indeed, these authors state that conscious pleasure rating is sometimes detached from affective reactions as people can elaborate reasons to themselves for how they should feel. Therefore, associating VG with *happiness* may be the result of a rationalization process to reduce the cognitive

TABLE 10 | Synthetic view of self-report results (Emotional states associated with VG play).

	Pleasure and/or Happiness linked with VG (6-items)	Pleasure/VG vs. Happiness/VG (3 bipolar items)	Key words associated with VG	Pleasure/VG or Happiness/VG (1 bipolar item)
Results	AU associated more Happiness to VG than NAU (Significant difference)	AU associated more Happiness to VG than NAU (Significant difference)	Both groups associated Pleasure and Happiness to VG (No significant difference)	Both groups associated Pleasure to VG (No significant difference)

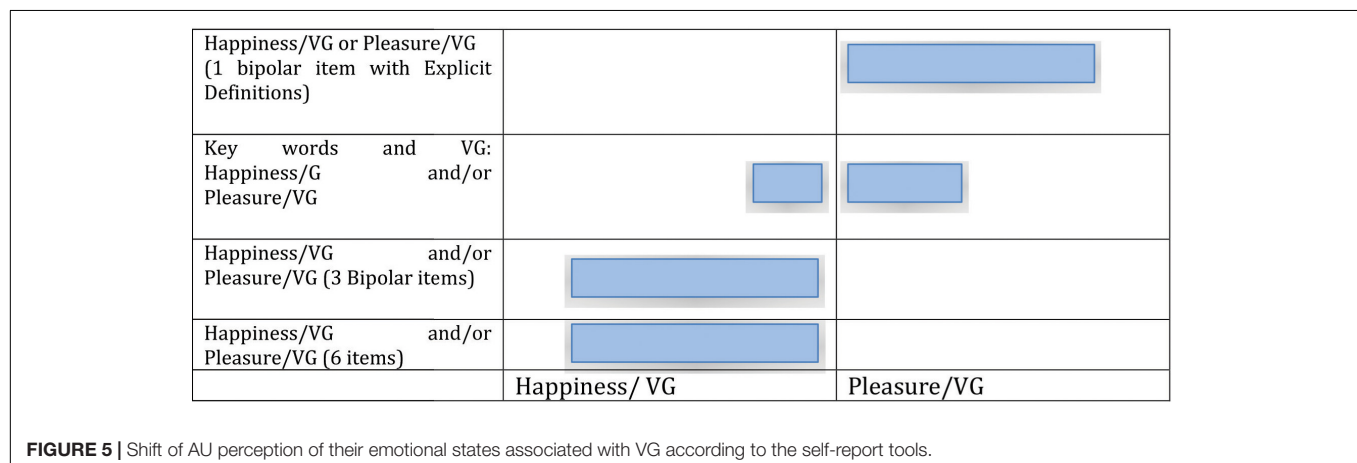
TABLE 11 | Descriptive statistics for self-report Craving, Relaxation, Heart Rate.

	Addiction Bool	Mean Craving	Standard Deviation	Skewness	Kurtosis	N
Craving/ Clips						
Neutral clips	NAU	2.27	1.09	0.222	−0.954	17
	AU	2.02	0.98	1.617	2.567	10
	Total	2.17	1.03	1.062	1.248	27
VG clips	NAU	4.11	0.82	−0.169	0.135	17
	AU	4.96	0.52	−2.523	7.414	10
	Total	4.42	0.82	−1.271	2.528	27
Relaxation/Clips						
Neutral clips	NAU	0.33	0.07	−0.873	1.095	15
	AU	0.24	0.09	1.256	3.303	11
	Total	0.29	0.08	0.292	0.460	26
VG clips	NAU	0.31	0.05	−1.380	1.390	15
	AU	0.23	0.07	1.633	4.688	11
	Total	0.28	0.07	0.292	2.630	26
Heart Rate/Clips						
Neutral clips	NAU	78.36	7.94	0.054	−0.292	9
	AU	79.51	8.36	2.130	5.013	8
	Total	78.90	7.90	0.972	1.530	17
VG clips	NAU	80.29	9.20	−0.502	0.219	9
	AU	81.58	9.34	2.037	4.661	8
	Total	80.89	8.99	0.614	1.535	17

dissonance. In other words, the unwished consequences of the VG addiction pattern (increased stress, problems at working, studying, socializing, etc.) (Griffiths et al., 2012) probably produce an increasing amount of pressure (due to the difficulty to reduce gaming time, guilt, etc.) that can become overwhelming if it lasts too long. Consequently, if the affected individuals are

unable to master the yearning for VG, perceiving VG activities as a source of well being may reduce the mentioned pressures insofar as the notion of *happiness* usually suggests a socially acceptable mood, a legitimate aim and a safe emotional state. In this perspective, equating happiness with satisfying craving and with short-term pleasure might contribute to feed the addictive pattern (Lustig, 2017).

In a broader perspective, the rationalization process described in the previous paragraph may be also related with coping strategies to deal with adversity. For instance, it has been observed that problematic gamers may use VG play as a means to cope with stressors and to enhance mood (Demetrovics et al., 2011). An association has been found between stressful life events and addiction to Internet activities (Schimmenti et al., 2017), with the mediating role of psychological needs satisfaction and the moderating role of coping styles (Dongping et al., 2016). Several theories and studies support this approach that strives for a more holistic understanding of this issue. The self-determination theory postulates that humans share three universal psychological needs (Deci and Ryan, 2000; in Dongping et al., 2016): autonomy (i.e., feeling of being self-determining in one's behavior), relatedness (i.e., the feeling of connectedness to others) and competence (i.e., the feeling of dealing with issues in a competent manner). Besides, individuals can adopt different strategies to cope with adversity (Lazarus and Folkman, 1984; in Dongping et al., 2016). According to Zheng et al. (2012; in Dongping et al., 2016), the positive coping approach is the set of strategies aiming at problem solving, support seeking and cognitive restructuring to address the stressors. On the other hand, according to the same authors, the negative coping consists in strategies such as blaming, social withdrawing, denial and disengagement so as to avoid the stressful situations. Now, a parallel can be established



between these two coping styles and the brain activities involved in the goal-directed learning and the habit learning.

The goal-directed learning would correspond to the positive coping style insofar as it focuses on the relationship between an action and the motivational value of the outcome, and is associated with the activation of the prefrontal cortex, the dorsomedial striatum and the dorsomedial thalamus (Ballaine and Dickinson, 1998; in Schwabe et al., 2012). On the other hand, habit learning, would be linked with the avoidant coping style. This learning process encodes the relationship between a response and preceding stimuli without taking into account the outcome caused by the response and is related to the activation of the dorsolateral striatum (Yin et al., 2004; Tricomi et al., 2009; in Schwabe et al., 2012). According to Schwabe et al. (2012), stressful situations may modulate the processes involved in instrumental learning in a way that may produce the shift from goal-directed learning to habitual learning.

In line with these findings, it has been observed that, like cocaine cues, psychological stress induction can generate the same craving response in a cocaine abusers population (Bradley et al., 1989; Wallace, 1989; in Sinha et al., 2000). The relevance of these observations lies in the fact that both SUD and behavioral addictions (including gaming disorders, Han et al., 2011) recruit to an important extent common brain regions and produce similar physiological patterns, as quoted in the introduction of this document.

Considering the association between unhappiness and VG disorders mentioned earlier, it could be posited that the gamers concerned could not overcome the causes of their unhappiness. Indeed, studies suggest that subjects with Internet gaming disorders embark in VG play more to deal with negative affect than to achieve a good performance in the game (Schimmenti and Caretti, 2010; Billieux et al., 2013; both in Bonnaire and Baptista, 2019). In this scenario, based on the mentioned studies, a low level of happiness would imply that psychological needs are somewhat unmet and associated with the avoidant coping style together with the habit learning. Furthermore, this pattern is supported by compensatory Internet use theory, which postulates that adversity can operate as a stimulus to seek psychological comfort (i.e., satisfying the psychological needs via the cyberspace) (Kardefelt-Winther, 2014; in Dongping et al., 2016).

In other words, the psychological comfort engendered by the VG activities in this population of gamers, combined with the characteristics of the avoidant coping style (denial, social withdrawal, avoiding stressful situation, etc.) and with the traits of the habitual learning (actions' outcomes are disregarded, with little or no awareness of actions' consequences), might explain, at least partially, the biased perception of the emotional states in AU (*happiness* associated to VG) and of their causes of craving for VG. This assumption suggests that online gaming might not be the cause of VG addiction, but rather that VG excessive use could be a compensatory strategy to deal with pre-existing psychological characteristics and deleterious social context (Kowert et al., 2015). For instance, some studies suggest that traumatic experiences, poor emotions regulation, elements of impulsivity and the motivation to

experience immersion in a virtual world would increase the likelihood of IGD and Internet addiction (Billieux et al., 2011; Schimmenti et al., 2017).

In sum, it would seem as if for AU the mentioned behavioral pattern is a manner to mitigate the difficulties to deal with stressors. This interpretation would be in line with the motives for play in problematic gaming (Demetrovics et al., 2011). Through a massive survey these authors observed seven dimensions that would cover the entire spectrum of motives for VG play in all sort of on line games: escape (from reality), cope (with stressors, playing as a way to improve mood), fantasy (trying new identities/things in a virtual world), skills development (improving concentration, coordination, new skills) recreation (relaxing aspects of gaming), competing (sense of achievement), and social (knowing/being/playing with others). This study suggests that there would be positive and beneficial motives for playing (entertaining gaming) as well as harmful ones (problematic gaming). The correlations between these factors appear to shed light on the positive and negative aspects of gaming. Whilst the weakest correlation is between escape and recreation (also low correlation was found between escape and both, skills development and competition), the strongest correlations were observed between escape and cope and fantasy. These results would indicate that *escape* and *cope* are motives associated with problematic gaming, however, the authors argue that escapism would facilitate the coping efforts to deal with stressors and negative moods. Moreover, it is noteworthy underlining that escapism had the lowest mean score in this study among the seven dimensions, which would match with the prevalence level of problematic gaming mentioned previously (Griffiths et al., 2012).

Probably, regarding AU, the accuracy in perceiving emotional states, the ability to deal with stressors and the quality of insights into oneself are dimensions that deserve much attention in the therapeutic processes.

Therapeutic Implications

A cognitive-behavioral approach may contribute to the recovery process by enabling problematic gamers to explore the motives that lead them to abuse of VG play (Orzack et al., 2006; in Griffiths, 2008). Developing strategies to tackle stressors appears to be a therapeutic priority for treating this disorder. Consequently, this axis of work includes the understanding of the environmental demands that are perceived as exceeding the individual abilities to handle them. In this line, ensuring the accuracy of the individual's insights into the emotional states linked to the sources of stress as well as to the game habit could increase the awareness of the underlying issues to be addressed. In particular, deciphering the conditioned desires (unconscious wanting) and the hedonic dimension (unconscious liking) (Kringelbach and Berridge, 2009; Berridge and Kringelbach, 2013) linked to VG play may produce added value information for understanding and overcoming the problematic gaming pattern. Within this frame, it could be hypothesized that distinguishing between *happiness* and *feeling alleviated* could be beneficial to the therapeutic process, although it remains to be demonstrated.

Overall, this sort of therapeutic approach may contribute to reduce the alexithymia, usually associated with this kind of disorders (Kandri et al., 2014).

In problematic internet/gaming several studies have explored and highlighted to role of alexithymia and its links with other therapeutic issues. For instance, it has been shown that alexithymic individuals are more associated with Internet addiction than non-alexithymic ones (Baysan-Arslan et al., 2016). In this research, the authors consider that the difficulty in identifying and differentiating emotions that characterizes alexithymia may lead individuals with this affliction to regulate their emotional states via their addictive activities.

Another study showed that IGD would be related with alexithymia, anxiety and depression (Bonnaire and Baptista, 2019).

Schimmenti et al. (2017) observed that traumatic experiences (mainly in males) and traits of alexithymia (mainly in females) were associated with Internet addiction symptoms, which may enable a tailored prevention and treatment approach. Besides, Internet addiction (including online role-playing) would be correlated with alexithymia, dissociation (protecting one-self in a more pleasant created reality as a means to deal with traumatic experiences) and insecure attachment (Craparo, 2011).

However, the causal link in the association between alexithymia and Internet addiction would still need to be verified, as indicated by Mahapatra and Sharma (2018). Moreover, discerning the nature of alexithymia remains an uneasy task: this emotional identification and differentiation disorder might be regarded as a stable personality trait that could increase risks of mental disorder development, and also may be seen as a defense mechanism to cope with psychological stressors (Mikolajczak and Luminet, 2006; in Mahapatra and Sharma, 2018).

Apart from alexithymia and traumatic memories, high urgency (a dimension of impulsivity defined by the proneness to have strong reactions usually tied with negative affect) and being motivated to experience immersion in a virtual world would be psychological predictors of problematic multiplayer online games (Billieux et al., 2011). These findings led the authors to posit that individuals with the two mentioned traits are more likely to use the immersion in the virtual world as a means to avoiding facing real life adverse issues. According to the authors, this behavior will lead to a deleterious outcome (culpability and embarrassment as a result of feeling unable to deal with problems), which in turn is experienced as a pernicious condition likely to activate behaviors related to high urgency and immersion.

Like the previously mentioned clinical issues, this vicious loop reinforcing escapism also appears to be a therapeutic target.

Considering the possible association between alexithymia and problematic gaming as a manner to regulate emotions (Baysan-Arslan et al., 2016; Bonnaire and Baptista, 2019), the Emotion Regulation Therapy (ERT) might strengthen the therapeutic process. The aim being that the observed difficulties in Internet (including VG) addicts to identifying emotions and regulating affects (Carette et al., 2010; in Craparo, 2011) could be, at least partially, overcome through the ERT process. In effect, Compare et al. (2014), show that ERT operates as a means to reappraise emotions that trigger actions leading to negative consequences.

Reappraising emotions is associated with the involvement of the medial prefrontal cortex, which attenuates the amygdala activation and, thus, reduces the intensity of negative affect; these two areas being coordinated by the orbitofrontal cortex (Compare et al., 2014). Since AU would be prone to associate happiness with VG play, ERT might facilitate the perceptual change enabling to link VG play with pleasure [Carette and Craparo, 2009; in Craparo (2011) consider Internet addiction (including VG) “as a syndromic condition characterized by a recurrent and reiterated search for *pleasure* derived from dependence behavior, associated with abuse, *craving*, clinically significant stress, and compulsive dependence actions despite the possible negative consequences”]. Within this approach, it may be postulated that enabling problematic gamers to familiarize with and to see the self-transcendent notion of *happiness* could favor the distinction between pleasure and happiness and would render them less vulnerable from impulses and from environmental circumstances (Dambrun et al., 2012). The idea is to facilitate the shift from wanting more than liking (or even without liking) toward liking with little or without wanting (Berridge and Kringelbach, 2011). Furthermore, regarding motives for playing, it could be posited that helping problematic gamers to identify and distinguish the emotions tied to escaping/coping from those related to recreational gaming (Demetrovics et al., 2011), would be a necessary condition to orient effectively the ERT toward the escaping issues and targeted emotional states requiring therapeutic input. In this line, based on the previously mentioned studies in this section, it might be useful exploring the possible link that the excessive time spent in cyber activity could have with past traumatic experiences, insecure attachment, impulsivity, anxiety and depression.

In conclusion, this study suggests that the mentioned confusion of emotional states (pleasure and happiness) associated with addiction (Lustig, 2017), could take place in subjects with VG addiction, and potentially in the entire spectrum of addictions. Moreover, from a cognitive therapeutic perspective, it shows the potential benefits of reappraising emotions as a means to contribute to the emotional distortion reduction.

Limitations

The small sample of this study demands cautiousness when making generalizations from its results. Besides, watching VG clips rather than actually playing VG might be less stimulating for chronic gamers and could have influenced the physiological values recorded during the clip visioning phases. That said, many gamers do attend to public competitions to watch other gamers playing VG. Although, to the best of our knowledge, there is no information available to affirm that there are VG addicts in these audiences.

We also faced the usual paradox when assessing craving via self-report tools. Indeed, participants were asked to judge their craving intensity for VG play whereas sensing craving often may imply a compromised self-awareness level and thus a self-assessment whose value needs to be interpreted carefully.

Although the GAS is a validated tool, which has shown its usefulness in screening addict gamers, having complemented this measurement with thorough diagnostic-driven interviews run by

specialists when choosing participants to form the AU and the NAU groups would have strengthened the selection process.

The participants' selection was centered on the gamer status (gaming addiction/non-addiction and names of games usually played) rather than on the cultural and/or educational background of the persons. Future researches could complete this approach by assessing the possible cultural and educational bias in perceiving the studied emotional states.

Moreover, including more physiological parameters related to *pleasure* and *happiness* could further complete the self-reported information and may enable reaching more robust results.

Prospective Research

Further research is required to better understand the relationship between the studied emotional states and this addiction. For instance, since VG addiction decreases with age (Wittek et al., 2016) a longitudinal study could reveal the factors (psychophysiological, environmental, etc.) that operate that change. Moreover, VG addiction is only one area of the spectrum of addictions. Undertaking similar researches on other addictions and with larger samples could also contribute to deepening the comprehension of this issue. Finally, keep enhancing the scales that measure *pleasure* and *happiness* may provide with more accurate information about the range of nuances intrinsic to these two emotional states.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/supplementary material.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Université Libre de Bruxelles Ethical Committee.

REFERENCES

- Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., et al. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: a large-scale cross-sectional study. *Psychol. Behav.* 30, 252–262. doi: 10.1037/ad0000160
- Ballaine, B. W., and Dickinson, A. (1998). Goal-directed instrumental action: contingency and incentive learning and their cortical substrates. *Neuropharmacology* 37, 407–419. doi: 10.1016/s0028-3908(98)00033-1
- Baysan-Arslan, S., Cebeci, S., Kaya, M., and Canbal, M. (2016). Relationship between Internet addiction and alexithymia among university students. *Clin. Invest. Med.* 39, S111–S115.
- Berridge, K., and Kringelbach, M. (2011). Building a neuroscience of pleasure and well being. *Psychol. Well Being* 1, 1–3.
- Berridge, K. C., and Kringelbach, M. L. (2013). Neuroscience of affect: brain mechanisms of pleasure and displeasure. *Current Opin. Neurobiol.* 23, 294–303. doi: 10.1016/j.conb.2013.01.017
- Billieux, J., Chanal, J., Khazaal, Y., Rochat, L., Gay, P., Zullino, D., et al. (2011). Psychological predictors of problematic involvement in massively multiplayer online role-playing games: illustration in a sample of male cybercafé players. *Psychopathology* 44, 165–171. doi: 10.1159/000322525

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

AUTHOR CONTRIBUTIONS

LG developed the proposal and the conception of the original project research, searched and articulated the theoretical background, participated in the study and protocol design, elaborated the results interpretation, assembled all the chapters of the study, and in charge of the manuscript writing. ND was involved in the scientific and publication management, participated – as the Research Center Manager – in the study and protocol design, and in charge of the configuration and writing of the physiological measures. JL, as a member of the Research Center, was involved in the study and protocol design, also involved in the configuration of physiological measures, managed the experimental phases in the laboratory, and elaborated the data analysis. CL, as a full Professor at the Faculty of Psychology and Director of the Research Center for Work and Consumer Psychology, assured the scientific and publication management, participated in the study and protocol design, in charge of making the critical reviews of the manuscript along the process, and involved in the manuscript writing.

ACKNOWLEDGMENTS

We would like to express our gratitude to Maastricht University (Department of Psychiatry and Neuropsychology) as well as Université Libre de Bruxelles (Faculty of Psychological Sciences and of Education – Research Center for Work and Consumer Psychology). This work was performed as a partial fulfillment toward the International Master in Affective Neuroscience of Maastricht University and the University of Florence.

- Billieux, J., Van der Linden, M., Achab, S., Khazaal, Y., Paraskevopoulos, L., Zullino, D., et al. (2013). Why do you play Warcraft? An in-depth exploration of self-reported motivation to play online and in the game behaviors in the virtual world of Azeroth. *Compt. Hum. Behav.* 29, 103–109. doi: 10.1016/j.chb.2012.07.021
- Bonnaire, C., and Baptista, D. (2019). Internet gaming disorder in male and female young adults: the role of alexithymia, depression, anxiety and gaming type. *Psychiatry Res.* 272, 521–530. doi: 10.1016/j.psychres.2018.12.158
- Bradley, B. P., Phillips, G., Green, L., and Gossop, M. (1989). Circumstances surrounding the initial lapse to opiate use following detoxification. *Br. J. Psychiatry* 154, 354–359. doi: 10.1192/bjp.154.3.354
- Bruchon-Schweitzer, M., and Boujut, E. (2014). *Psychologie de la Santé: Concepts, Méthodes et Modèles*. Paris: Dunod, doi: 10.3917/dunod.bruch.2014.01
- Caretti, V., and Craparo, G. (2009). “Psychological issues of technological addiction. New diagnostic criteria for addiction,” in *Annual Review of Cybertherapy and Telemedicine 2009. Advanced Technologies in the Behavioural, Social and Neurosciences*, eds B. K. Wiederhold, and G. Riva, (Amsterdam: IOS Press), 227–280.
- Caretti, V., Craparo, G., and Schimmenti, A. (2010). “Alcune evidenze empiriche sul costrutto di trance dissociativa da videoterminale,” in *Addiction*, eds V. Caretti, and D. La Barbera, (Milano: Rafaelo Cortina), 167–182.

- Chou, T., and Ting, C. H. (2003). The role of flow experience in cyber-game addiction. *Cyber Psychol. Behav.* 6, 663–675. doi: 10.1089/109493103322725469
- Cipresso, P., Serino, S., and Riva, G. (2014). The pursuit of happiness measurement: a psychometric model based on psychological correlates. *Sci. World J.* 2014:139128.
- Compare, A., Zarbo, C., Shonin, E., van Gordon, W., and Marconi, C. (2014). Emotional regulation and depression: a potential mediator between heart and mind. *Cardiovasc. Psychiatry Neurol.* 2014:324374. doi: 10.1155/2014/324374
- Cooper, S., Robinson, A. J., and Mazei-Robinson, M. (2017). Reward circuitry in addiction. *Neurotherapeutics* 14, 687–697. doi: 10.1007/s13311-017-0525-z
- Craparo, G. (2011). Internet addiction, dissociation and alexithymia. *Proc. Soc. Behav. Sci.* 30, 1051–1056. doi: 10.1016/j.sbspro.2011.10.205
- Dambrun, M., Ricard, M., Després, G., Drelon, E., Gibelin, E., Gibelin, M., et al. (2012). Measuring happiness: from fluctuating happiness to authentic, durable happiness. *Front. Psychol.* 3:16. doi: 10.3389/fpsyg.2012.00016
- Deci, E. L., and Ryan, R. M. (2000). The “what” and “why” of goal pursuits: human needs and the self-determination of behaviour. *Psychol. Inq.* 11, 227–668.
- Deci, E. L., and Ryan, R. M. (2008). Hedonia, eudamonia, and well-being: an introduction. *J. Happiness Stud.* 9, 1–11. doi: 10.1007/s10902-006-9018-1
- Demetrovics, Z., Urbán, R., Nagygyörgy, K., Farkas, J., Zilahy, D., Mervó, B., et al. (2011). Why do you play? The development of the motives for online gaming questionnaire (MOGQ). *Behav. Res. Methods* 43, 814–825. doi: 10.3758/s13428-011-0091-y
- Dong, G., Li, H., and Potenza, M. (2017). Cognitive control and reward/loss processing in Internet gaming disorders: results from a comparison with recreational Internet game users. *Eur. Psychiatry* 44:3038.
- Dong, G., and Potenza, M. (2015). A cognitive-behavioural model of Internet gaming disorders: theoretical underpinnings and clinical implications. *J. Psychiatry Res.* 58, 7–11. doi: 10.1016/j.jpsychires.2014.07.005
- Dongping, L., Wenhau, Z., Xian, L., Yueyue, Z., Liyan, Z., and Yanhui, W. (2016). Stressful life events and adolescent Internet addiction: the mediating role of psychological needs satisfaction and the moderating role of coping style. *Comp. Hum. Behav.* 63, 408–415. doi: 10.1016/j.chb.2016.05.070
- Esposito, E., Di Matteo, V., and Di Giovanni, G. (2008). Serotonin-dopamine interaction: an overview. *Prog. Brain Res.* 172, 3–6. doi: 10.1016/S0079-6123(08)00901-1
- Gaetan, S., Bonnet, A., Brejard, V., and Cury, F. (2014). French validation of the 7-item Game Addiction Scale for adolescents. *Rev. Eur. Psychol. Appl.* 64, 161–168. doi: 10.1016/j.erap.2014.04.004
- Geisel, O., Panneck, P., Stickel, A., Schneider, M., and Müller, C. A. (2015). Characteristics of social network gamers: results of an online survey. *Front. Psychiatry* 6:69. doi: 10.3389/fpsyg.2015.00069
- Gil, S., and Droit-Volet, S. (2012). Emotion time distortions: the fundamental role of arousal. *Cogn. Emot.* 26, 847–862. doi: 10.1080/02699931.2011.625401
- Gowing, L., Ali, R. L., Allsop, S., Marsden, J., Turf, E. E., West, R., et al. (2015). Global statistics on addictive behaviours: 2014 status report. Society for the study of addiction. *Addiction* 110, 904–919. doi: 10.1111/add.12899
- Griffiths, M. (2008). Diagnosis and management of video game addiction. *New Direct. Addict. Treat. Prevent.* 12, 27–41.
- Griffiths, M., Kuss, D., and King, D. (2012). Video game addiction: past. Present and future. *Curr. Psychiatry Rev.* 8, 308–318. doi: 10.2174/157340012803520414
- Han, D. H., Bolo, N., Daniels, M. A., Arenella, L., Lyoo, I. K., and Renshaw, P. F. (2011). Brain activity and desire for Internet video game play. *Comprehens. Psychiatry* 52, 88–95. doi: 10.1016/j.comppsy.2010.04.004
- Hills, P., and Argyle, M. (2002). The Oxford happiness questionnaire: a compact scale for the measurement of psychological well-being. *Pers. Individ. Differ.* 33, 1073–1082. doi: 10.1016/S0191-8869(01)00213-6
- Hull, D., William, G. A., and Griffiths, M. D. (2013). Video game characteristics, happiness and flow as predictors of addiction among video game players: a pilot study. *J. Behav. Addict.* 2, 145–152. doi: 10.1556/JBA.2.2013.005
- Jatupaiboon, N., Pan-ngum, S., and Israsena, P. (2013). Real-time EEG-based happiness detection system. *Sci. World J.* 2013:618649. doi: 10.1155/2013/618649
- Kandri, T. A., Bonotis, K. S., Floros, G. D., and Zafiropoulou, M. M. (2014). Alexithymia components in excessive internet users: a multi-factorial analysis. *Psychiatry Res.* 220, 348–355. doi: 10.1016/j.psychres.2014.07.066
- Kardefelt-Winther, D. (2014). A conceptual and methodological critique of Internet addiction research: towards a model of compensatory Internet use. *Comput. Hum. Behav.* 31, 351–354. doi: 10.1016/j.chb.2013.10.059
- Kashdan, T., Bsiwas-Diener, R., and King, L. (2008). “Reconsidering Happiness: the cost of distinguishing between hedonics and eudemonia”. *J. Posit. Psychol.* 3, 219–233. doi: 10.1080/17439760802303044
- Kennedy, A., Epstein, D. H., Jobes, M. L., Agage, D., Tyburski, M., Phillips, K. A., et al. (2015). Continuous in-the-field measurement of heart rate: correlates of drug use, craving, stress and mood in polydrug users. *Drug Alcohol Depend.* 151, 159–166. doi: 10.1016/j.drugalcdep.2015.03.024
- Keyes, K. M., Jager, J., Hamilton, A., O'Malley, P. M., Miech, R., and Schulenberg, J. (2015). National multi-cohort time trends in adolescent risk preference and relation with substance use and problem behavior from 1976 to 2011. *Drug Alcohol Depend.* 155, 267–274. doi: 10.1016/j.drugalcdep.2015.06.031
- Khazaal, Y., Chatton, A., Rothen, S., Achab, S., Thorens, G., Zullino, D., et al. (2016). Psychometric properties of the 7-item game addiction scale among French and German adults. *BMC Psychiatry* 16:132.
- Khazaal, Y., Zullino, D., and Billieux, J. (2012). The Geneva smoking pictures: development and preliminary validation. *Eur. Addict. Res.* 18, 103–109. doi: 10.1159/000335083
- Kim, E. J., Namkoong, K., Ku, T., and Kim, S. J. (2007). The relationship between online game addiction and aggression, self, control and narcissistic personality traits. *Eur. Psychiatry* 23, 212–218. doi: 10.1016/j.eurpsy.2007.10.010
- Kim, H., Ha, J., Chang, W. D., Park, W., Kim, L., and Im, C. H. (2018). Detection of craving for gaming in adolescents with internet gaming disorders using multimodal bio signals. *Sensors* 18:102. doi: 10.3390/s18010102
- Ko, C.-H., Gin-Chung, L., Sigmund, H., Ju-Yu, Y., Ming-Jen, Y., Wei-Chen, L., et al. (2009). Brain activities associated with gaming urge of online gaming addiction. *J. Psychiatry Res.* 43, 739–747. doi: 10.1016/j.jpsychires.2008.09.012
- Koepp, M. J., Gunn, R. N., Lawrence, A. D., Cunningham, V. J., Dagher, A., Jones, T., et al. (1998). Evidence for striatal dopamine release during a video game. *Nature* 393, 266–268. doi: 10.1038/30498
- Kowert, R., Vogelgesang, J., Festl, R., and Quandt, T. (2015). Psychological causes and consequences of online video game play. *Comput. Hum. Behav.* 45, 51–58. doi: 10.1016/j.chb.2014.11.074
- Kringelbach, M., and Berridge, K. (2009). Towards a functional neuro-anatomy of pleasure and happiness. *Trends Cogn. Sci.* 13, 479–487. doi: 10.1016/j.tics.2009.08.006
- Kringelbach, M., and Berridge, M. (2010). The neuroscience of happiness and pleasure. *Soc. Res.* 77, 659–678.
- Lawrence, L. M., Ciorciari, J., and Kyrios, M. (2014). “Relationships that compulsive buying has with addiction, obsessive-compulsiveness, hoarding and depression”. *Compr. Psychiatry* 55, 1137–1145. doi: 10.1016/j.comppsy.2014.03.005
- Lazarus, R. S., and Folkman, S. (1984). *Stress, Appraisal and Coping*. New York, NY: Springer.
- Lee, Y., Han, D., Yang, K. C., Daniels, M. A., Na, C., Kee, B. S., et al. (2008). Depression like characteristics of 5HTTLPR polymorphism and temperament in excessive Internet users. *J. Affect. Disord.* 2, 165–169. doi: 10.1016/j.jad.2007.10.020
- Lemmens, J., Valkenburg, P., and Peter, J. (2011). Psychological causes and consequences of pathological gaming. *Comput. Hum. Behav.* 27, 144–152. doi: 10.1016/j.chb.2010.07.015
- Lemmens, J. S., Valkenburg, P. M., and Peter, J. (2009). Development and validation of game addiction scale for adolescents. *Media Psychol.* 12, 77–95. doi: 10.1080/15213260802669458
- Lepine, J.-P., and Birely, M. (2011). The increasing burden of depression. *Neuropsychiatr. Dis. Treat.* 7(Suppl. 1), 3–7.
- Loas, G., Dubal, S., Perot, P., Tirel, F., Nowackowski, P., and Pierson, A. (1997). Etude de validation de la version française de l'échelle de plaisir de Snaith et Hamilton. *L'Encephale* 23, 454–458.
- Loonen, A., and Ivanova, S. (2016). Circuits regulating pleasure and happiness – mechanisms of depression. *Front. Hum. Neurosci.* 10:571.
- Lu, D., Wang, J. W., and Huang, A. C. (2010). Differentiation of internet addiction risk level based on autonomic nervous responses: the internet-addiction hypothesis of autonomic activity. *Cyberpsychol. Behav. Soc. Netw.* 13, 371–378. doi: 10.1089/cyber.2009.0254
- Lustig, R. (2017). *The Hacking of the American Mind*. New York, NY: Avery.
- MacNicol, B. (2016). The biology of addiction. *Can. J. Anesthesia* 64, 141–148. doi: 10.1097/YPG.0000000000000095

- Mahapatra, A., and Sharma, P. (2018). Association of internet addiction and alexithymia – A scoping review. *Addict. Behav.* 81, 175–182. doi: 10.1016/j.addbeh.2018.02.004
- Mikolajczak, M., and Luminet, O. (2006). Is alexithymia affected by situational stress or is it a stable trait related to emotion regulation? *Pers. Individ. Differ.* 40, 1399–1408. doi: 10.1016/j.paid.2005.10.020
- Orzack, M. H., Vouse, A. C., Wolf, D., and Hennen, J. (2006). An on-going study of group treatment for men involved in problematic Internet enabled sexual behaviour. *CyberPsychol. Behav.* 9, 348–360. doi: 10.1089/cpb.2006.9.348
- Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H. J., Mößle, T., et al. (2014). An international consensus for assessing Internet gaming disorder using new DSM-5 approach. *Addiction* 109, 1399–1406. doi: 10.1111/add.12457
- Petry, N. M., Rehbein, F., Ko, C. H., and O'Brien, C. H. (2015). Internet gaming disorders in the DSM-5. *Curr. Psychiatry Rep.* 17:19.
- Pollard, I. (2003). *From Happiness to Depression*. *Today's Life Science*. Available at: www.biotechnews.com.au (accessed August, 2019).
- Procter, P. (1985). *Longman Concise English Dictionary*. England: Longman Group Limited.
- Ryu, H., Lee, J., Choi, A., Park, S., Kim, D., and Choi, J. (2018). The relationship between impulsivity and internet gaming disorders in young adults: mediating effects of interpersonal relationships and depression. *Int. J. Environ. Res. Public Health* 15:458. doi: 10.3390/ijerph15030458
- Sarda, E., Bègue, L., Bry, C., and Gentile, D. (2016). Internet gaming disorders and well-being: a scale validation. *Cyberpsychol. Behav. Soc. Netw.* 19, 674–679. doi: 10.1089/cyber.2016.0286
- Schimmenti, A., and Caretti, V. (2010). Psychic retreats or psychic pits? Unbearable states of mind add technological addiction. *Psychoanalysis* 27, 115–132. doi: 10.1037/a0019414
- Schimmenti, A., Passanisi, A., Caretti, V., La Marca, L., Granieri, A., Iacolino, C., et al. (2017). Traumatic experiences, alexithymia and Internet addiction symptoms among late adolescents: a moderated mediation analysis. *Addict. Behav.* 64, 314–320. doi: 10.1016/j.addbeh.2015.11.002
- Schmidt, L. A. (2016). "What are addictive substances and behaviours and how far do they extend?," in *Impact of Addictive Substances and Behaviours on Individual and Societal Well-Being*, eds P. Anderson, J. Rehm, and R. Room, (London: Oxford University Press).
- Schwabe, L., Tegenhoff, M., Höffken, O., and Wolf, O. (2012). Simultaneous glucocorticoid and noradrenergic activity disrupts the neural basis of goal-directed action in the human brain. *J. Neurosci.* 32, 10146–10155. doi: 10.1523/JNEUROSCI.1304-12.2012
- Seay, A. F., and Kraut, R. E. (2007). "Project massive: self-regulation and problematic use of on-line gambling," in *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*, San Jose, CA.
- Serretti, A., Calati, R., Mandelli, L., and Ronchi, D. D. (2006). Serotonin transporter gene variant and behaviour: a comprehensive review. *Curr. Drug Targets* 7, 1659–1669. doi: 10.2174/138945006779025419
- Shen, C., Ratan, C., Dora, Y., and Leavitt, A. (2016). "Do men advance faster than women? Debunking the gender performance gap in two massively multiplayer online games. *J. Comput. Med Commun.* 21, 312–329. doi: 10.1111/jcc4.12159
- Sinha, R., Fuse, T., Aubin, L. R., and O'Malley, S. S. (2000). Psychological stress drug-related cues and cocaine craving. *Psychopharmacology* 152, 140–148. doi: 10.1007/s002130000499
- Snaith, R. P., Hamilton, M., Morley, S., and Humayan, A. (1995). A scale for the assessment of the hedonic tone: the Snaith-Hamilton Pleasure Scale. *Br. J. Psychiatry* 167, 99–103. doi: 10.1192/bjp.167.1.99
- Szalavitz, M. (2011). *What does a 400% increase in antidepressant use really mean?*. Patna: Time.
- Teplan, M., and Krakovská, A. (2009). "EEG features of psycho-physiological relaxation," in *Proceedings of the 2nd International Symposium on Applied Sciences in Biomedical and Communication Technologies ISABEL 2009*, (Bratislava: Institute of Measurement Science SAS).
- Tian, Y., Liu, P., and Huang, X. (2018). The role of emotion regulation in reducing emotional distortions of duration perception. *Front. Psychol.* 9:347. doi: 10.3389/fpsyg.2018.00347
- Torres, A., Catena, A., Megias, A., Maldonado, A., Candido, A., Verdejo-Garcia, A., et al. (2013). Emotional and non-emotional pathways to impulsive behavior and addiction. *Front. Hum. Neurosci.* 7:43. doi: 10.3389/fnhum.2013.00043
- Tricomi, E., Ballaine, B. W., and O'Doherty, J. P. (2009). A specific role for posterior dorsolateral striatum in human habit learning. *Eur. J. Neurosci.* 29, 2225–2232. doi: 10.1111/j.1460-9568.2009.06796.x
- Üstün, T. B., Ayuso-Mateos, J. L., Chatterji, S., Mathers, C., and Murray, C. J. (2004). Global burden of depressive disorders in the year 2000. *Br. J. Psychiatry* 184, 386–392. doi: 10.1192/bjp.184.5.386
- van Holst, R. J., Lemmens, J. S., Valkenburg, P. M., Peter, J., Veltman, D. J., and Goudriaan, A. E. (2012). Attentional bias and disinhibition toward gaming cues are related to problem gaming in male adolescents. *J. Adolescent. Health* 50, 541–546. doi: 10.1016/j.jadohealth.2011.07.006
- Volkow, N., Wang, G., Fowler, J., Tomasi, D., and Telang, F. (2011). Addiction: beyond dopamine reward circuitry. *PNAS* 108, 15037–15042. doi: 10.1073/pnas.1010654108
- Wallace, B. C. (1989). Psychological and environmental determinants of relapse in crack cocaine smokers. *J. Subst. Abuse Treat.* 6, 95–106. doi: 10.1016/0740-5472(89)90036-6
- Wang, L., Wu, L., Wang, Y., Li, H., Liu, X., Du, X., et al. (2017). Altered brain activities associated with craving and cue reactivity in people with Internet gaming disorders: evidence from the comparison with recreational Internet game users. *Front. Psychol.* 8:1150. doi: 10.3389/fpsyg.2017.01150
- Waterman, A., Schwartz, S., and Conti, R. (2008). The implication of the two conceptions of happiness (Hedonic. (enjoyment)and Eudamonia) for the understanding of intrinsic motivation. *J. Happiness Stud.* 9, 41–79. doi: 10.1007/s10902-006-9020-7
- Wei, H.-T., Chen, M. H., Huang, P. C., and Bai, Y. M. (2012). The association between online gaming, social phobia and depression: an internet survey. *BMC Psychiatry* 12:92. doi: 10.1186/1471-244X-12-92
- Wenzel, H. G., Bakken, I. J., Johansson, A., Götestam, K. G., and Øren, A. (2009). Excessive computer game playing among Norwegian adults: self-reported consequences of playing and association with mental health problems. *Psychol. Rep.* 105, 1237–1247. doi: 10.2466/pr0.105.f.1237-1247
- Whiteford, H., Degenhardt, L., Rehm, J., Baxter, A. J., Ferrari, A. J., Erskine, H. E., et al. (2013). "Global burden of attributable to mental and substance use disorders: findings from the global burden of disease study 2010". *Lancet* 382, 1575–1586. doi: 10.1016/S0140-6736(13)61611-6
- Witteck, C. T., Reiten Finseras, T., Pallesen, S., Mentzoni, A., Hanss, D., Griffiths, M., et al. (2016). Prevalence and predictors of video game addiction: a study based on a national and representative sample gamers. *Int. J. Mental Health Addict.* 14, 672–686. doi: 10.1007/s11469-015-9592-8
- World Health Organization [WHO] (2018). Available at: https://www.who.int/features/qa/gaming-disorder/en/ (accessed December, 2018).
- Yau, Y., Crowley, M., Mayes, L., and Potenza, M. (2012). Are Internet use and video game play addictive behaviours? Biological, clinical and public health implications for youths and adults. *Minerva Psichiatrica* 53, 153–170.
- Yin, H. H., Knowlton, B. J., and Ballaine, B. W. (2004). Lesions of dorsolateral striatum preserve outcome expectancy but disrupt habit formation in instrumental learning. *Eur. J. Neurosci.* 19, 181–189. doi: 10.1111/j.1460-9568.2004.03095.x
- Zheng, Y., Fan, F., Liu, X., and Mo, L. (2012). Life events, coping and posttraumatic stress symptoms among Chinese adolescents exposed to 2008 Wenchuan Earthquake. China. *PLoS One* 7:e29404. doi: 10.1371/journal.pone.0029404

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 Gros, Debye, Lete and van de Leemput. 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.

ANNEX

Self-Report Questionnaires

- Six items Questionnaire: Pleasure and/or Happiness associated with VG play (Items 7 and 8 were suppressed after the preliminary phase)

Items

- (1) I enjoy playing video games.
- (2) I am happy when I play video games.
- (3) I would find pleasure in my video game activities.
- (4) I find video games amusing.
- (5) I enjoy playing my favorite video game.
- (6) I often experience joy and exaltation when playing video games.
- (7) I would feel pleasure when I receive praise from other people on my capacity to play video games.
- (8) I don't have fun when playing video games with other people.

fully disagree disagree slightly disagree slightly agree agree fully agree

<-----I-----I-----I-----I-----I-----I----->

– Questionnaire on Craving for playing VG

- After having watched this clip I feel craving for playing video games.

fully disagree disagree slightly disagree slightly agree agree fully agree

<-----I-----I-----I-----I-----I-----I----->

- Three bipolar items Questionnaire: Pleasure and/or Happiness associated with VG play

Bipolar items.

- (1) I enjoy playing video games
- I ————— I ————— I ————— I ————— I
- (2) I would find pleasure in my video game activities
- I ————— I ————— I ————— I ————— I
- (3) I enjoy playing my favorite video game
- I ————— I ————— I ————— I ————— I

– Ten key words [resulting from the semantic mapping of pleasure (P) and happiness (H)]: 3/10 words to be associated with VG play

- Joy
- Craving
- Well-being
- Impulsivity
- Fellowship
- Desire
- Fun
- Contentment
- Gratification
- Serenity

Pleasure cluster: joy, craving, impulsivity, desire, fun, gratification.

Happiness cluster: well-being, fellowship, contentment, serenity.

– **One bipolar item Questionnaire: Pleasure or Happiness associated with VG play (with explicit definitions)**

Happiness: emotional state of lasting contentment.

Pleasure: transient emotional state when satisfying a desire, a craving.

A bipolar item

– When I play my favorite video games, I feel. . .

– Much happiness – Happiness – A little bit of happiness – A little bit of pleasure – Pleasure – Much pleasure





Objectified Body Consciousness, Body Image Control in Photos, and Problematic Social Networking: The Role of Appearance Control Beliefs

Valentina Boursier^{1*}, Francesca Gioia¹ and Mark D. Griffiths²

¹ Department of Humanities, University of Naples Federico II, Naples, Italy, ² School of Social Sciences, Nottingham Trent University, Nottingham, United Kingdom

OPEN ACCESS

Edited by:

Luca Milani,
Catholic University of the Sacred
Heart, Italy

Reviewed by:

Silvia Casale,
University of Florence, Italy
Antonia Lonigro,
Università Europea di Roma, Italy

*Correspondence:

Valentina Boursier
valentina.boursier@unina.it

Specialty section:

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

Received: 20 November 2019

Accepted: 20 January 2020

Published: 25 February 2020

Citation:

Boursier V, Gioia F and
Griffiths MD (2020) Objectified Body
Consciousness, Body Image Control
in Photos, and Problematic Social
Networking: The Role of Appearance
Control Beliefs.
Front. Psychol. 11:147.
doi: 10.3389/fpsyg.2020.00147

At present, adolescents' photo-taking and photo-sharing on social media represent ubiquitous practices and objectified body consciousness (OBC) might offer a useful framework to explore online self-presentation and social networking site (SNS) use. Indeed, SNS might represent a highly accessible medium for socializing with self-objectification. However, the relationship between OBC components and problematic SNS use is still understudied. The present study evaluated the previously unexplored predictive role of appearance control beliefs on problematic SNS use, testing the mediating effect of body image control in photos (BICP) across male and female groups. A total of 693 adolescents (55% females; mean age 16 years) participated in the study. Results showed the negatively predictive role of appearance control beliefs on control over body image in photos. Moreover, BICP mediated the appearance control beliefs' negative effect on problematic SNS use in girls. The present study tested the unexplored effect of appearance control beliefs upon problematic SNS use, contributing to the OBC research field and the ongoing debate concerning predictive and protective factors in problematic SNS use.

Keywords: appearance control beliefs, objectified body consciousness, body image, problematic social network site use, social networking, adolescence

INTRODUCTION

In recent years, self-focused photo-taking and photo-sharing on social networking sites (SNSs) have become ubiquitous practices and objectification theory (Fredrickson and Roberts, 1997) might offer a useful framework to explore online self-presentation and SNS use (Fox and Vendemia, 2016). *Objectification theory* (Fredrickson and Roberts, 1997) provides a framework to understand the possible consequences of being female in Western societies, where female bodies are constructed as objects, looked at, commented upon, and evaluated primarily on the basis of bodily appearance (Holland and Tiggemann, 2016; Karsay et al., 2018). A close predecessor of objectification theory is the psychological construct identified in objectified body consciousness (OBC) (McKinley and Hyde, 1996). These frameworks posit that repeated objectification experiences might lead to females' *self-objectification* and facilitate such individuals to assume and internalize an outside observer's gaze on their physical selves (Fredrickson and Roberts, 1997; Moradi and Huang, 2008; Feltman and Szymanski, 2018). This particular view of self might lead to a form of self-consciousness in which females develop identities strongly rooted in (and defined by) their physical

appearance (McKinley and Hyde, 1996; Fredrickson and Roberts, 1997; McKinley, 1999; Sinclair and Myers, 2004; Sinclair, 2005). However, an increasing number of studies have highlighted that self-objectification and consequent beliefs are also experienced by males, especially in adolescence (Moradi and Huang, 2008; Daniel and Bridges, 2010; Moradi, 2010; Vandenbosch and Eggermont, 2013; Dakanalis et al., 2015; Manago et al., 2015; Holland and Tiggemann, 2016; Karsay et al., 2018).

McKinley and Hyde (1996) operationalized OBC including three main components. The central tenet *body surveillance* represents persistent thinking and constant self-monitoring assuming an outside observer's perspective to comply with cultural body standards and avoid negative judgments. *Body shame* arises due to the comparison with cultural standards and the perception of failure to meet them. Finally, *appearance control beliefs* refer to those beliefs that individuals are responsible for their bodily look and that, with enough effort, their physical appearance can be controlled. Typically, self-objectification and OBC have been explored in relation to consumption of traditional mass media, such as magazines, television, and films (for a review, see Grabe et al., 2008). In fact, a few studies have shown that the increasing exposure to objectifying media and images might lead to body self-objectification by individuals (e.g. Fredrickson and Roberts, 1997; Aubrey, 2006; Meier and Gray, 2014). In the past few years, the increasing popularity of social media use and the large increase in engagement of adolescents and young people in social networking (Mascheroni and Ólafsson, 2018; D'Arienzo et al., 2019; Gioia and Boursier, 2019) have led researchers to focus on SNS use as a new and highly accessible medium for socializing with self-objectification experiences and OBC (de Vries and Peter, 2013; Fardouly et al., 2015; Manago et al., 2015; Bell et al., 2018; Cohen et al., 2018; Caso et al., 2019).

The objectification theory research field (Fredrickson and Roberts, 1997) has traditionally explored the predictive role of SNS use on self-objectification experiences (Vandenbosch and Eggermont, 2012; de Vries and Peter, 2013; Fardouly et al., 2015, 2018; Manago et al., 2015; McLean et al., 2015; Holland and Tiggemann, 2016; Bell et al., 2018; Cohen et al., 2018; Feltman and Szymanski, 2018; Tiggemann and Barbato, 2018; Butkowski et al., 2019). Nevertheless, as Moradi and Huang (2008) stated, further research concerning the possible effects of OBC on subsequent outcomes is needed. Only recently, Veldhuis et al. (2018) evaluated the influence of self-objectification on SNS use, confirming the plausibility of Strelan and Hargreaves' (2005) circle of self-objectification and, thus, the bidirectional nature of the SNS use-self-objectification pathway. In terms of OBC (McKinley and Hyde, 1996), body surveillance has been the most investigated OBC factor in association with social networking. Some studies have highlighted the strong predictive role of SNS involvement on body surveillance (Tiggemann and Slater, 2013; Fardouly et al., 2018; Feltman and Szymanski, 2018), which in turn predicts greater body shame (Manago et al., 2015; Slater and Tiggemann, 2015; Tiggemann and Slater, 2015). Veldhuis et al. (2018) hypothesized and confirmed the predictive role of body surveillance on selfie-related activities on SNSs. Few studies have explored the predictive role of adolescents' risky sexual behaviors online concerning body surveillance

(Vandenbosch and Eggermont, 2013; Doornwaard et al., 2014), and more recently, one study included appearance control beliefs to evaluate the predictive role of OBC on teenagers' sexting for sexual purposes (Bianchi et al., 2017). However, no studies have specifically focused on the relationship between SNSs and appearance control beliefs.

Traditionally, appearance control beliefs represent a controversial and debated factor of OBC. McKinley and Hyde (1996) themselves located appearance control beliefs in a paradoxical position within OBC theory (John and Ebbeck, 2008). Even though the authors hypothesized that higher beliefs in the ability of individuals to control own appearance might contribute to them negatively experiencing their own body, their findings and several subsequent studies have reported a negative correlation or no connection between appearance control beliefs and body surveillance, body shame, and other body-related negative outcomes (i.e. eating disorder symptomatology and internalization of cultural standards of attractiveness) (McKinley and Hyde, 1996; Sinclair and Myers, 2004; John and Ebbeck, 2008; Moradi, 2010; Sinclair, 2010; Fitzsimmons-Craft et al., 2011). On the contrary, in other research, appearance control beliefs have shown significant positive association with measures of psychological well-being, body esteem, and body satisfaction (McKinley and Hyde, 1996; McKinley, 1999; Sinclair and Myers, 2004; John and Ebbeck, 2008; Crawford et al., 2009; Noser and Zeigler-Hill, 2014). Moreover, appearance control beliefs have been found to strongly and positively relate to indicators of personal agency, sense of competence, locus of control, and perceived generalized controllability over life events (McKinley and Hyde, 1996; McKinley, 1998, 1999; Sinclair and Myers, 2004; Laliberte et al., 2007; Moradi, 2010; Sinclair, 2010). On the contrary, within the addictive behaviors research field and thus from another perspective, some studies highlighted that beliefs in control over information (and perhaps also over own appearance) might promote individuals' trust about their ability to manage it and SNSs, reducing the perception of online risks (Niemz et al., 2005; Joinson et al., 2010; Krasnova et al., 2010; Taddei and Contena, 2013). Similarly, positive metacognitions (Spada et al., 2015) have been conceptualized as specific beliefs related to a behavior as a way to control and regulate cognition and emotion. Several studies have found that these metacognitions strongly promote individuals' engagement in Internet-related problematic behaviors (Spada et al., 2007, 2015; Casale et al., 2016, 2018; Spada and Marino, 2017). Nevertheless, within the OBC framework, the relationships between appearance control beliefs and SNS use and misuse are still unexplored.

Social networking sites are virtual communities that allow users to be not just passive receivers but also active creators of individual private or public profiles, sharing various forms of personal content, interacting with "offline" friends, meeting other people who share common interests, and viewing, commenting, and "liking" peer-generated content (e.g. Boyd and Ellison, 2007; Kuss and Griffiths, 2011b, 2017; Perloff, 2014; Holland and Tiggemann, 2016; Balakrishnan and Griffiths, 2017; Tiggemann and Slater, 2017; Boursier and Manna, 2018a; Boursier et al., 2018; Cohen et al., 2018; Veldhuis et al., 2018; Butkowski et al., 2019).

However, social networking-related risks and opportunities remain a matter of scientific debate (Livingstone, 2008; Munno et al., 2017). On the one hand, SNS use could be considered as a “way of being” (Kuss and Griffiths, 2017), supporting adolescents’ need to belong and representing ideal places for their identity construction processes via a digital screen (Zhao et al., 2008; Riva, 2010; Pelosi et al., 2014; Manago et al., 2015; Boursier and Manna, 2019). On the other hand, possible social networking-related risks fuel the scientific debate about overpathologized, problematic, and potentially addictive use of SNSs (e.g., Kuss and Griffiths, 2011a, 2017; Billieux et al., 2015; Andreassen et al., 2016; Bányai et al., 2017; Franchina and Lo Coco, 2018; Kircaburun and Griffiths, 2018). According to Kuss and Griffiths (2017), within social media and SNS research fields, unanimous agreement about terminological and operational definitions is still lacking. Within the biopsychosocial framework, some studies have utilized the six criteria of the component model of addiction (i.e. salience, mood modification, tolerance, withdrawal, relapse, and conflict) to evaluate problematic SNS use (e.g., Griffiths, 2005; Andreassen et al., 2016; Kuss and Griffiths, 2017; Monacis et al., 2017; D’Arienzo et al., 2019). On the contrary, according to a social-cognitive model, researchers have conceptualized problematic online activities in terms of difficulties in impulse control and mood regulation, subsequent negative outcomes resulting from online misuse, and preference for online social interactions, due to a perceived lack of social skills (e.g., Caplan, 2003; Baker and White, 2010; LaRose et al., 2010; Pontes et al., 2016; Casale and Fioravanti, 2017; Lee et al., 2017). In this regard, SNS use might allow young users to (i) avoid face-to-face difficulties, (ii) provide greater control over informational disclosure, and (iii) be strategic in managing own self-presentation (Casale and Fioravanti, 2017), especially through the widespread use of pictures, videos, and stories shared on SNS.

According to Feltman and Szymanski (2018), social networking use appears to be increasingly based upon the sharing of visual content that boys and girls might use as a source of comparison and information to improve their physical appearance (Rousseau et al., 2017; Franchina and Lo Coco, 2018). Consequently, for adolescents who are dealing with a “new” body mentalization and identity construction processes, the body images on SNSs assume great relevance (Pelosi et al., 2014; Franchina and Lo Coco, 2018; Boursier and Manna, 2019). In this regard, social networking activities focused on pictures and visual self-presentation might offer higher perceived control over an individual’s own body image, improving social confidence (Rodgers et al., 2013; Pelosi et al., 2014). On the other hand, such activities might promote appearance-related concerns and potentially problematic monitoring of an individual’s body image and online visual content (Perloff, 2014; Fox and Vendemia, 2016). As previous studies have highlighted, the investment and control over individuals’ own body image in photos pay great attention to picture quality, concerns about self-image shared online (McLean et al., 2015), and strategies in taking and choosing self-pictures before sharing on SNSs (Boursier and Manna, 2019). The asynchronous nature of SNS use might promote

the editing utility and an overinvestment of individuals’ body image (Fox and Vendemia, 2016), allowing them to construct and share online the best version of themselves (Fox and Rooney, 2015; Manago et al., 2015; McLean et al., 2016; Casale and Fioravanti, 2017; Boursier and Manna, 2018b; Cohen et al., 2018; Lonergan et al., 2019). This great visual attention directed toward body appearance might trigger behaviors such as body image control and monitoring, potentially related to self-objectification (Vandenbosch and Eggermont, 2012; de Vries and Peter, 2013; Fox and Vendemia, 2016; Butkowski et al., 2019).

In summary, empirical research has confirmed that body image and social networking research fields are strongly connected and rapidly evolving together, highlighting close relationships among appearance-related issues, SNS use, and self-objectification. Within the OBC framework, researchers have mainly focused on the close relationship between body surveillance and SNS use, and only a few studies have examined body shame. No studies have examined appearance control beliefs, which are therefore an understudied aspect of the self-objectification field. Thus, research on the relationship between appearance control beliefs and problematic social networking is still lacking, despite scholarly findings showing that preexisting psychosocial problems, in association with maladaptive cognitions about self, might lead to problematic cognitions, behaviors, and negative outcomes linked to Internet-related activities (Caplan, 2002). Consequently, the present study evaluated the direct and indirect effects of appearance control beliefs and body image control in photos (BICP) upon adolescents’ problematic SNS use, testing the validity of this mediation model across male and female groups. It was expected that appearance control beliefs would influence problematic SNS use and that BICP would mediate the relationship between these variables. Nevertheless, due to the poor and controversial findings concerning appearance control beliefs and the unexplored gender-related differences, a direction for these effects was not specified.

MATERIALS AND METHODS

Participants and Procedure

A total of 693 participants were asked to participate in a survey study. The sample comprised 310 males (45%) and 383 females (55%), aged between 13 and 19 years, with a mean age of 16 years ($SD = 1.58$). Data collection occurred in five different Italian high schools. The parents and school principal of each school were informed of the nature of the research and the measures to be used in the survey, assuring full confidentiality to all participants. Their written consent was provided. General information about the aim of the study was also announced in class. Participation was voluntary, and all participants were informed that they could omit any information they did not wish to give and could withdraw from the study at any time. All students agreed to participate and completed the survey in a classroom setting using their smartphones. The study was approved by the research

team's university research ethics committee and was conducted in accordance with the ethical guidelines for psychological research laid down by the Italian Psychological Association (AIP). No course credits or remunerative rewards were given.

Measures

Socio-Demographic Information and the Amount of Time Spent on SNSs

In this section, information about gender, age, the most used SNSs, and hours per day spent on SNSs was collected. Specifically, participants were asked to answer two items: (i) "Which of these SNSs and Apps do you use mostly," choosing among WhatsApp, Facebook, Facebook Messenger, Instagram, Snapchat, YouTube, Telegram, Tinder, Tumbler, and Skype and (ii) "How many hours do you spend on SNSs every day," from 1 (*less than 1 h*) to 8 (*more than 6 h*).

Appearance Control Beliefs

The eight-item appearance control beliefs (ACB) subscale of the Italian version of the Objectified Body Consciousness Scale (OBCS; Dakanalis et al., 2017; original English version by McKinley and Hyde, 1996) was used. The ACB subscale evaluates the beliefs by which, given enough effort, physical appearance, body shape, and size can be controlled (e.g. "I think a person can look pretty much how they want to if they are willing to work at it" and "I can weigh what I'm supposed to when I try hard enough"). The items were rated on a seven-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Appropriate items are reverse-scored, and an average subscale score was created. In the present study, Cronbach's α coefficient was good (0.77), lower than values reported by Dakanalis et al. (2017) but comparable with the value reported by McKinley and Hyde (1996).

Body Image Control in Photos-Revised

In the present study, the revised (short) version of the BICP-R questionnaire (Boursier and Manna, 2019; for the original version, Pelosi et al., 2014) was used. The BICP-R comprises 16 items rated on a five-point Likert scale, from 1 (*never*) to 5 (*always*), and evaluates adolescents' photo management and control online and offline, corresponding to five different factors: selfie-related factors (e.g. "I prefer my image as it appears in self-portraits, because I know how to make it look better"), privacy filter behaviors (e.g. "I use privacy filters in order to show photos in which I appear more attractive only to certain people"), positive body image factors (e.g. "I post those photos which I hope will receive praise for my appearance"), sexual attraction factors (e.g. "I have posted provocative photos on Facebook, in order to attract attention to myself"), and negative body image factors (e.g. "I feel awkward if I notice that someone has posted photos that show my body's defects"). The denomination of BICP-R factors has been modified compared to the previous version of the questionnaire (Boursier and Manna, 2019), to improve their intelligibility. Similar to a previous study that used the BICP-R (Boursier and Manna, 2019), in the present study, Cronbach's α value for the scale was very good (0.82).

Generalized Problematic Internet Use Scale 2

In the present study, the Italian version of Generalized Problematic Internet Use Scale 2 (GPIUS2) (Fioravanti et al., 2013) was used. The GPIUS2 (Caplan, 2010) is a 15-item scale rated on a seven-point Likert scale, from 1 (*strongly disagree*) to 7 (*strongly agree*), and assesses the degree of generalized problematic Internet use, examining five factors: preference for online social interactions (e.g. "I prefer communicating with people online rather than face-to-face"), mood regulation (e.g. "I have used the Internet to make myself feel better when I was down"), cognitive preoccupation (e.g. "I think obsessively about going online when I am offline"), compulsive Internet use (e.g. "I have difficulty controlling the amount of time I spend online"), and negative outcomes (e.g. "My Internet use has created problems for me in my life"). As in a previous study by Casale and Fioravanti (2017), for the purposes of this study, the word "Internet" was replaced by "social network sites" to explore potential problematic social networking among adolescents (e.g. "I have used SNSs to make myself feel better when I was down"). In the present study, Cronbach's α was very good (0.88) and Cronbach's α values for each subscale were 0.69 (preference for online social interactions), 0.73 (mood regulation), 0.81 (cognitive preoccupation), 0.82 (compulsive SNS use), and 0.75 (negative outcomes).

Statistical Analysis

Descriptive statistics were performed using the Statistical Package for Social Sciences (SPSS Version 23 for Windows) and it was used to assess the means, standard deviation of the variables, and confidence interval of means (CI: 95%). Independent *t*-tests were used to assess gender differences, and the magnitude of the differences were evaluated with effect sizes (Cohen's *d*). Path analyses within structural equation modeling (SEM) were used to test the proposed mediation model. To evaluate the overall model goodness of fit, several indexes were used: the comparative fit index (CFI) and the Tucker–Lewis fit index (TLI), which are indices related to the total variance accounted for by the model and where values higher than 0.90 are desired (Bentler, 1990) root mean square error approximation (RMSEA), which is related to the variance of residuals and for which values below 0.08 are recommended (Browne and Cudeck, 1993); and the standardized root mean square residuals (SRMR) for which values below 0.08 are considered a good fit (Kline, 2015). The Satorra–Bentler χ^2 difference test (Δ SB χ^2) was used to test the relative fit of nested models (Satorra, 2000). When the more constrained model was rejected, a gradually less restrictive model of partial invariance was tested. All SEM analyses were performed utilizing MPlus 8 (Muthén & Muthén, Los Angeles, CA, United States).

RESULTS

Descriptive Statistics

Among the participants, the most popular and used SNSs were WhatsApp (99%), Instagram (92%), YouTube (80%), and Facebook (70%). Descriptive analyses and gender differences are

TABLE 1 | Means, standard deviations (SD), confidence intervals (CI), *t*-test, and effect sizes (Cohen's *d*) for both genders.

	Total sample	Males	Females	<i>t</i>	<i>d</i>
	Mean (SD) [95% CI]	Mean (SD) [95% CI]	Mean (SD) [95% CI]		
Hours per day spent on SNSs	3.40 (1.209) [3.32–3.49]	3.08 (1.230) [2.95–3.22]	3.66 (1.127) [3.55–3.78]	6.456***	0.49
OBCS appearance control beliefs	4.91 (0.785) [4.852–4.968]	4.676 (0.869) [4.575–4.769]	5.099 (0.651) [5.031–5.164]	7.313***	0.56
BICP selfie-related factors	2.712 (1.093) [2.630–2.793]	2.329 (1.043) [2.215–2.450]	3.021 (1.035) [2.919–3.122]	8.729***	0.66
BICP privacy filter behaviors	1.70 (1.078) [1.615–1.777]	1.597 (1.062) [1.482–1.71]	1.779 (1.085) [1.658–1.886]	2.224*	0.17
BICP positive body image factors	2.775 (0.845) [2.713–2.836]	2.676 (0.883) [2.582–2.773]	2.854 (0.806) [2.774–2.930]	2.780**	0.21
BICP sexual attraction factors	1.68 (1.143) [1.604–1.761]	2.027 (1.380) [1.871–2.184]	1.398 (0.805) [1.316–1.482]	7.488***	0.57
BICP negative body image factors	3.175 (1.191) [3.075–3.263]	3.011 (1.272) [2.868–3.155]	3.308 (1.105) [3.200–3.427]	3.291**	0.25
PSNSU preference for online social interactions	2.467 (1.504) [2.343–2.583]	2.460 (1.498) [2.290–2.632]	2.472 (1.510) [2.32–2.621]	0.100 ^{n.s.}	0.01
PSNSU mood regulation	3.299 (1.767) [3.176–3.425]	3.04 (1.775) [2.844–3.256]	3.509 (1.734) [3.33–3.686]	3.506***	0.27
PSNSU cognitive preoccupation	3.242 (1.849) [3.097–3.387]	2.967 (1.766) [2.785–3.179]	3.465 (1.887) [3.286–3.655]	3.555***	0.27
PSNSU compulsive social network site use	3.306 (1.943) [3.162–3.453]	2.869 (1.785) [2.672–3.069]	3.661 (1.996) [3.470–3.86]	5.443***	0.41
PSNSU negative outcomes	1.965 (1.312) [1.877–2.061]	2.224 (1.315) [2.078–2.37]	1.756 (1.273) [1.630–1.889]	4.735***	0.36

OBCS, Objectified Body Consciousness Scale; BICP, body image control in photos; PSNSU, problematic social network site use. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; n.s., non-significant.

reported in **Table 1**. Statistically significant differences between males' and females' scores were found. Girls reported higher mean scores in hours per day spent on SNSs, appearance control beliefs, selfie-related factors, privacy filter behaviors, positive body image factors, negative body image factors, mood, cognitive preoccupation, and compulsive SNS use. On the contrary, boys showed higher mean scores in sexual attraction factors and negative outcomes. The effect sizes (Cohen's *d*) were small for privacy filter behaviors, positive body image factors, negative body image factors, mood regulation, and cognitive preoccupation. Medium effect sizes were found for compulsive SNS use and negative outcomes. Finally, relevant effect sizes were found for body control beliefs, selfie-related factors, and sexual attraction factors. Bivariate correlations between all variables are shown in **Table 2**. Negative correlations were generally found between appearance control beliefs and BICP and problematic SNS use in both male and female samples.

Mediation Analysis

The mediated effect of appearance control beliefs on problematic SNS use via BICP was tested. An unconstrained model in which all paths were allowed to freely vary was tested across male and female groups. The model produced an inadequate fit to the data, MLR $\chi^2(48) = 264.139$, $p < 0.001$; CFI = 0.90; TLI = 0.76; RMSEA = 0.114, 90% CI [0.101–0.128]; SRMR = 0.087. The subsequent fully constrained model showed

a little improvement of the model fit, MLR $\chi^2(82) = 324.349$, $p < 0.001$; CFI = 0.88; TLI = 0.84; RMSEA = 0.092, 90% CI [0.082–0.103]; SRMR = 0.091. Nevertheless, comparing the fit of the unconstrained model to the fit of a fully constrained model, the $\Delta SB \chi^2$ indicated that groups were already different: $\Delta SB \chi^2(34) = 60.21$, $p = 0.004$. Thus, invariance has not been established.

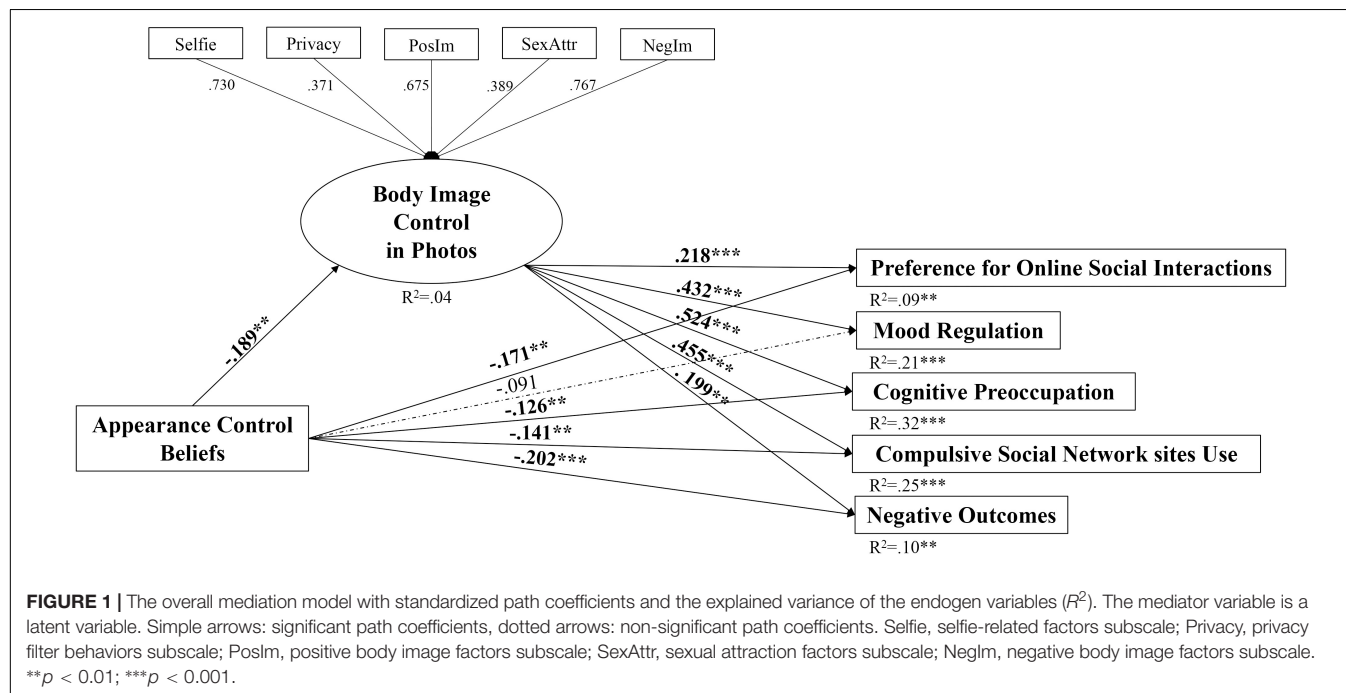
Consequently, the mediation model was tested on both male and female independent samples. The mediation model on the male group showed a quite inadequate fit to the data, MLR $\chi^2(29) = 107.742$, $p < 0.001$; CFI = 0.92; TLI = 0.85; RMSEA = 0.094, 90% CI [0.075–0.113]; SRMR = 0.072. Differently, the mediation model on the female sample showed an optimal fit to the data: MLR $\chi^2 = 66.144$, $p < 0.001$; CFI = 0.97; TLI = 0.94; RMSEA = 0.058, 90% CI [0.039–0.076]; SRMR = 0.040. According to the results (**Figure 1**), appearance control beliefs have a significant direct negative effect on BICP, preference for online social interactions, cognitive preoccupation, compulsive SNS use, and negative outcomes. BICP was significantly and strongly associated with problematic SNS use, with direct effects on preference for online social interactions, mood regulation, cognitive preoccupation, compulsive SNS use, and negative outcomes.

In relation to the indirect effects, all paths were statistically significant: (i) appearance control beliefs \rightarrow BICP \rightarrow preference for online social interactions ($\beta = -0.041$; $p < 0.05$), (ii)

TABLE 2 | Bivariate correlations between all variables.

	1	2	3	4	5	6	7	8	9	10
1. OBCS appearance control beliefs	–	–0.113*	–0.165**	–0.137**	–0.053	–0.144**	–0.213**	–0.173**	–0.225**	–0.227**
2. BICP selfie-related factors	–0.148**	–	0.259**	0.461**	0.292**	0.565**	0.123*	0.310**	0.456**	0.394**
3. BICP privacy filter behaviors	–0.077	0.355**	–	0.277**	0.274**	0.249**	0.158**	0.248**	0.134**	0.170**
4. BICP positive body image factors	–0.420**	0.350**	0.282**	–	0.241**	0.554**	0.174**	0.343**	0.319**	0.301**
5. BICP sexual attraction factors	–0.407**	0.301**	0.228**	0.426**	–	0.261**	0.176**	0.189**	0.252**	0.231**
6. BICP negative body image factors	–0.344**	0.527**	0.235**	0.463**	0.417**	–	0.206**	0.312**	0.413**	0.342**
7. PSNSU preference for online social interactions	–0.150**	0.238**	0.311**	0.146*	0.234**	0.223**	–	0.414**	0.344**	0.337**
8. PSNSU mood regulation	0.116*	0.297**	0.315**	0.080	0.031	0.221**	0.515**	–	0.401**	0.455**
9. PSNSU cognitive preoccupation	–0.021	0.343**	0.346**	0.188**	0.055	0.224**	0.425**	0.591**	–	0.784**
10. PSNSU compulsive social network site use	0.038	0.289**	0.360**	0.095	0.024	0.206**	0.488**	0.640**	0.710**	–

Males' data below the diagonal, females' data above the diagonal. OBCS, Objectified Body Consciousness Scale; BICP, body image control in photos; PSNSU, problematic social network site use. * $p < 0.05$; ** $p < 0.01$.



appearance control beliefs → BICP → mood regulation ($\beta = -0.081$; $p < 0.01$), (iii) appearance control beliefs → BICP → cognitive preoccupation ($\beta = -0.099$; $p < 0.01$), (iv) appearance control beliefs → BICP → compulsive SNS use ($\beta = -0.086$; $p < 0.01$), and (v) appearance control beliefs → BICP → negative outcomes ($\beta = -0.037$; $p < 0.05$). The full model explained 9% of the total variance of preference for online social interactions, 21% for mood regulation, 32% for cognitive preoccupation, 25% for compulsive SNS use, and 10% for negative outcomes.

DISCUSSION

The present study primarily focused on the understudied construct of appearance control beliefs, contributing to the OBC research field and the ongoing debate concerning predictive

factors in problematic SNS use. More specifically, a mediation model was tested to explore the predictive role of appearance control beliefs on problematic SNS use via BICP.

Differently from previous findings (e.g. McKinley, 1998; John and Ebbeck, 2008; Dakanalis et al., 2017), in which no statistically significant gender differences concerning appearance control beliefs have been reported, girls in the present study showed higher rates of appearance control beliefs than boys with a relevant effect size. This result appears to fit OBC theory's underlying assumption that females, more than males, internalize the belief that they are responsible for their physical appearance and that, given enough effort, they can control it complying with cultural standards.

Overall, in the present study, adolescents showed a preference for WhatsApp (an app that promotes the exchange of messages, pictures, and videos) as well as for body image-focused SNSs (Instagram, YouTube, and Facebook). However, in accordance

with previous findings (Griffiths et al., 2014; Andreassen et al., 2017; Boursier and Manna, 2019), the present study also showed higher engagement by girls relating to time spent on SNSs and BICP, investing more time than boys in creating self-portraits as a way to express their identity and to manage own positive and negative images, promoting their best self-presentation and applying privacy restrictions to moderate relational exchanges via photos. On the contrary, boys used greater body image control to improve their sexual attractiveness, confirming the males' great attention for sexual aspects of online body images that might promote sexual exploration experiences (Boursier and Manna, 2018b). Moreover, in terms of problematic social networking, female adolescents were significantly more likely than males to use SNSs to regulate their mood states, with higher cognitive preoccupation and poorly self-regulated SNS use. These findings appeared in line with several previous studies that found a strong association between females' engagement in social media use and depressive mood, low self-esteem, and other psychological distress, leading to their greater problematic social networking (McCrae et al., 2017; Nowland et al., 2018; Raudsepp and Kais, 2019). However, the negative outcomes due to problematic social networking appeared to affect more boys than girls, likely due to males' higher attention for sexual aspects of online body image-related activities and engagement in online sexual behaviors (Jonsson et al., 2014; Bianchi et al., 2018; Boursier and Manna, 2018b) and/or due to a higher online disinhibition (Casale et al., 2015) despite other studies finding that females were more engaged in online self-disclosure (Schouten et al., 2007). No statistically significant difference between girls' and boys' preferences for online social interactions was found. In line with Boursier and Manna (2019), the present study found a positive correlation between males' and females' BICP and adolescents' problematic SNS use. Interestingly, appearance control beliefs negatively co-occurred with BICP and problematic social networking, especially among females.

Concerning the mediation model, invariance was not established. Subsequently, the mediation model was tested on independent male and female samples, being significant only among female adolescents. Different interpretations of the current findings are possible. Firstly, they might confirm the OBC's assumption that females, more than males, consider themselves responsible for how they look and that, given enough effort, they can control their appearance to satisfy cultural standards (McKinley and Hyde, 1996). Internalizing the outside observer's perspective on body and cultural appearance standards, females might perceive them as a personal choice that in turn promotes beliefs in appearance controllability (McKinley and Hyde, 1996). Moreover, the large effect size of gender-related difference in appearance control beliefs might confirm this interpretation. Differently, the lack of invariance might suggest that male and female adolescents involved in the present study differently perceived the content of the appearance control beliefs items. Finally, these controversial results might confirm Moradi and Varnes' (2017) findings about the uncertain belonging of appearance control beliefs to the OBC framework, suggesting further investigation, refinement, and conceptualization.

Nevertheless, the mediation model confirmed the expected effect of appearance control beliefs on problematic social networking, with the mediating effect of BICP. More specifically, interestingly, appearance control beliefs showed a direct and negative effect on BICP, confirming previous empirical findings in which believing in control over one's own physical appearance leads to a decrease of body monitoring and feelings of shame toward one's own body (Taylor, 1989; Noser and Zeigler-Hill, 2014) and an increase of healthy behaviors (Sinclair, 2010). Similarly, in the present study, female adolescents who believed they could control their own body appearance might become less vigilant about their body image in photos, picture quality, their self-image promoted online, and strategies for taking, choosing, and editing their shared photos online (Manago et al., 2015; McLean et al., 2015; Boursier and Manna, 2019). It is likely, adolescents who believe they can control their own appearance might feel more positive regarding their bodies (McKinley and Hyde, 1996; John and Ebbeck, 2008) show a greater sense of competence (Sinclair and Myers, 2004). Moreover, beliefs that body appearance can be controlled, as expected, directly predicted problematic social networking. Specifically, appearance control beliefs negatively predicted adolescents' preference for online social interactions, cognitive preoccupation, compulsive SNS use, and negative outcomes (likely assuming a protective function). It is likely, girls who believe they can control their own appearance and thus feel more positive regarding their bodies (McKinley and Hyde, 1996; John and Ebbeck, 2008) do not prefer online contexts for relational exchanges, with consequent less SNS use-related cognitive preoccupation, compulsive use, and negative outcomes. Furthermore, according to previous studies in which beliefs of control over own life and appearance have been found as a means of relieving stress and anxiety situations (McKinley and Hyde, 1996; McKinley, 1999; Sinclair and Myers, 2004), these findings might explain why females in the present study did not seem to use SNSs to regulate their mood. Additionally, appearance control beliefs confirmed their negative (and likely protective) effect on adolescents' problematic social networking also through the reduced engagement in BICP. In this regard, previous studies have highlighted that problematic Internet-related activities and consequent negative outcomes were related to the perceived utility of online contexts for providing greater control compared to face-to-face environments (Fioravanti et al., 2012; Casale et al., 2015). It is likely, the present study suggests that girls who believe they can control their own appearance do not perceive or do not need this SNS benefit. In this regard, the present study seems to disagree with the chain relationships in which the perceived control over personal information might enhance individuals' confidence in managing it in online contexts, reducing the perception of SNS-related risks (Niemz et al., 2005; Joinson et al., 2010; Krasnova et al., 2010; Taddei and Contena, 2013). Moreover, appearance control beliefs appear different from positive metacognitions that promote the engagement in problematic behaviors (Spada et al., 2007, 2015; Casale et al., 2016). On the contrary, according to previous studies within the OBC framework (McKinley and Hyde, 1996; McKinley, 1998, 1999; Sinclair and Myers, 2004; Laliberte et al., 2007; Moradi, 2010; Sinclair, 2010), the present

findings seem to confirm the involvement, into appearance control beliefs, of a sense of agency, sense of competence, perceived generalized controllability over life events, and locus of control, which in turn might promote healthy behaviors, body satisfaction, and psychological well-being (McKinley and Hyde, 1996; McKinley, 1999; Sinclair and Myers, 2004; John and Ebbeck, 2008; Crawford et al., 2009; Sinclair, 2010; Noser and Zeigler-Hill, 2014).

Therefore, it appears that perceived control affects behaviors and emotions (Schall et al., 2016) and, likely, believing in the ability to control one's own body appearance may be seen as a skill, improve perceived self-efficacy, and contribute to physical self-worth (John and Ebbeck, 2008). Nevertheless, as Crawford et al. (2009) stated, females' beliefs that appearance control is in their own hands, which might lead to accepting both negative and positive judgments over their body images, are warranted, often fueling self-blame for perceived failure of control and leading to other negative outcomes (i.e. excessive exercise, dietary restrictions, and marginalization) (Schall et al., 2016). Therefore, how girls interact with their own body and photos prior to posting on SNSs appears to be strongly associated with problematic social networking (Cohen et al., 2018), especially during adolescence, when social reward and peer approval are pivotal motivators of adolescents' behavior (Foulkes and Blakemore, 2016; Bell et al., 2018).

The present study's findings provided some novel and previously unreported issues. The findings demonstrated the understudied association between appearance control beliefs and monitoring of body image in the online environment. More specifically, females who feel they can control their own body image appear to decrease strategies to control their body image in photos. Furthermore, the present study showed the unexplored effect of appearance control beliefs and BICP upon problematic SNS use. Therefore, firstly, these findings contribute to the ongoing debate concerning predictive and protective factors related to problematic SNS use, confirming the pivotal role of body image-related issues in relation to social networking and its misuse. Secondly, the present study contributes to the OBC research field and the debated (and controversial) role of appearance control beliefs within this framework. The inconsistent mix of positive, negative, or non-significant relationships between appearance control beliefs and other indicators of OBC (McKinley and Hyde, 1996; McKinley, 1998, 1999; Parsons and Betz, 2001; Moradi and Varnes', 2017) has led to a gradual disregard of appearance control belief implications with regard to body image and social media use issues. Nevertheless, as Moradi and Varnes' (2017) stated, rather than abandoning appearance control beliefs, further research is needed to refine this multidimensional construct and operationalize it by investigating understudied dimensions such as sense of agency, locus of control, and personal competence (McKinley and Hyde, 1996; McKinley, 1998, 1999; Parsons and Betz, 2001; Sinclair and Myers, 2004; John and Ebbeck, 2008; Crawford et al., 2009; Noser and Zeigler-Hill, 2014; Moradi and Varnes', 2017).

Some limitations of the present study also need to be addressed. Firstly, the participants involved in the study came from a specific (Italian) cultural context, and these cross-sectional data limited the ability to formally test causality. Indeed, it is plausible to suppose that problematic SNS use and appearance control beliefs might mutually affect and reinforce each other, according to Strelan and Hargreaves' (2005) circle of self-objectification concerning the bidirectional nature of the SNS use-self-objectification relationship. Secondly, the study used a self-report survey, and its potential method biases are well known. Moreover, despite the participants reporting a great preference for images-based SNSs, the present study did not focus on specific photographic SNSs, such as Instagram or Snapchat. Future research should explore the relationships between appearance control beliefs and specific body image-based SNSs, likely in association with other appearance-related issues (for example, body dissatisfaction and photo-editing). Finally, the present study explored only a small number of variables in relation to the complex constructs of OBC and problematic SNS use. Thus, future research could consider other variables such as body image-related issues, personality traits, and peer-to-peer friendships. However, the findings presented here might contribute to future research and intervention programs. Based on the findings of previous studies (i.e. Sinclair, 2010; McLean et al., 2016; Fardouly et al., 2018), media literacy interventions are needed to educate adolescents about their real body image, their feelings and self-efficacy about physical appearance, culturally and peer-to-peer promoted body standards, and their sharing of photos on SNSs.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

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

AUTHOR CONTRIBUTIONS

VB designed the study and revised it critically, and contributed to writing the final version of manuscript. VB and FG led the literature search and interpretation of data. FG contributed to the data collection and statistical analysis. FG wrote a first draft of manuscript. MG revised the whole work critically for important intellectual content. All authors read and approved the final version of work to be published and agreed to be accountable for all aspects of the work, ensuring that questions as to the accuracy of any part of the work are appropriately investigated and resolved.

REFERENCES

- Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., et al. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: a large-scale cross-sectional study. *Psychol. Addict. Behav.* 30, 252–262. doi: 10.1037/adb0000160
- Andreassen, C. S., Pallesen, S., and Griffiths, M. D. (2017). The relationship between addictive use of social media, narcissism, and self-esteem: findings from a large national survey. *Addict. Behav.* 64, 287–293. doi: 10.1016/j.addbeh.2016.03.006
- Aubrey, J. S. (2006). Exposure to sexually objectifying media and body self-perceptions among college women: an examination of the selective exposure hypothesis and the role of moderating variables. *Sex Roles* 55, 159–172.
- Baker, R. K., and White, K. M. (2010). Predicting adolescents' use of social networking sites from an extended theory of planned behaviour perspective. *Comput. Hum. Behav.* 26, 1591–1597.
- Balakrishnan, J., and Griffiths, M. D. (2017). Social media addiction: what is the role of content in YouTube? *J. Behav. Addict.* 6, 364–377. doi: 10.1556/2006.6.2017.058
- Bányai, F., Zsila, Á., Király, O., Maraz, A., Elekes, Z., Griffiths, M. D., et al. (2017). Problematic social media use: results from a large-scale nationally representative adolescent sample. *PLoS One* 12:e0169839. doi: 10.1371/journal.pone.0169839
- Bell, B. T., Cassarly, J. A., and Dunbar, L. (2018). Selfie-objectification: self-objectification and positive feedback (“likes”) are associated with frequency of posting sexually objectifying self-images on social media. *Body Image* 26, 83–89. doi: 10.1016/j.bodyim.2018.06.005
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychol. Bull.* 107, 238–246.
- Bianchi, D., Morelli, M., Baiocco, R., and Chirumbolo, A. (2017). Sexting as the mirror on the wall: body-esteem attribution, media models, and objectified-body consciousness. *J. Adolesc.* 61, 164–172. doi: 10.1016/j.adolescence.2017.10.006
- Bianchi, D., Morelli, M., Baiocco, R., and Chirumbolo, A. (2018). Psychometric properties of the sexting motivations questionnaire for adolescents and young adults. *Rass. Psicol.* 33, 5–18.
- Billieux, J., Schimmenti, A., Khazaal, Y., Maurage, P., and Heeren, A. (2015). Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *J. Behav. Addict.* 4, 119–123.
- Boursier, V., and Manna, V. (2018a). “Problematic linkages in adolescents: Italian adaptation of a measure for internet-related problems,” in *Psychological, Social, and Cultural Aspects of Internet Addiction*, ed. B. Bozoglan, (Hershey, PA: IGI Global), 253–282.
- Boursier, V., and Manna, V. (2018b). Selfie expectancies among adolescents. Construction and validation of an instrument to assess expectancies toward selfies among boys and girls. *Front. Psychol.* 9:839. doi: 10.3389/fpsyg.2018.00839
- Boursier, V., and Manna, V. (2019). “Relational body identities: body image control through self-portraits – A revision of the body image control in photos questionnaire,” in *Intimacy and Developing Personal Relationships in the Virtual World*, ed. R. T. Gopalan, (Hershey, PA: IGI Global), 40–63.
- Boursier, V., Manna, V., Gioia, F., Coppola, F., and Venosa, N. (2018). “Cyber-moms facing motherhood: holding functions and regressive movements in parenting websites,” in *Global Perspectives on Health Communication in the Age of Social Media*, (Hershey, PA: IGI Global), 29–58.
- Boyd, D. M., and Ellison, N. B. (2007). Social network sites: definition, history, and scholarship. *J. Comput. Med. Commun.* 13, 210–230.
- Browne, M. W., and Cudeck, R. (1993). Alternative ways of assessing model fit. *Sage Focus Editions* 154:136.
- Butkowski, C. P., Dixon, T. L., and Weeks, K. (2019). Body surveillance on Interim: examining the role of selfie feedback investment in young adult women's body image concerns. *Sex Roles* doi: 10.1007/s11199-018-0993-6 [Epub ahead of print].
- Caplan, S. E. (2002). Problematic Internet use and psychosocial well-being: development of a theory-based cognitive-behavioral measurement instrument. *Comput. Hum. Behav.* 18, 553–575.
- Caplan, S. E. (2003). Preference for online social interaction: a theory of problematic Internet use and psychosocial well-being. *Commun. Res.* 30, 625–648.
- Caplan, S. E. (2010). Theory and measurement of generalized problematic Internet use: a two-step approach. *Comput. Hum. Behav.* 26, 1089–1097.
- Casale, S., Caplan, S. E., and Fioravanti, G. (2016). Positive metacognitions about Internet use: the mediating role in the relationship between emotional dysregulation and problematic use. *Addict. Behav.* 59, 84–88. doi: 10.1016/j.addbeh.2016.03.014
- Casale, S., and Fioravanti, G. (2017). Shame experiences and problematic social networking sites use: an unexplored association. *Clin. Neuropsychiatry* 14, 44–48.
- Casale, S., Fiovaranti, G., and Caplan, S. (2015). Online disinhibition: precursors and outcomes. *J. Media Psychol.* 27, 170–177. doi: 10.1027/1864-1105/a000136
- Casale, S., Rugai, L., and Fioravanti, G. (2018). Exploring the role of positive metacognitions in explaining the association between the fear of missing out and social media addiction. *Addict. Behav.* 85, 83–87. doi: 10.1016/j.addbeh.2018.05.020
- Caso, D., Fabbicatore, R., Muti, F., and Starace, C. (2019). Sessualizzazione e oggettivazione femminile su Instagram: Il ruolo delle influencer. *Psicol. Soc.* 3, 441–463.
- Cohen, R., Newton-John, T., and Slater, A. (2018). ‘Selfie’-objectification: the role of selfies in self-objectification and disordered eating in young women. *Comput. Hum. Behav.* 79, 68–74.
- Crawford, M., Lee, I. C., Portnoy, G., Gurung, A., Khati, D., Jha, P., et al. (2009). Objectified body consciousness in a developing country: a comparison of mothers and daughters in the US and Nepal. *Sex Roles* 60, 174–185.
- Dakanalis, A., Carrà, G., Calogero, R., Fida, R., Clerici, M., Zanetti, M. A., et al. (2015). The developmental effects of media-ideal internalization and self-objectification processes on adolescents' negative body-feelings, dietary restraint, and binge eating. *Eur. Child Adolesc. Psychiatry* 24, 997–1010.
- Dakanalis, A., Timko, A. C., Clerici, M., Riva, G., and Carrà, G. (2017). Objectified body consciousness (OBC) in eating psychopathology: construct validity, reliability, and measurement invariance of the 24-item OBC scale in clinical and nonclinical adolescent samples. *Assessment* 24, 252–274.
- Daniel, S., and Bridges, S. K. (2010). The drive for muscularity in men: media influences and objectification theory. *Body Image* 7, 32–38.
- D'Arienzo, M. C., Boursier, V., and Griffiths, M. D. (2019). Addiction to social media and attachment styles: a systematic literature review. *Int. J. Ment. Health Addict.* 17, 1094–1118.
- de Vries, D. A., and Peter, J. (2013). Women on display: the effect of portraying the self online on women's self-objectification. *Comput. Hum. Behav.* 29, 1483–1489.
- Doornwaard, S. M., Bickham, D. S., Rich, M., Vanwesenbeeck, I., van den Eijnden, R. J., and Ter Bogt, T. F. (2014). Sex-related online behaviors and adolescents' body and sexual self-perceptions. *Pediatrics* 134, 1103–1110.
- Fardouly, J., Diedrichs, P. C., Vartanian, L. R., and Halliwell, E. (2015). The mediating role of appearance comparisons in the relationship between media usage and self-objectification in young women. *Psychol. Women Q.* 39, 447–457.
- Fardouly, J., Willburger, B. K., and Vartanian, L. R. (2018). Instagram use and young women's body image concerns and self-objectification: testing mediational pathways. *New Media Soc.* 20, 1380–1395.
- Feltman, C. E., and Szymanski, D. M. (2018). Instagram use and self-objectification: the roles of internalization, comparison, appearance commentary, and feminism. *Sex Roles* 78, 311–324.
- Fioravanti, G., Dèttore, D., and Casale, S. (2012). Adolescent Internet addiction: testing the association between self-esteem, the perception of Internet attributes, and preference for online social interactions. *Cyberpsychol. Behav. Soc. Netw.* 15, 318–323.
- Fioravanti, G., Primi, C., and Casale, S. (2013). Psychometric evaluation of the generalized problematic internet use scale 2 in an Italian sample. *Cyberpsychol. Behav. Soc. Netw.* 16, 761–766.
- Fitzsimmons-Craft, E. E., Bardone-Cone, A. M., and Kelly, K. A. (2011). Objectified body consciousness in relation to recovery from an eating disorder. *Eat. Behav.* 12, 302–308.

- Foulkes, L., and Blakemore, S.-J. (2016). Is there heightened sensitivity to social reward in adolescence? *Curr. Opin. Neurobiol.* 40, 81–85. doi: 10.1016/j.conb.2016.06.016
- Fox, J., and Rooney, M. C. (2015). The Dark Triad and trait self-objectification as predictors of men's use and self-presentation behaviors on social networking sites. *Pers. Individ. Dif.* 76, 161–165.
- Fox, J., and Vendemia, M. A. (2016). Selective self-presentation and social comparison through photographs on social networking sites. *Cyberpsychol. Behav. Soc. Netw.* 19, 593–600.
- Franchina, V., and Lo Coco, G. (2018). The influence of social media use on body image concerns. *Int. J. Psychoanal. Educ.* 10, 5–14.
- Fredrickson, B. L., and Roberts, T. A. (1997). Objectification theory: toward understanding women's lived experiences and mental health risks. *Psychol. Women Q.* 21, 173–206.
- Gioia, F., and Boursier, V. eds (2019). "Treatment of internet addiction and internet gaming disorder in adolescence: a systematic review," in *Multifaceted Approach to Digital Addiction and Its Treatment*, (Hershey, PA: IGI Global), 157–176.
- Grabe, S., Ward, L. M., and Hyde, J. S. (2008). The role of the media in body image concerns among women: a meta-analysis of experimental and correlational studies. *Psychol. Bull.* 134, 460–476. doi: 10.1037/0033-2909.134.3.460
- Griffiths, M. D. (2005). A 'components' model of addiction within a biopsychosocial framework. *J. Subst. Use* 10, 191–197.
- Griffiths, M. D., Kuss, D. J., and Demetrovics, Z. (2014). "Social networking addiction: an overview of preliminary findings," in *Behavioral Addictions: Criteria, Evidence and Treatment*, eds K. Rosenberg, and L. Feder, (New York, NY: Elsevier), 119–141.
- Holland, G., and Tiggemann, M. (2016). A systematic review of the impact of the use of social networking sites on body image and disordered eating outcomes. *Body Image* 17, 100–110.
- John, D. H., and Ebbeck, V. (2008). Gender-differentiated associations among objectified body consciousness, self-conceptions and physical activity. *Sex Roles* 59, 623–632.
- Joinson, A. N., Reips, U. D., Buchanan, T., and Schofield, C. B. P. (2010). Privacy, trust, and self-disclosure online. *Hum. Comput. Interact.* 25, 1–24.
- Jonsson, L. S., Priebe, G., Bladh, M., and Svedin, C. G. (2014). Voluntary sexual exposure online among Swedish youth—social background, Internet behavior and psychosocial health. *Comput. Hum. Behav.* 30, 181–190.
- Karsay, K., Knoll, J., and Matthes, J. (2018). Sexualizing media use and self-objectification: a meta-analysis. *Psychol. Women Q.* 42, 9–28.
- Kırcaburun, K., and Griffiths, M. D. (2018). Instagram addiction and the big five of personality: the mediating role of self-liking. *J. Behav. Addict.* 7, 158–170. doi: 10.1556/2006.7.2018.15
- Kline, R. B. (2015). *Principles and Practice of Structural Equation Modeling*, 2nd Edn. New York, NY: Guilford Press.
- Krasnova, H., Spiekermann, S., Koroleva, K., and Hildebrand, T. (2010). Online social networks: why we disclose. *J. Inf. Technol.* 25, 109–125.
- Kuss, D. J., and Griffiths, M. D. (2011a). Excessive online social networking: can adolescents become addicted to Facebook? *Educ. Health* 29, 68–71. doi: 10.1016/j.eurpsy.2015.04.002
- Kuss, D. J., and Griffiths, M. D. (2011b). Online social networking and addiction – A review of the psychological literature. *Int. J. Environ. Res. Public Health* 8, 3528–3552. doi: 10.3390/ijerph8093528
- Kuss, D. J., and Griffiths, M. D. (2017). Social networking sites and addiction: ten lessons learned. *Int. J. Environ. Res. Public Health* 14, 1–17.
- Laliberte, M., Newton, M., McCabe, R., and Mills, J. S. (2007). Controlling your weight versus controlling your lifestyle: how beliefs about weight control affect risk for disordered eating, dissatisfaction and self-esteem. *Cogn. Ther. Res.* 31, 853–869.
- LaRose, R., Kim, J., and Peng, W. (2010). "Social networking: addictive, compulsive, problematic, or just another media habit," in *A Networked Self: Identity, Community, and Culture on Social Network Sites*, ed. Z. Papacharissi, (New York, NY: Routledge), 59–81.
- Lee, E. W., Ho, S. S., and Lwin, M. O. (2017). Explicating problematic social network sites use: a review of concepts, theoretical frameworks, and future directions for communication theorizing. *New Media Soc.* 19, 308–326.
- Livingstone, S. (2008). Taking risky opportunities in youthful content creation: teenagers' use of social networking sites for intimacy, privacy and self-expression. *New Media Soc.* 10, 393–411.
- Loneragan, A. R., Bussey, K., Mond, J., Brown, O., Giffiths, S., Muray, S. B., et al. (2019). Me, my selfie, and I: the relationship between editing and posting selfies and body dissatisfaction in men and women. *Body Image* 28, 39–43.
- Manago, A. M., Ward, L. M., Lemm, K. M., Reed, L., and Seabrook, R. (2015). Facebook involvement, objectified body consciousness, body shame, and sexual assertiveness in college women and men. *Sex Roles* 72, 1–14.
- Mascheroni, G., and Ólafsson, K. (2018). *Accesso, usi, Rischi e Opportunità di Internet per i Ragazzi Italiani. I Primi Risultati di EU Kids Online 2017. EU Kids Online and OssCom*. Available at: <http://www.lse.ac.uk/media-and-communications/assets/documents/research/eu-kids-online/reports/EU-Kids-Online-Italy-report-06-2018.pdf> (accessed September 6, 2019).
- McCrae, N., Gettings, S., and Purcell, E. (2017). Social media and depressive symptoms in childhood and adolescence: a systematic review. *Adolesc. Res. Rev.* 2, 315–330.
- McKinley, N. M. (1998). Gender differences in undergraduates' body esteem: the mediating effect of objectified body consciousness and actual/ideal weight discrepancy. *Sex Roles* 39, 113–123.
- McKinley, N. M. (1999). Women and objectified body consciousness: mothers' and daughters' body experience in cultural, developmental, and familial context. *Dev. Psychol.* 35, 760–769.
- McKinley, N. M., and Hyde, J. S. (1996). The objectified body consciousness scale: development and validation. *Psychol. Women Q.* 20, 181–215.
- McLean, S. A., Paxton, S. J., and Wertheim, E. H. (2016). Does media literacy mitigate risk for reduced body satisfaction following exposure to thin-ideal media? *J. Youth Adolesc.* 45, 1678–1695.
- McLean, S. A., Paxton, S. J., Wertheim, E. H., and Masters, J. (2015). Photoshopping the selfie: self photo editing and photo investment are associated with body dissatisfaction in adolescent girls. *Int. J. Eat. Disord.* 48, 1132–1140. doi: 10.1002/eat.22449
- Meier, E. P., and Gray, J. (2014). Facebook photo activity associated with body image disturbance in adolescent girls. *Cyberpsychol. Behav. Soc. Netw.* 17, 199–206. doi: 10.1089/cyber.2013.0305
- Monacis, L., De Palo, V., Griffiths, M. D., and Sinatra, M. (2017). Social networking addiction, attachment style, and validation of the Italian version of the Bergen social media addiction scale. *J. Behav. Addict.* 6, 178–186. doi: 10.1556/2006.6.2017.023
- Moradi, B. (2010). Addressing gender and cultural diversity in body image: objectification theory as a framework for integrating theories and grounding research. *Sex Roles* 63, 138–148.
- Moradi, B., and Huang, Y. P. (2008). Objectification theory and psychology of women: a decade of advances and future directions. *Psychol. Women Q.* 32, 377–398.
- Moradi, B., and Varnes, J. R. (2017). Structure of the objectified body consciousness scale: reevaluated 20 years later. *Sex Roles* 77, 325–337.
- Munno, D., Cappellin, F., Saroldi, M., Bechon, E., Guglielmucci, F., Passera, R., et al. (2017). Internet addiction disorder: personality characteristics and risk of pathological overuse in adolescents. *Psychiatry Res.* 248, 1–5. doi: 10.1016/j.psychres.2016.11.008
- Niemz, K., Griffiths, M., and Banyard, P. (2005). Prevalence of pathological Internet use among university students and correlations with self-esteem, the General Health Questionnaire (GHQ), and disinhibition. *Cyberpsychol. Behav.* 8, 562–570.
- Noser, A., and Zeigler-Hill, V. (2014). Investing in the ideal: does objectified body consciousness mediate the association between appearance contingent self-worth and appearance self-esteem in women? *Body Image* 11, 119–125. doi: 10.1016/j.bodyim.2013.11.006
- Nowland, R., Necka, E. A., and Cacioppo, J. T. (2018). Loneliness and social internet use: pathways to reconnection in a digital world? *Perspect. Psychol. Sci.* 13, 70–87. doi: 10.1177/1745691617713052
- Parsons, E. M., and Betz, N. E. (2001). The relationship of participation in sports and physical activity to body objectification, instrumentality, and locus of control among young women. *Psychol. Women Q.* 25, 209–222.
- Pelosi, A., Zorzi, G., and Corsano, P. (2014). The "body image control in photos questionnaire" (BICP). *BPA Appl. Psychol. Bull.* 62, 42–52.
- Perloff, R. M. (2014). Social media effects on young women's body image concerns: theoretical perspectives and an agenda for research. *Sex Roles* 71, 363–377.

- Pontes, H. M., Caplan, S. E., and Griffiths, M. D. (2016). Psychometric validation of the generalized problematic Internet use scale 2 in a Portuguese sample. *Comput. Hum. Behav.* 63, 823–833. doi: 10.1016/j.chb.2016.11.007
- Raudsepp, L., and Kais, K. (2019). Longitudinal associations between problematic social media use and depressive symptoms in adolescent girls. *Prev. Med. Rep.* 15:100925.
- Riva, G. (2010). *I Social Network*. Bologna: Il Mulino.
- Rodgers, R. F., Melioli, T., Laconi, S., Bui, E., and Chabrol, H. (2013). Internet addiction symptoms, disordered eating, and body image avoidance. *Cyberpsychol. Behav. Soc. Netw.* 16, 56–60. doi: 10.1089/cyber.2012.1570
- Rousseau, A., Rodgers, R. F., and Eggermont, S. (2017). A biopsychosocial model for understanding media internalization and appearance dissatisfaction among preadolescent boys and girls. *Commun. Res.* 1–27. doi: 10.1177/0093650217739996
- Satorra, A. (2000). “Scaled and adjusted restricted tests in multi-sample analysis of moment structures,” In *Innovations in Multivariate Statistical Analysis*, eds A. Satorra, and R. D. H. Heijmans, (Boston, MA: Springer), 233–247. doi: 10.1007/978-1-4615-4603-0_17
- Schall, J., Wallace, T. L., and Chhuon, V. (2016). ‘Fitting in’ in high school: how adolescent belonging is influenced by locus of control beliefs. *Int. J. Adolesc. Youth* 21, 462–475.
- Schouten, A. P., Valkenburg, P. M., and Peter, J. (2007). Precursors and underlying processes of adolescents’ online self-disclosure: developing and testing an “Internet-attribute-perception” model. *Media Psychol.* 10, 292–315.
- Slater, A., and Tiggemann, M. (2015). Media exposure, extracurricular activities, and appearance-related comments as predictors of female adolescents’ self-objectification. *Psychol. Women Q.* 39, 375–389. doi: 10.1177/0361684314554606
- Sinclair, K. R. (2010). Objectified body consciousness, depression, and eating disorders: the importance of control beliefs. *Yale Rev. Undergrad. Res. Psychol.* 1, 68–77.
- Sinclair, S. L. (2005). Object lessons: a theoretical and empirical study of objectified body consciousness in women. *J. Ment. Health Counsel.* 28, 48–68.
- Sinclair, S. L., and Myers, J. E. (2004). The relationship between objectified body consciousness and wellness in a group of college women. *J. Coll. Counsel.* 7, 150–161.
- Spada, M. M., Caselli, G., Nikčević, A. V., and Wells, A. (2015). Metacognition in addictive behaviors. *Addict. Behav.* 44, 9–15. doi: 10.1016/j.addbeh.2014.08.002
- Spada, M. M., Langston, B., Nikčević, A. V., and Moneta, G. B. (2007). The role of metacognitions in problematic Internet use. *Comput. Hum. Behav.* 24, 2325–2335.
- Spada, M. M., and Marino, C. (2017). Metacognitions and emotion regulation as predictors of problematic internet use in adolescents. *Clin. Neuropsychiatry* 14, 59–63.
- Strelan, P., and Hargreaves, D. (2005). Women who objectify other women: the vicious circle of objectification? *Sex Roles* 52, 707–712.
- Taddei, S., and Contena, B. (2013). Privacy, trust and control: which relationships with online self-disclosure? *Comput. Hum. Behav.* 29, 821–826.
- Taylor, S. E. (1989). *Positive Illusions: Creative Self-Deception and the Healthy Mind*. New York, NY: Basic Books.
- Tiggemann, M., and Barbato, I. (2018). “You look great!”: the effect of viewing appearance-related Instagram comments on women’s body image. *Body Image* 27, 61–66. doi: 10.1016/j.bodyim.2018.08.009
- Tiggemann, M., and Slater, A. (2013). NetGirls: the internet, Facebook, and body image concern in adolescent girls. *Int. J. Eat. Disord.* 46, 630–633. doi: 10.1002/eat.22141
- Tiggemann, M., and Slater, A. (2015). The role of self-objectification in the mental health of early adolescent girls: predictors and consequences. *J. Pediatr. Psychol.* 40, 704–711. doi: 10.1093/jpepsy/jsv021
- Tiggemann, M., and Slater, A. (2017). Facebook and body image concern in adolescent girls: a prospective study. *Int. J. Eat. Disord.* 50, 80–83. doi: 10.1002/eat.22640
- Vandenbosch, L., and Eggermont, S. (2012). Understanding sexual objectification: a comprehensive approach toward media exposure and girls’ internalization of beauty ideals, self-objectification, and body surveillance. *J. Commun.* 62, 869–887.
- Vandenbosch, L., and Eggermont, S. (2013). Sexualization of adolescent boys: media exposure and boys’ internalization of appearance ideals, self-objectification, and body surveillance. *Men Masc.* 16, 283–306.
- Veldhuis, J., Alleva, J. M., Bij, de Vaate, A. J., Keijer, M., and Konijn, E. A. (2018). Me, my selfie, and I: the relations between selfie behaviors, body image, self-objectification, and self-esteem in young women. *Psychol. Pop. Media Cult.* doi: 10.1037/ppm0000206 [Epub ahead of print].
- Zhao, S., Grasmuck, S., and Martin, J. (2008). Identity construction on Facebook: digital empowerment in anchored relationships. *Comput. Hum. Behav.* 24, 1816–1836.

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 Boursier, Gioia and Griffiths. 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 Typology of Buyers Grounded in Psychological Risk Factors for Compulsive Buying (Impulsivity, Self-Esteem, and Buying Motives): Latent Class Analysis Approach in a Community Sample

OPEN ACCESS

Edited by:

Luca Milani,
Catholic University of the Sacred
Heart, Italy

Reviewed by:

Bernardo Barahona-Correa,
New University of Lisbon, Portugal
David Hodgins,
University of Calgary, Canada

*Correspondence:

Gaëlle Challet-Bouju
gaelle.bouju@chu-nantes.fr

Specialty section:

This article was submitted to
Psychopathology,
a section of the journal
Frontiers in Psychiatry

Received: 05 December 2019

Accepted: 23 March 2020

Published: 21 April 2020

Citation:

Challet-Bouju G, Mariez J, Perrot B,
Grall-Bronnec M and Chauchard E
(2020) A Typology of Buyers
Grounded in Psychological Risk
Factors for Compulsive Buying
(Impulsivity, Self-Esteem, and Buying
Motives): Latent Class Analysis
Approach in a Community Sample.
Front. Psychiatry 11:277.
doi: 10.3389/fpsy.2020.00277

Gaëlle Challet-Bouju^{1,2*}, Julie Mariez^{1,3}, Bastien Perrot², Marie Grall-Bronnec^{1,2}
and Emeline Chauchard³

¹ CHU Nantes, Addictology and Psychiatry Department, Nantes, France, ² Université de Nantes, Université de Tours, INSERM, SPHERE U1246 “methodS in Patient-centered outcomes and Health ResEarch”, Nantes, France, ³ Université de Nantes, Laboratoire de Psychologie des Pays de la Loire, Nantes, France

Our objective was to identify meaningful subgroups of buyers based on psychological risk factors for compulsive buying. A community sample of 242 adult women fulfilled an online survey exploring buying habits and motives, impulsivity, self-esteem, and severity of compulsive buying. A latent class cluster analysis was performed. A nonproblematic cluster (28%) was characterized by low levels of impulsivity and buying motives. An intermediary cluster (51%) was characterized by higher levels of positive and negative reinforcement-related buying motives. Both clusters were characterized by a low frequency of compulsive buying (2 and 8%, respectively), but the severity of compulsive buying was higher for the intermediary cluster. A third cluster (21%) was characterized by a higher frequency of compulsive buying (43%), a higher severity of compulsive buying, a stronger feeling of losing control, and higher levels of negative urgency and coping motive. These results present similarities with the Interaction of Person-Affect-Cognition-Execution (I-PACE) model of addiction and the negative reinforcement model of drug addiction, which both postulate that negative feelings play a central role in motivating and maintaining addiction. These results also echo other typologies performed in problem gamblers and problematic videogame users. These similarities of psychological profiles with other addictive behaviors, and with common symptoms and clinical expressions, are supplementary arguments to consider conceptualizing compulsive buying as an addictive disorder.

Keywords: compulsive buying, behavioral addictions, latent class cluster analysis, motivation, impulsivity, negative reinforcement

INTRODUCTION

Compulsive buying (CB) refers to a problematic buying behavior involving frequent and excessive buying episodes, which are uncontrollable and persistent despite negative consequences. Such a disorder may induce marked clinical distress and cause significant psychological, interpersonal, and financial difficulties (1–3). In a meta-analysis, the prevalence of CB was estimated at 4.9% in a representative adult sample, with female and young individuals being more prone to develop CB (4). This disorder has been the subject of increasing attention but is under-studied and neglected in clinical settings (5). As a consequence, its classification as an individualized mental disorder, either as an impulse-control disorder, an obsessive-compulsive disorder, or an addictive disorder, has been and remains a subject of debate (2, 5–8).

Several psychological factors may be involved in the etiology of CB, such as impulsivity, material values, depression, perceived stress, poor self-esteem, decision-making difficulties, cue-reactivity reward and punishment sensitivity, distortions in judging elapsed time, *etc.* (5, 9–13). Among them, impulsivity was certainly the most studied because it may relate to the loss of control experienced by compulsive buyers (9, 14–16). As defined in the UPPS model (17), impulsivity is a multidimensional construct composed of five facets: positive and negative urgency refer to the tendency to act rashly when managing either positive or negative emotions; lack of premeditation is the inclination to act without thinking of the consequences; lack of perseverance is the inability to remain focused on a boring and/or difficult task; and sensation seeking is the tendency to enjoy and pursue new and exciting activities. Impulsivity has been consistently found to be a predictor of CB (9, 15, 16), especially the “urgency” (*i.e.*, positive and negative) dimensions. A high level of impulsivity, and especially a high urgency, may lead to poor self-control capacities and thus to an unregulated behavior (9).

According to several authors, low self-esteem is associated with CB (18–20). In a study on 548 female consumers, self-esteem was identified as a moderating factor both of the direct relationship between perceived stress and online CB and of the mediation effect of negative coping in the relationship between perceived stress and online CB (13). More specifically, Biolcati highlighted that low self-esteem is a strong predictor of CB, and that this relationship is partially mediated by the fear of others' negative judgment in women (20). As hypothesized by this author, individuals who base their self-worth on external standards are more prone to compare themselves with others and to seek their approval, leading to poor self-evaluation. Such self-disapproval may induce the process of symbolic self-completion, which implies that the acquisition of material symbols is thought to compensate for perceived inadequacies in self-evaluation (21). Such a process may lead individuals to engage in frequent and excessive purchases as an alternative solution for low self-esteem (20) and to sometimes develop CB.

Finally, motives for buying have been poorly explored in the CB literature. However, a key study based on ecological

momentary assessment has demonstrated that changes in mood states were significantly associated with CB episodes (22). In particular, negative mood increased prior to and decreased following a CB episode, whereas positive mood decreased prior to a CB episode and subsequently remained stable. Moreover, the “negative affect” personality trait was significantly associated with CB in an online survey on 233 students, supporting the importance of negative emotions in this disorder (23). These results may support the assumption that CB occurs mainly to obtain relief from negative feelings, as hypothesized by Billieux et al. (9). In consumer research, most of the studies have considered utilitarian and economics motives for buying (efficiency, convenience, good value for money) or hedonist and social motives in the context of business and marketing (24–27). However, in psychological research, emotionally-driven buying motives are rarely explored. Negative coping has been previously identified as a mediating factor between perceived stress and online CB in women (13). Moreover, boredom and positive emotions were more frequently associated with engagement in buying lapses (28). The three-dimensional model of motives used in alcohol research (29) and in gambling research (30) represents a good compromise to assess such motives. Indeed, this model assumes that the consumption behavior is driven by reinforcement-related motives (negative: coping; positive: enhancement) and social-affiliation-related motives.

The objective of this study was to establish a typology of buyers grounded in psychological risk factors for CB, namely, impulsivity facets, self-esteem, and motives for buying. Attempts in the literature to identify typologies of individuals with CB have been made. Most of these attempts have targeted individuals at-risk for CB or meeting the diagnostic criteria for CB (28, 31–34), with the objective of identifying clusters of patients who can benefit from different clinical approaches. Another study has explored the heterogeneity of individuals who presented with few difficulties related to their buying behavior to discuss the relative contribution of compulsivity and impulsivity for the heterogeneity of compulsive buyers (35). Finally, another study identified three clusters of frequent buyers with moderate risk of CB or presence of CB, based on their propensity to engage in buying lapses in response to three affective states (boredom, negative emotions and positive emotions): “escape seekers”, “excitement seekers” and “low affect management buyers” (28). “Excitement seekers” were found to engage more frequently in buying lapses in response to boredom, whereas “escape seekers” engaged more frequently in buying lapses in response to negative affective states.

Given the commonalities shared between CB and addictive disorders, especially behavioral addictions (5, 36–38), a tempting approach to relate CB to addictive disorders would be based on the confirmation of common symptoms. However, such a confirmatory approach pre-assuming the addictive nature of CB may lead to biased conclusions (39). By contrast, this work proposes adopting an exploratory approach based on relevant psychological factors that have been demonstrated to be related to CB. Such a clustering approach may highlight meaningful

subgroups of individuals, as has been performed for other behavioral addictions such as gambling disorder (40) and online gaming problematic involvement (41). The combination of impulsivity, buying motives and self-esteem as predictors for establishing such subgroups may highlight new insights on the profiles of buyers as compared with previous works in the field. Moreover, performing such work in a community sample with a large range of CB severity, including non at-risk buyers, may bring new insights on buying determinants, without focusing only on those who encounter problems with their buying behavior.

Our hypotheses were that we would be able to identify at least two profiles of buyers: (i) one profile with a low frequency of CB, characterized by low levels of impulsivity, medium to high self-esteem, and a buying behavior not driven by reinforcement or social affiliation (*i.e.*, low levels on the three buying motives); and (ii) one less represented profile with a higher frequency of CB and high levels of impulsivity, especially regarding urgency (*i.e.*, positive and negative) dimensions, reduced self-esteem, and high levels of motives for buying, especially reinforced motives (coping and enhancement).

METHODS

Participants and Procedure

The participants were recruited through the internet (mainly social networks) and within the registry of volunteers for research that was constituted by our research team. For online social networks, we posted a message which presented the study, including the link to complete the survey. For the registry of volunteer, we send an email offering to participate in this survey, also including the link to complete the survey. The data collection was based on an anonymous internet survey (GoogleForms®). Inclusion criteria were women who aged over 18 years. No exclusion criteria were applied.

Measures

Socio-Demographics

A brief questionnaire was created to assess gender, age, education level, current professional status, and level of income.

Buying Habits

Participants had to indicate their frequency of buying in shops and on the internet. From this data, we extracted a binary variable depending on whether the participant makes purchases once per week or more, that is, in shops or on the internet.

Compulsive Buying Scale (CBS)

The CBS (3) is a self-report questionnaire used to screen for CB in the general population and determine the severity of the disorder in a dimensional approach. Respondents are asked to answer a set of seven items on a 5-point Likert scale. The items explore behaviors, feelings, and motivations associated with CB. We used a French version of the CBS, composed of the 7 items

proposed by Faber and O'Guinn translated into French. A bilingual English–French professional translator back translated the French items and all discrepancies between the original English CBS and the back-translation were discussed until a satisfactory solution was found.

In our sample, the CBS had a Cronbach's alpha of 0.79. According to the original version of the CBS, a total score is computed with a ponderation on each item and ranges from -7.03 to $+3.61$. Participants who scored lower than -1.34 were classified as individuals with CB (CB group), and participants who scored higher were classified as individuals without CB (non-CB group). In addition to the CBS, participants were asked to estimate their feeling of losing control over buying behavior in the 6 previous months on a Visual Analogic Scale from 0 (*no loss of control*) to 10 (*complete loss of control*).

Buying Motives Questionnaire (BMQ)

The BMQ is a direct adaptation from the Gambling Motives Questionnaire (30), with instructions adapted to buying behaviors. The formulation of items in French were obtained from the French version of the Gambling Motives Questionnaire (42). This 15-item self-report questionnaire is for the assessment of motives for buying according to three dimensions: coping (buying to relieve negative feelings or boredom, or to escape real-life problems), which is a negative reinforcement-related motive; enhancement (buying to search for stimulation, arousal, or positive feelings), which is a positive reinforcement-related motive; social (buying to enhance affiliation with others or to share moments with peers). Participants are asked to indicate how often they buy for each of the 15 listed reasons with a 4-point Likert scale. The score of each dimension ranges from 5 to 20. In our sample, reliability of the BMQ was found to be good, with a Cronbach's alpha of 0.88. The BMQ subscales displayed moderate (social motive, $\alpha = 0.49$) to good reliability (coping motive, $\alpha = 0.85$; enhancement motive, $\alpha = 0.82$).

Short UPPS-P Impulsivity Scale (UPPS-P)

We used the French version of the UPPS-P (43), adapted from the original English version (44). It is a 20-item self-report questionnaire used to measure five dimensions of the UPPS model of impulsivity (17): positive and negative urgency, (lack of) premeditation, (lack of) perseverance, and sensation seeking. Participants were asked to answer on a 4-point Likert scale, and a score ranging from 4 to 16 was computed for each dimension. The UPPS-P had good reliability in our sample (positive urgency, $\alpha = 0.84$; negative urgency, $\alpha = 0.76$; lack of premeditation, $\alpha = 0.83$; lack of perseverance, $\alpha = 0.90$; sensation seeking, $\alpha = 0.86$).

Rosenberg Self-Esteem Scale (RSES)

The RSES (45) is a 10-item self-report scale, which assesses the global self-esteem on a 4-point Likert scale. The total score is computed by summing the scores of all the items, with half of them being reversed. A score lower than 30 indicates low self-esteem. A validated French version of this scale was used for our study (46) and had excellent reliability (Cronbach's alpha of 0.91).

Statistical Analysis

A descriptive analysis of the sample was first conducted.

A typology of participants was then determined using Latent Class Cluster Analysis (LCCA) (47). The purpose of using LCCA was to classify similar observations into homogeneous groups, where the number of groups is unknown. Unlike other clustering algorithms such as K-means or hierarchical clustering, a probabilistic model is used to attribute to each observation a set of cluster membership probabilities, rather than affecting each individual to a unique cluster. Consequently, each individual is characterized by as many membership probabilities as there are clusters. For example, if the final model is composed of three clusters (A, B, and C), a participant will be characterized by three probabilities of being in each cluster (for example, $P_A = 40\%$; $P_B = 15\%$; $P_C = 45\%$). This strategy is particularly notable for avoiding a loss of information. Indeed, in the provided example, the participant would have been classified in cluster C with traditional clustering algorithms, while his probability of being in cluster A was almost equivalent.

The variables included in the LCCA were the Z-transformed scores of the psychological factors: the RSES score, the three BMQ scores, and the five UPPS-P scores. This strategy was used to avoid the problems related to the different ranges of the three scales and to allow for the observation of the relative contribution of each score to the clustering. The Z-transformation was applied with reference to means and standard deviations of the non-CB group; thus, the “standard” adopted is that of individuals with non-CB behavior. We fitted 1- to 7- cluster models using maximum *a posteriori* estimation and selected the best model as the one with the lowest Bayesian information criterion (BIC). Other fit indices were also computed to reflect the accuracy of classification, namely entropy (which should be the closest to one as possible) and classification error rate (which should be the closest to zero as possible).

The clusters were compared using one-factor analyses of variance (ANOVAs) on the psychological factors used for the clustering (impulsivity, motives, and self-esteem) and the covariates of interest, that is, age, frequency of buying, and severity of CB (CBS score, CBS category, and loss of control score). The variables used for the ANOVAs were the weighted scores according to the cluster membership probabilities in each cluster (*i.e.* in each cluster, the score of a participant was re-estimated using the membership probability of the participant in the specified cluster). In case of significance, comparisons between all possible pairs of means of the three clusters were conducted using *post-hoc* Tukey (HSD) tests.

Ethics

The study was conducted in accordance with Good Clinical Practice Guidelines and the Declaration of Helsinki, with approval from the local ethics committee (Groupe Nantais d’Ethique dans le Domaine de la Santé—GNEDS, Nantes). All participants provided electronic informed consent (individuals who were minor or under guardianship were not included). No compensation was given for participation.

RESULTS

Description of the Sample

A description of the total sample is provided in **Table 1**. Among the 242 participants, 34 were identified as individuals with CB and 208 as individuals without CB. Due to the recruitment through social networks, most participants were students aged around 25 years old, with a low level of income.

Typology of Buyers: Results of the LCAA

The fit indices of the 1- to 7- cluster solutions tested in the Latent Class Cluster Analysis (LCCA) are provided in **Table 2**. The three-cluster solution was selected because it had the lowest BIC. The entropy of the selected model was 0.801, which is considered high entropy (48), and the classification error rate was low (8.7%). This means that the latent classes were well distinct and that class membership probabilities were well predicted.

The profiles of the three clusters obtained with the LCCA are depicted in **Figure 1**. Compared with the non-CB group (dashed line), individuals from Cluster 1 seem to display lower scores on all the variables, except self-esteem and perseverance. However, the Z-scores are all comprised between 0 and –1 standard

TABLE 1 | Description of the sample (n = 242).

	M (SD) or N (%)
Age	25.6 (9.6)
Education level (years)	14.7 (1.7)
Professional status	
Student	176 (72.4%)
Active	56 (23.0%)
Inactive	8 (3.3%)
Retired	2 (0.8%)
Income	
≤€540 ^a	142 (58.7%)
≤€1150 ^b	48 (19.8%)
≤€2300	39 (16.1%)
>€2300	13 (5.4%)
CBS status	
Non-CB	208 (86.0%)
CB	34 (14.0%)

^aIn France, a €540-income corresponds to the RSA (Active Solidarity Income), which is provided to individuals without financial resources to guarantee them a minimum level of income; ^bIn France, a €1150-income corresponds to the SMIC (Growth-Indexed Minimum Wage), which is the minimum wage that a person with an employed activity must perceive as a salary.

TABLE 2 | Fit indices for 1- to 7- cluster solutions.

	Log-likelihood	BIC	Entropy	Classification errors
1-Cluster	–4691,17	9470,17	1	0
2-Cluster	–4510,12	9201,37	0.802	0.056
3-Cluster	–4439,57	9153,58	0.801	0.087
4-Cluster	–4403,24	9174,24	0.812	0.097
5-Cluster	–4352,38	9165,82	0.831	0.096
6-Cluster	–4345,78	9245,95	0.828	0.112
7-Cluster	–4327,15	9302,00	0.865	0.093

BIC, Bayesian information criterion.

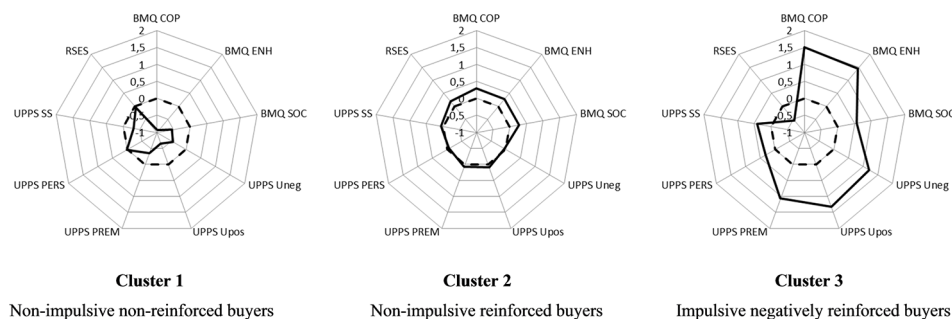


FIGURE 1 | Profiles of the three clusters of buyers. UPPS, Short UPPS-P Impulsivity Scale; BMQ, Buying Motives Questionnaire; RSES, Rosenberg Self-Esteem Scale. BMQ COP, Coping score of the BMQ; BMQ ENH, Enhancement score of the BMQ; BMQ SOC, Social score of the BMQ; UPPS Uneg, Negative Urgency score of the UPPS; UPPS Upos, Positive Urgency score of the UPPS; UPPS PREM, Lack of Premeditation score of the UPPS; UPPS PERS, Lack of Perseverance score of the UPPS; UPPS SS, Sensation Seeking score of the UPPS; RSES = total score of the RSES. Dashed lines represent the mean Z-scores of the non-CB group, which was used as the standard. Bold lines correspond to mean Z-scores of each cluster.

deviation (SD), so that the observed differences are not considered clinically meaningful. Individuals from Cluster 2 seem to have a profile very similar to that of the non-CB group, with SD very close to zero. Finally, individuals from Cluster 3 seem to have a very different profile than the non-CB group, *i.e.* largely higher scores for buying motives and impulsivity, and lower self-esteem scores. The Z-scores are comprised between +1 and +1.5 SD for coping and enhancement motives, and for positive urgency, negative urgency, and lack of premeditation, which is considered close to clinical meaningfulness. However, as the relative proportion of non-CB individuals is very different from a cluster to another (see below), these results should be interpreted with caution.

The results from the ANOVAs are presented in **Table 3**. Among the psychological factors that contribute to the clustering, the three clusters differed significantly regarding three impulsivity facets (negative urgency, positive urgency, and lack of premeditation) and two buying motives (coping and enhancement) but not self-esteem. We observed a gradient from Cluster 1 to Cluster 3 (Cluster 1 < Cluster 2 < Cluster 3) for all the scores with significant differences.

More specifically, *post-hoc* analyses revealed that individuals from the Cluster 3 scored significantly higher than the two other clusters on the UPPS negative urgency dimension and on the BMQ coping dimension. The other observed differences (positive urgency, lack of premeditation, and enhancement motive) were only in comparison with Cluster 1, which is the lowest extremity of the gradient. Consequently, Cluster 3 was named “impulsive reinforced buyers.” Moreover, this cluster was the cluster that displayed the highest probability of buying once per week or more; the lowest CBS score, that is, the higher the severity of CB, the higher probability of being an individual with CB, and the highest feeling of losing of control.

The only characteristics which distinguished Cluster 2 from Cluster 1 in the *post-hoc* analyses were the BMQ coping and enhancement dimensions, with Cluster 2 scoring higher for both. This cluster was therefore named “non-impulsive reinforced buyers.”

Finally, Cluster 1 was characterized by low levels of impulsivity and buying motives; thus, this cluster was named them “nonimpulsive nonreinforced buyers.”

When considering only individuals with CB ($n = 34$), we found an increasing probability in each cluster, with a gradient from Cluster 1 to Cluster 3: Cluster 1 (4.1%) < Cluster 2 (30.2%) < Cluster 3 (65.7%).

DISCUSSION

The objective of the present work was to investigate the profiles of buyers according to psychological characteristics known to be associated with a higher risk of CB (buying motives, impulsivity, and self-esteem). We identified three clusters of buyers with an observed gradient of impulsivity (negative urgency, positive urgency, and lack of premeditation) and buying motives (coping and enhancement).

As expected, we were able to isolate a non-problematic cluster, the “non-impulsive non-reinforced buyers” cluster, which represented a quarter of the sample. This cluster was characterized by a very low frequency of CB (2%), low levels of impulsivity, medium self-esteem (weighted score just under the threshold for “high self-esteem”), and low levels of buying motives for the three dimensions. Given the very low buying motives scores, an assumption could be that those individuals make purchases for a primarily utilitarian purpose and do not expect any rewards from the buying behavior other than the good.

In addition to this non-problematic cluster, an intermediary cluster emerged: the “non-impulsive reinforced buyers” cluster. This cluster was also characterized by a low frequency of CB (8%), with low to medium levels of impulsivity and high self-esteem (weighted score just over the threshold). Compared with the first cluster, “non-impulsive reinforced buyers” displayed higher levels of reinforcement-related buying motives, that is, negatively reinforced (coping) and positively reinforced (enhancement) motives, and a higher severity of CB (although

TABLE 3 | Description and comparisons of the three clusters of buyers.

Weighted scores ^a	Cluster 1 Nonimpulsive nonreinforced buyers	Cluster 2 Nonimpulsive reinforced buyers	Cluster 3 Impulsive reinforced buyers	ANOVAs		post-hoc Tukey (HSD) tests
Average cluster size ^b	0.28	0.51	0.21			
Psychological factors (contributive to the clustering)	M (SD)	M (SD)	M (SD)	F	p values	p values ^c
Impulsivity						
UPPS—negative urgency (/16)	7.84 (12.05)	8.97 (7.90)	12.36 (22.99)	5.47	0.004	1–2: 0.709 1–3: 0.004 2–3: 0.045
UPPS—positive urgency (/16)	8.79 (13.11)	10.52 (9.15)	13.40 (24.32)	4.66	0.010	1–2: 0.491 1–3: 0.007 2–3: 0.143
UPPS—lack of premeditation (/16)	6.53 (10.01)	7.39 (6.65)	9.44 (18.22)	3.41	0.034	1–2: 0.738 1–3: 0.030 2–3: 0.171
UPPS—lack of perseverance (/16)	7.20 (11.66)	6.99 (6.46)	7.95 (15.70)	0.44	0.644	–
UPPS—sensation seeking (/16)	9.16 (14.07)	10.20 (9.27)	11.22 (21.20)	1.05	0.349	–
Buying motives						
BMQ—coping (/20)	6.38 (9.32)	10.30 (9.60)	14.18 (26.39)	12.60	< 0.001	1–2: 0.031 1–3: < 0.001 2–3: 0.033
BMQ—enhancement (/20)	6.36 (9.32)	9.85 (9.04)	13.27 (24.97)	10.93	< 0.001	1–2: 0.048 1–3: < 0.001 2–3: 0.054
BMQ—social (/20)	7.47 (11.16)	9.13 (8.25)	9.69 (17.84)	1.90	0.150	–
Self-esteem						
RSES—total score (/40)	28.76 (44.48)	30.21 (26.97)	25.56 (46.20)	0.85	0.429	–
Covariates (not contributive to the clustering)						
Age	27.70 (46.19)	25.39 (25.18)	23.58 (43.44)	0.66	0.515	–
Frequency of buying (once per week or more)	0.04 (0.39)	0.05 (0.31)	0.20 (0.92)	5.01	0.007	1–2: 0.980 1–3: 0.022 2–3: 0.013
Severity of CB						
CBS score	2.03 (3.88)	1.07 (2.10)	-1.12 (4.70)	45.66	< 0.001	1–2: 0.012 1–3: < 0.001 2–3: < 0.001
CBS category (probability to be an individual with CB)	0.02 (0.23)	0.08 (0.36)	0.43 (1.32)	18.68	< 0.001	1–2: 0.670 1–3: < 0.001 2–3: < 0.001
Loss of control score (/10)	1.32 (4.08)	2.30 (3.43)	4.08 (9.66)	11.65	< 0.001	1–2: 0.208 1–3: 0.006 2–3: < 0.001

UPPS, Short UPPS-P Impulsivity Scale; BMQ, Buying Motives Questionnaire; RSES, Rosenberg Self-Esteem Scale; CBS, Compulsive Buying Scale; CB, Compulsive Buying;

^aThe weighted scores for a given cluster were computed by multiplying the raw score of each individual by the membership probability in the given cluster and by dividing the result by the mean of the membership probabilities of the given cluster of all the individuals. Given the membership probability weight, the distribution of weighted scores is artificially more dispersed;

^bThe average cluster size represents the mean of the cluster membership probabilities of all the participants for each cluster; ^cFor each variable, p values are reported for the comparisons of all possible pairs of means of the three clusters (1–2: cluster 1 vs cluster 2; 1–3: cluster 1 vs cluster 3; 2–3: cluster 2 vs cluster 3); Significant p values (p < 0.05) are indicated in bold.

insufficient to reach the threshold for CB). This cluster was the most represented among the sample (51%) and may represent a category of buyers experiencing few difficulties with their buying behavior (higher severity of CB than the first cluster) and with no real clinical distress. For these individuals, buying episodes may have either positive or negative reinforcing properties.

Regarding the literature on CB, such emotionally-driven buying behaviors can induce a decrease in self-regulation capacities (22), especially for negative mood. As a consequence, and given the higher severity of CB evidenced in this cluster compared with the nonproblematic cluster, “nonimpulsive

reinforced buyers” may be more at-risk for subsequent development of CB. However, it is critical to highlight that those buyers are primarily non-problematic buyers with a weak sense of losing control over the buying behavior, similar to the first cluster, and a low frequency of CB (8%). As a consequence, no real psychological distress can be evidenced.

Finally, as expected, we were able to identify a cluster with a high frequency of CB (43%), which was characterized by higher impulsivity, stronger buying motives, low self-esteem, an elevated feeling of losing control over the buying behavior, and a higher level of CB severity. Although not directly assessed, this

may presume psychological distress for a non-negligible proportion of buyers in this cluster, and those buyers may be identified as “problematic” buyers. Although being the least represented cluster, “impulsive reinforced buyers” nevertheless represented approximately one fifth of the sample (21%), which was much more than expected. Buyers from this cluster were especially distinguished from the intermediary cluster regarding negative urgency and coping motive. They displayed a much higher negative urgency score, which is relevant to the assumption made by Billieux et al.: buyers with elevated negative urgency are more likely to buy compulsively when they experience negative feelings (9).

Moreover, this higher responsiveness to negative feelings is supported because those buyers who have the highest levels of impulsivity also displayed the highest levels of coping motives. Indeed, in the literature regarding CB, buying motives have been little explored, especially with the three-dimensional model of motives used in the addictive literature (29, 30). More specifically, the coping motive refers to the completion of the behavior to relieve negative feelings or boredom, or to escape real-life problems. “Impulsive reinforced buyers” may thus use buying as a maladaptive coping strategy to manage negative feelings, as demonstrated by Muller et al., who used ecological momentary assessment (22).

Such a switch to negatively reinforced behaviors for problematic subgroups has been previously highlighted in problem gamblers (49) and problematic videogame users (41), which would put forward a certain form of similarity with behavioral addictions. This result is also in line with the recently revised I-PACE model of addiction (50). Such model postulates that the addictive behavior results from the interaction of a person's core characteristics that predispose to addiction (such as genetics, psychopathology, temperament, coping style, motives for using, *etc.*), affective and cognitive responses to external or internal triggers, and executive functioning (inhibitory control and decision-making). According to this model, the addictive behavior is learnt in early stages through changes of expectancies (feelings of gratification or relief from negative moods in response to the behavior) in response to internal and external triggers associated with the behavior. Such changes may increase the urge to perform the behavior in subsequent confrontation to the triggers. In later stages, gratification gradually switches to compensation, and stimulus-specific inhibitory control is altered, leading to a progressive loss of control over the urges and the maintenance of the behavior. As a consequence, in such later stages, negative moods and dysfunctional coping skills play a central role in maintaining addictive behaviors (50, 51). Moreover, as hypothesized by Baker et al. in the framework of the negative reinforcement model of drug addiction, the induction of negative feelings through exposure to negative cues should increase motivation for buying (52). In our study, the cluster with the higher frequency of CB is the cluster with the higher levels of negative buying motives and negative urgency, which seems compatible with the central role of negative reinforcement highlighted in addictive disorders. Moreover, still according to Baker et al., in the context

of drug addiction, abstinence from buying should induce a progressive increase in negative feelings and attention to negative cues, either internal or external cues (52). Such assumptions should be more deeply explored and confirmed in future studies on CB, especially with neurocognitive approaches and clinical samples. However, the similarities of the psychological profiles of individuals with CB with other addictive behaviors, and common symptoms and clinical expressions, are supplementary arguments to consider conceptualizing CB as an addictive disorder, as argued by several researchers (5, 7).

This work has several limitations. First, the sample was recruited from two sources (online networks and registry of volunteer). This may have brought a kind of heterogeneity in the profiles of participants. Second, the majority of the sample was students, and the sample was a self-selected, which may limit the generalizability of the results. Third, considering that the data collection was based on a cross-sectional design and included only self-reported questionnaires, the results should be considered as preliminary and considered with caution. Moreover, the survey was limited to only measures necessary to explore our hypotheses. However, nor psychiatric symptoms such as depression or anxiety nor co-addictions were screened (for the sake of feasibility of the survey, which had to remain short). Future studies interested in subtyping CBr should use longitudinal designs to explore the relative role of buying motives, especially negative buying motives; impulsivity; and self-esteem on the subsequent development of CB, taking into account psychiatric or addictive comorbidities. Fourth, the sample was composed of only women, which may have reduced the scope of the results. However, CB is a disorder with a large predominance of women. Fifth, the BMQ explores only positive and negative reinforcement-related and social-affiliation-related motives. In the same manner as what was performed for the Gambling Motives Questionnaire with the addition of a financial motive (53), it may be useful to develop a revised version of the BMQ which explores other motives relevant for buying behavior, and especially utilitarian motives, which are a critical motivation for everyday purchases. Moreover, as the BMQ relies on a model developed for substance use, one could argue that its use may participate in a confirmatory approach that we tried to avoid. However, the BMQ model explores motives for use (consumption), and not especially for pathological/addictive use. As a consequence, it does not explore symptoms of CB in an addictive perspective, but rather the reasons to engage in buying. It was especially relevant because it gave us access to emotionally-driven (positive and negative) motives. Finally, this work was performed on a community sample. We cannot exclude that the profile obtained will not be similar to a clinical sample. Moreover, the sample size of the sample was marginally sufficient in size for this type of analyses. As a consequence, the present sample should not be considered representative of the population of compulsive buyers. However, the objective here was to highlight profiles of buyers according to certain vulnerability traits and to observe whether such profiles show different distributions of CB.

CONCLUSION

Our study has allowed the identification of three profiles of buyers, who differed significantly in impulsivity and buying motives. A problematic cluster emerged, characterized by a high frequency of CB and an association with buying motives and impulsivity with negative feelings. These results present similarities with certain aspects of the I-PACE model of addiction and echo other typologies performed with problem gamblers and problematic videogame users. These similarities of psychological profiles with other addictive behaviors, and with common symptoms and clinical expressions, are supplementary arguments to consider conceptualizing CB as an addictive disorder.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors to any qualified researchers, provided that the intended purpose of use is relevant with the ethical consent given by the participant and with French legislation. Requests to access the dataset analyzed in this study should be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Groupe Nantais d'Ethique dans le Domaine de la

Santé—GNEDS, Nantes. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GC-B, JM, and EC designed the study. GC-B was responsible for the project management and supervision. JM created the Internet survey, conducted the data collection, and performed the descriptive analysis. BP conducted the Latent Class Analysis. EC and GC-B were responsible of the interpretation of data and wrote the first draft of the manuscript. MG-B provided significant feedback on the manuscript. All authors had full access to all data and approved the final manuscript.

ACKNOWLEDGMENTS

We wish to sincerely thank students from the “Licence Professionnelle Statistique Informatique pour la Santé” of the IUT de Vannes (Université Bretagne Sud) for their valuable assistance in the statistical analysis (Adèle Bihannic, Ewen Boigné and Damien Tranchant). This work constitutes a new statistical treatment of a dataset previously used, which lead to original conclusions (another manuscript based on another statistical treatment is under consideration for publication elsewhere, the preliminary results of which were presented at the 4th International Conference on Behavioral Addictions in 2017).

REFERENCES

- McElroy SL, Keck PE Jr., Pope HG Jr., Smith JM, Strakowski SM. Compulsive buying: a report of 20 cases. *J Clin Psychiatry* (1994) 55(6):242–8.
- Christenson GA, Faber RJ, de Zwaan M, Raymond NC, Specker SM, Ekern MD, et al. Compulsive buying: descriptive characteristics and psychiatric comorbidity. *J Clin Psychiatry* (1994) 55(1):5–11.
- Faber RJ, O'Guinn TC. A Clinical Screener for Compulsive Buying. *J Consum Res* (1992) 19(3):459–69. doi: 10.1086/209315
- Maraz A, Griffiths MD, Demetrovics Z. The prevalence of compulsive buying: a meta-analysis. *Addiction* (2016) 111(3):408–19. doi: 10.1111/add.13223
- Muller A, Mitchell JE, de Zwaan M. Compulsive buying. *Am J Addict* (2015) 24(2):132–7. doi: 10.1111/ajad.12111
- Piquet-Pessôa M, Ferreira GM, Melca IA, Fontenelle LF. DSM-5 and the decision not to include sex, shopping or stealing as addictions. *Curr Addict Rep* (2014) 1:172–6. doi: 10.1007/s40429-014-0027-6
- Potenza MN, Higuchi S, Brand M. Call for research into a wider range of behavioural addictions. *Nature* (2018) 555(7694):30. doi: 10.1038/d41586-018-02568-z
- Muller A, Brand M, Claes L, Demetrovics Z, de Zwaan M, Fernandez-Aranda F, et al. Buying-shopping disorder—is there enough evidence to support its inclusion in ICD-11? *CNS Spectr* (2019) 24(4):374–9. doi: 10.1017/S1092852918001323
- Billieux J, Rochat L, Rebetz MML, Van der Linden M. Are all facets of impulsivity related to self-reported compulsive buying behavior? *Pers Individ Dif* (2008) 44(6):1432–42. doi: 10.1016/j.paid.2007.12.011
- Mestre-Bach G, Granero R, Steward T, Fernandez-Aranda F, Bano M, Aymami N, et al. Reward and punishment sensitivity in women with gambling disorder or compulsive buying: Implications in treatment outcome. *J Behav Addict* (2016) 5(4):658–65. doi: 10.1556/2006.5.2016.074
- Trotzke P, Starcke K, Muller A, Brand M. Cue-induced craving and symptoms of online-buying-shopping disorder interfere with performance on the Iowa Gambling Task modified with online-shopping cues. *Addictive Behav* (2018) 96:82–8. doi: 10.1016/j.addbeh.2019.04.008
- Nicolai J, Moshagen M. Pathological buying symptoms are associated with distortions in judging elapsed time. *J Behav Addict* (2018) 7(3):752–9. doi: 10.1556/2006.7.2018.80
- Zheng Y, Yang X, Liua Q, Chu X, Huang Q, Zhou Z. Perceived stress and online compulsive buying among women: A moderated mediation model. *Comput Hum Behav* (2020) 103:13–20. doi: 10.1016/j.chb.2019.09.012
- Williams AD, Grisham JR. Impulsivity, Emotion Regulation, and Mindful Attentional Focus in Compulsive Buying. *Cognit Ther Res* (2012) 36(5):451–7. doi: 10.1007/s10608-011-9384-9
- Rose P, Segrist DJ. Negative and positive urgency may both be risk factors for compulsive buying. *J Behav Addict* (2014) 3(2):128–32. doi: 10.1556/JBA.3.2014.011
- de Paula JJ, Costa DS, Oliveira F, Alves JO, Passos LR, Malloy-Dini LF. Impulsivity and compulsive buying are associated in a non-clinical sample: an evidence for the compulsivity-impulsivity continuum? *Braz J Psychiatry* (2015) 37(3):242–4. doi: 10.1590/1516-4446-2014-1644
- Whiteside SP, Lynam DR. The Five Factor Model and impulsivity: using a structural model of personality to understand impulsivity. *Pers Individ Dif* (2001) 30(4):669–89. doi: 10.1016/S0191-8869(00)00064-7
- DeSarbo WS, Edwards EA. Typologies of Compulsive Buying Behavior: A Constrained Clusterwise Regression Approach. *J Consum Psychol* (1996) 5(3) 231–62. doi: 10.1207/s15327663jcp0503_02
- Ertelt TW, Marino JM, Mitchell JE, Lancaster K. Current Status of Cognitive-Behavioral Intervention for Compulsive Buying Disorder. *J Contemp Psychother* (2009) 39:213–20. doi: 10.1007/s10879-009-9121-9
- Biolcati R. The Role of Self-esteem and Fear of Negative Evaluation in Compulsive Buying. *Front Psychiatry* (2017) 8:74. doi: 10.3389/fpsy.2017.00074

21. Dittmar H, Beattie J, Friese S. Objects, decision considerations and self-image in men's and women's impulse purchases. *Acta Psychol (Amst)* (1996) 93(1-3):187–206. doi: 10.1016/0001-6918(96)00019-4
22. Muller A, Mitchell JE, Crosby RD, Cao L, Johnson J, Claes L, et al. Mood states preceding and following compulsive buying episodes: an ecological momentary assessment study. *Psychiatry Res* (2012) 200(2-3):575–80. doi: 10.1016/j.psychres.2012.04.015
23. Duroy D, Sabbagh O, Baudel A, Lejoyeux M. Compulsive buying in Paris psychology students: Assessment of DSM-5 personality trait domains. *Psychiatry Res* (2018) 267:182–6. doi: 10.1016/j.psychres.2018.06.015
24. Kukar-Kinney M, Ridgway NM, Monroe KB. The Relationship Between Consumers' Tendencies to Buy Compulsively and Their Motivations to Shop and Buy on the Internet. *J Retailing* (2009) 85(3):298–307. doi: 10.1016/j.jretai.2009.05.002
25. Kukar-Kinney M, Scheinbaum AC, Schaeffers T. Compulsive buying in online daily deal settings: An investigation of motivations and contextual elements. *J Bus Res* (2016) 69(2):691–9. doi: 10.1016/j.jbusres.2015.08.021
26. Moon MA, Farooq A, Kiran M. Social Shopping Motivations of Impulsive and Compulsive Buying Behaviors. *UW J Manage Sci* (2017) 1:15–27.
27. Horváth C, Adigüzel F. Shopping enjoyment to the extreme: Hedonic shopping motivations and compulsive buying in developed and emerging markets. *J Bus Res* (2018) 86:300–10. doi: 10.1016/j.jbusres.2017.07.013
28. Jung J, Yi S. Assessment of heterogeneity of compulsive buyers based on affective antecedents of buying lapses. *Addict Res Theory* (2014) 22(1):37–48. doi: 10.3109/16066359.2012.756475
29. Cooper ML, Russell M, Skinner JB, Windle M. Development and validation of a three-dimensional measure of drinking motives. *Psychol Assess* (1992) 4:123–32. doi: 10.1037/1040-3590.4.2.123
30. Stewart SH, Zack M. Development and psychometric evaluation of a three-dimensional Gambling Motives Questionnaire. *Addiction* (2008) 103(7):1110–7. doi: 10.1111/j.1360-0443.2008.02235.x
31. Mueller A, Mitchell JE, Black DW, Crosby RD, Berg K, De Zwaan M. Latent profile analysis and comorbidity in a sample of individuals with compulsive buying disorder. *Psychiatry Res* (2010) 178(2):348–53. doi: 10.1016/j.psychres.2010.04.021
32. Mueller A, Claes L, Mitchell JE, Wonderlich SA, Crosby RD, de Zwaan M. Personality prototypes in individuals with compulsive buying based on the Big Five Model. *Behav Res Ther* (2010) 48(9):930–5. doi: 10.1016/j.brat.2010.05.020
33. Claes L, Luyckx K, Vogel B, Verschueren M, Müller A. Identity processes and clusters in individuals with and without pathological buying. *Psychiatry Res* (2018) 267:467–72. doi: 10.1016/j.psychres.2018.06.003
34. Granero R, Fernandez-Aranda F, Bano M, Stewart T, Mestre-Bach G, Del Pino-Gutierrez A, et al. Compulsive buying disorder clustering based on sex, age, onset and personality traits. *Compr Psychiatry* (2016) 68:1–10. doi: 10.1016/j.comppsy.2016.03.003
35. Yi S. Heterogeneity of compulsive buyers based on impulsivity and compulsivity dimensions: a latent profile analytic approach. *Psychiatry Res* (2013) 208(2):174–82. doi: 10.1016/j.psychres.2012.09.058
36. Hartston H. The case for compulsive shopping as an addiction. *J Psychoactive Drugs* (2012) 44(1):64–7. doi: 10.1080/02791072.2012.660110
37. Granero R, Fernandez-Aranda F, Mestre-Bach G, Stewart T, Bano M, Del Pino-Gutierrez A, et al. Compulsive Buying Behavior: Clinical Comparison with Other Behavioral Addictions. *Front Psychol* (2016) 7:914. doi: 10.3389/fpsyg.2016.00914
38. Diez D, Aragay N, Soms M, Prat G, Bonet P, Casas M. Women with compulsive buying or gambling disorder: Similar profiles for different behavioural addictions. *Compr Psychiatry* (2018) 87:95–9. doi: 10.1016/j.comppsy.2018.09.002
39. Billieux J, Schimmenti A, Khazaal Y, Maurage P, Heeren A. Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *J Behav Addict* (2015) 4(3):119–23. doi: 10.1556/2006.4.2015.009
40. Milosevic A, Ledgerwood DM. The subtyping of pathological gambling: A comprehensive review. *Clin Psychol Rev* (2010) 30(8):988–98. doi: 10.1016/j.cpr.2010.06.013
41. Billieux J, Thorens G, Khazaal Y, Zullino D, Achab S, Van der Linden M. Problematic involvement in online games: A cluster analytic approach. *Comput Hum Behav* (2015) 43:242–50. doi: 10.1016/j.chb.2014.10.055
42. Devos G, Challet-Bouju G, Burnay J, Maurage P, Grall-Bronnec M, Billieux J. Adaptation and validation of the Gambling Motives Questionnaire-Financial (GMQ-F) in a sample of French-speaking gamblers. *Int Gambl Stud* (2017) 17(1):87–101. doi: 10.1080/14459795.2016.1264080
43. Billieux J, Rochat L, Ceschi G, Carre A, Offerlin-Meyer I, Defeldre AC, et al. Validation of a short French version of the UPPS-P Impulsive Behavior Scale. *Compr Psychiatry* (2012) 53(5):609–15. doi: 10.1016/j.comppsy.2011.09.001
44. Cyders MA, Littlefield AK, Coffey S, Karyadi KA. Examination of a short English version of the UPPS-P Impulsive Behavior Scale. *Addictive Behav* (2014) 39(9):1372–6. doi: 10.1016/j.addbeh.2014.02.013
45. Rosenberg M. *Society and the Adolescent Self-image*. Princeton: Princeton University Press (1965) p. 560–2 p.
46. Vallières EF, Vallerand RJ. Traduction et validation canadienne-française de l'échelle d'estime de soi de Rosenberg. *Int J Psychol* (1990) 25(2):305–16. doi: 10.1080/00207599008247865
47. Vermunt JK, Magidson J. Latent Class Cluster Analysis. In: *Applied Latent Class Analysis*. Hagenaars JA, McCutcheon AL, editors. Cambridge: Cambridge University Press (2002) p. 89–106.
48. Clark SL, Muthén B. (2009). Relating latent class analysis results to variables not included in the analysis. , [updated 2019 Jan 25]. Available from: <https://www.statmodel.com/download/relatinglca.pdf>.
49. Stewart SH, Zack M, Collins P, Klein RM. Subtyping pathological gamblers on the basis of affective motivations for gambling: relations to gambling problems, drinking problems, and affective motivations for drinking. *Psychol Addict Behav* (2008) 22(2):257–68. doi: 10.1037/0893-164X.22.2.257
50. Brand M, Wegmann E, Stark R, Muller A, Wolfing K, Robbins TW, et al. The Interaction of Person-Affect-Cognition-Execution (I-PACE) model for addictive behaviors: Update, generalization to addictive behaviors beyond internet-use disorders, and specification of the process character of addictive behaviors. *Neurosci Biobehav Rev* (2019) 104:1–10. doi: 10.1016/j.neubiorev.2019.06.032
51. Brand M, Young KS, Laier C, Wolfing K, Potenza MN. Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neurosci Biobehav Rev* (2016) 71:252–66. doi: 10.1016/j.neubiorev.2016.08.033
52. Baker TB, Piper ME, McCarthy DE, Majeskie MR, Fiore MC. Addiction motivation reformulated: an affective processing model of negative reinforcement. *Psychol Rev* (2004) 111(1):33–51. doi: 10.1037/0033-295X.111.1.33
53. Dechant K. Show me the money: incorporating financial motives into the gambling motives questionnaire. *J Gambl Stud* (2014) 30(4):949–65. doi: 10.1007/s10899-013-9386-5

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 Challet-Bouju, Mariez, Perrot, Grall-Bronnec and Chauchard. 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.



Coping Strategies, Creativity, Social Self-Efficacy, and Hypercompetitiveness in Gambling Behaviors: A Study on Male Adolescent Regular Gamblers

Alessia Passanisi*, Giulio D'Urso, Adriano Schimmenti, Stefano Ruggieri and Ugo Pace

Faculty of Human and Social Science, UKE – Kore University of Enna, Enna, Italy

OPEN ACCESS

Edited by:

Petko Kusev,
University of Huddersfield,
United Kingdom

Reviewed by:

Dafina Petrova,
Andalusian School of Public Health,
Spain
Simona Raimo,
University of Campania Luigi Vanvitelli,
Italy

*Correspondence:

Alessia Passanisi
alessia.passanisi@unikore.it

Specialty section:

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

Received: 08 April 2020

Accepted: 23 June 2020

Published: 21 July 2020

Citation:

Passanisi A, D'Urso G,
Schimmenti A, Ruggieri S and Pace U
(2020) Coping Strategies, Creativity,
Social Self-Efficacy,
and Hypercompetitiveness
in Gambling Behaviors: A Study on
Male Adolescent Regular Gamblers.
Front. Psychol. 11:1722.
doi: 10.3389/fpsyg.2020.01722

The purpose of this research was to explore the cognitive and personality characteristics of male adolescent gamblers. Participants were 273 teenage males ($M = 18.04$, $SD = 2.10$) attending betting centers in Sicily, who completed self-report questionnaires on gambling, creativity, perceived social self-efficacy, hypercompetitiveness, and coping strategies. Pathological gamblers reported higher levels of avoidant coping strategies than occasional gamblers. They also scored higher on hypercompetitiveness than both occasional and problem gamblers. Further, problem gamblers scored higher than occasional gamblers on the complexity domain of creative personality. Finally, poor perceived social self-efficacy, higher levels of avoidant coping, and hypercompetitiveness predicted pathological gambling. Theoretical, psycho-educational, and clinical implications are discussed.

Keywords: gambling, adolescents, coping strategies, self-efficacy, creativity, hypercompetitiveness

INTRODUCTION

Pathological gambling (PG) belongs to the diagnostic class of substance-related and addictive disorders. Indeed, in line with DSM-5 (American Psychiatric Association, 2013), gambling disorder is considered a non-substance-associated addictive behavior and may be defined as a pattern of insistent and repeated gambling behavior leading to extensive clinical impairments: people suffering from gambling disorder display symptoms such as a desire to gamble with increasing amounts of money, feelings of anxiety or irritability connected to the inability to play, risking bonds and career because of gambling, and other symptoms, including episodes of craving, such as an uncontrollable desire to play, and gambling when feeling distressed. Several studies underline how PG is a problem situation more usual among boys than girls (Ellenbogen et al., 2007; Pace and Passanisi, 2018).

Specifically, men bet and hazard more and have more difficulty related to gambling during adolescence than girls (Calado et al., 2017), but this “gender gap” in gambling involvement decreases during adulthood.

In addition, this problem affects both young people and adults in terms of incidence. Most gambling activities are legally restricted to adults in the majority of countries, but adolescent

gambling is not infrequent. Adolescents occasionally, although they bet and hazard less, show more severe episodes than adults (Bastiani et al., 2013). Specifically, the current generation of adolescents and young adults constitutes a susceptible age group because they have grown up in a time with widespread gambling opportunities (Gupta and Derevensky, 2004) that, for a small minority of youth, particularly males, instead of constituting a recreational activity can lead to severe negative outcomes (Calado et al., 2017), such as poor academic performance, injury, and dating violence (Thombs et al., 2009; Afifi et al., 2010). Given the great social costs of PG, it is important to explore those processes and risk factors that lead adolescents, statistically, more boys than girls, from gambling to significantly more structured PG in adulthood.

Several studies suggest that the number of adolescents who engage in risky behavior is constantly growing as, in this life stage, they tend more often to consider themselves invulnerable and lack knowledge about the negative consequences of such behaviors (e.g., Grant and Kim, 2005; Derevensky et al., 2010). The literature on PG has attempted to create different player profiles of gamblers. Indeed, Abbott et al. (1995) classified gamblers as “excessive” or “normal” on the basis of the time spent gambling, expense, and number of trips to the gaming sites. Gupta and Derevensky (1998) differentiated social players from problematic and pathological players, thus conceiving gambling behaviors along a continuum between normality and pathology (i.e., when the game induces the characteristics of chronic stress). According to Blaszczynski and Nower (2002), basically, there are three kinds of PGs. These comprise emotionally vulnerable subtypes, characterized by cognitive distortions and poor coping strategies.

In other words, if there are individual differences leading to different kinds of vulnerability to PG, then it could be relevant to better explore the categories of gamblers considering those individual variables of a social-cognitive and personality nature that can represent risk factors for gambling behaviors.

In this regard, some studies highlight how dysfunctional coping strategies can be involved in adolescent gambling (Bergevin et al., 2006; Shead et al., 2010; Dixon et al., 2016). According to extensive literature, adolescents may use various coping strategies: problem-focused strategies (e.g., striving to modify an event and aiming to reduce the stressful condition); emotion-focused strategies, which aim to diminish the emotional burden connected to the perceived stress (e.g., detachment from the situation, seeking social support); and avoidance-oriented strategies, by which the person tries to escape from the stressful situation (Lazarus, 1983; Roth and Cohen, 1986; Nigro, 1996). In particular, Sharpe and Tarrrier (1993) highlight that coping strategies are fundamental mechanisms that separate “controlled” from “excessive” gamblers. Exploratory studies suggest that adolescent gamblers who excessively play exhibit more emotionally based, avoidance, and distraction-oriented coping styles (Gupta et al., 2000, 2004; Nower et al., 2004; Verner-Filion et al., 2014; Casey et al., 2017). Moreover, Bergevin et al. (2006) found that teenagers with gambling problems exhibit less task-centered coping levels as well as more avoidance-focused strategies. Furthermore, problematic

male players would use emotion-focused coping strategies more than women.

Another psychological variable leading adolescents to PG could be hypercompetitiveness. This attitude denotes a deep need by people to win by competing to keep or to increase feelings of self-worth and self-esteem with a particular tendency toward aggression, control, denigration, and manipulation of other people (Ryckman et al., 1997). A few studies highlight how pathological gamblers show higher ranks of hypercompetitive attitudes due to obsession with achievement of goals and success (Walters, 1994; Burger et al., 2006; Passanisi et al., 2019). Because hypercompetitiveness is an intergroup construct, pathological gamblers, in this sense, need each other to feel powerful and strong to be able to achieve success. This attitude can be considered a cultural style in which the characteristics of ruthlessness are seen as positive and, therefore, as adaptive traits.

A few other studies show a connection among creativity and gambling (Pascual-Leone et al., 2011). The creative personality defines a person who can solve problems, develop products, or formulate new questions in a manner that is first considered original but ends up being accepted in a particular cultural environment (Gardner, 1988). Creativity is consequently a form of divergent and unconventional thought (Guilford, 1950, 1967), which can produce unusual responses. In this sense, creativity can be connected to gambling because it helps individuals to create a great number of original solutions for a given problem. This means that those who are at-risk gamblers may display some relevant differences in the way that they manage tasks, which may be linked to a larger factor of being exploration-oriented or unconventional. A recent study carried out on a sample of university students showed that at-risk gamblers had high levels of creativity, whereas non-players and problem gamblers showed equally low levels of creativity (Pascual-Leone et al., 2011).

Finally, research highlights that people's beliefs about their self-efficacy in managing events influence choices, aspirations, levels of effort, perseverance, vulnerability to stress, and in general the quality of performance (Bandura and Cervone, 1983; Kaur et al., 2006). Moreover, literature shows that individuals with low levels of self-efficacy are more prone to undertake addictive behaviors and that addictive behaviors positively correlate with lower social interactions, lower self-esteem, isolation, and depression (Kraut et al., 1998; Ko et al., 2005). Thus, self-efficacy can be considered a critical protective factor for the etiology of behavioral addictions, such as PG (Sylvain et al., 1997; Raylu and Oei, 2002; Hyde et al., 2008). In particular, the study conducted by Jeong and Kim (2011) suggests that perceived social self-efficacy, one facet of actual social abilities referring to a willingness to start conduct in social environments (Sherer and Adams, 1983; Smith and Betz, 2000) and to individuals' perception that they are capable of starting public interaction as well as making new friendships (Gecas, 1989), diminished with implemented adolescent addictive behaviors, in particular related to gambling. Conversely, individuals with high levels of social self-efficacy were less at risk of falling into addictive tendencies. Therefore, lack of social self-efficacy would be the launch pad toward the implementation of compensatory maladaptive behaviors that may result in the development

of a behavioral craving (Kardefelt-Winther et al., 2017). Studying perceived social self-efficacy concerning gambling can broaden the description of the psychological variables related to this phenomenon.

In line with the aforementioned theoretical premises, the aim of the present research was to investigate certain cognitive features (i.e., perceived social self-efficacy, hypercompetitiveness attitude, creativity, and coping strategies) that may represent protective or risk factors of PG in a male adolescent population by assessing the differences between three gambling categories: occasional gamblers, problem gamblers, and pathological gamblers.

METHODS

Participants and Procedure

Participants were 273 male adolescents and young adults aged 15–19 ($M_{\text{age}} = 18.04$, $SD = 2.10$) contacted in betting centers in Sicily, even though minors under 18 are not allowed to bet in Italian social fabric, between February 2019 and February 2020.

The adolescents were informed about the research objectives while they were in the game centers. After their written informed consent was obtained, they were requested to complete an anonymous battery of self-report tools to evaluate creativity, perceived social self-efficacy, coping styles, and gambling. The group of participants represents a convenience sample because we recruited the adolescents and young adults who were present in the main centers of the territory. The adolescents who agreed to participate in the study were also informed about available treatment centers to favor their contact with health services.

During the administration of the questionnaires, the participants were left free to abandon the administration at any time. Furthermore, given the particular legal situation, it was not possible to identify underage subjects, nor obviously ask their parents for informed consent. If we had to proceed with the usual procedures for identifying and parental consent of minors, we should have given up the research. We believe, on the contrary, that despite the identification difficulties, carrying out this study was important for the prevention of illicit behaviors during adolescence that can be pathologically structured in adulthood.

The research processes explained in this manuscript adhered to the ethical norms for research and were accepted by the internal review board (IRB) for psychological research of the UKE – Kore University of Enna (approval code: UKE-IRBPSY-04.20.01).

Measures

The South Oaks Gambling Screen

The South Oaks Gambling Screen (SOGS; Lesieur and Blume, 1987; Marazziti et al., 2014) is an 18-item, self-report tool that came from DSM criteria for PG. It is split into two parts: the first five items give information on the kind of gambling (e.g., bet on horses, play bingo for money, play cards, etc.) and on related topics [e.g., “Have you ever quit gambling for a period of time?” “What is the largest amount of money you have ever gambled

on any one day?” “Are there some people in your life who have (or had) a gambling problem?”]. Items from 6 to 18 concern information on the occurrence of behaviors linked to gambling (e.g., “When you play the game of chance and lose, how often do you return the next day to try to win the amount lost?” “Have you ever gambled more than you wanted?”). Adding up the number of items with an “at-risk” response gives the scores of SOGS. The first five questions are not considered for the total mark. As for the remaining items, some of them can be calculated more than once. The Cronbach’s alpha value is 0.702.

The Test of Creative Thinking

The Test of Creative Thinking consists of 50 items evaluating four levels of Williams (1994) classification for original thinking: curiosity, imagination, complexity, and risk taking. This measure is administered to children and adolescents; each answer obtains a score from –1 to 2 points (from almost always false to almost always true). For the current research, we only administered the “curiosity” (e.g., I like trying many new things; Cronbach alpha value is 0.74) and “complexity” scales (e.g., I like trying to solve a problem even when there is not a single solution; I like “different” things; Cronbach’s alpha value is 0.71).

The Perceived Social Self-Efficacy Scale

The Perceived Social Self-Efficacy Scale (PSSE; Smith and Betz, 2000; Di Giunta et al., 2010) measures individuals’ beliefs in their abilities to express their own ideas with others, to work supportively, and to manage interpersonal conflicts. The instrument consists of 15 items assessing the level of confidence in different social situations (e.g., “Put yourself in a new and different social situation” and “Find someone to go to lunch with”). Responses receive a score from 1 (“no confidence at all”) to 5 (“complete confidence”). Scores of the instrument are calculated by adding up the scores of each item (Cronbach’s alpha value is 0.81).

The Hypercompetitive Attitude Scale

The Hypercompetitive Attitude Scale (HCA; Ryckman et al., 1997; Menesini et al., 2018) consists of 26 items assessing individual differences in hypercompetitive attitudes (e.g., “Winning in competition make me feel more powerful as a person” and “It’s a dog-eat-dog world. If you don’t get the better of others, they will surely get the better of you”). Responses receive a score from 1 “never true of me” to 5 “always true of me.” Higher scores refer to a stronger HCA. Cronbach’s alpha value is 0.78.

The Coping Strategy Indicator

The Coping Strategy Indicator (CSI; Nigro, 1996) is a self-report questionnaire on the degree to which the coping strategies of problem-solving (e.g., Have you tried to make a detailed plan of action rather than act on impulse? Cronbach’s alpha = 0.80), avoidance or avoiding events (e.g., Have you tried to distract yourself from the problem? Cronbach’s alpha = 0.79), and seeking social support (e.g., Did you accept help from a friend or relative? Cronbach’s alpha = 0.76) have been employed to cope with a

TABLE 1 | Descriptive statistics on different groups of PGs.

Variables	Occasional gamblers (<i>n</i> = 82) Mean (SD)	Problem gamblers (<i>n</i> = 80) Mean (SD)	Pathological gamblers (<i>n</i> = 110) Mean (SD)	<i>F</i> (2, 272)	<i>p</i>
Seeking social support	22.85 (5.16)	22.74 (5.62)	22.64 (5.17)	0.04	0.96
Problem solving	24.40 (5.24)	24.48 (5.24)	24.92 (4.42)	0.32	0.72
Avoidance	20.59 (4.41)*	21.55 (4.70)	22.65 (3.52)*	5.81	0.003*
Social self-efficacy	50.04 (11.2)	51.09 (8.6)	48.11 (10.48)	2.10	0.15
Curiosity	26.95 (3.2)	27.79 (3.72)	27.25 (3.53)	1.10	0.31
Complexity	25.37 (3.2)*	26.54 (3.12)*	26.14 (2.98)	3.03	0.05*
Hyper-competitiveness	26.66 (5.9)*	27.58 (6.85)*	30.81 (6.53)*	11.21	0.00**

p* < 0.05; *p* < 0.01. The bold values are statistically significant values.

specific stressor. It consists of 33 items measured on a 3-point scale with three subscales of 11 items each.

Analysis Plan

First, we divided the participants into three groups based on the scores they reported on the SOGS (occasional gamblers: 0–2 points, problem gamblers: 3–4 points, pathological gamblers: from 5 points onward). Therefore, we conducted analyses of variance with *post hoc* tests. Subsequently, we conducted a linear regression in which we included hypercompetitiveness, self-efficacy, creativity (complexity + curiosity), and coping strategies as independent variables and the total mean scores that the participants reported on the SOGS as a dependent variable. In this way, we were able to test the risk and protective factors connected to gambling.

RESULTS

To evaluate any differences between groups of occasional gamblers, problem gamblers, and pathological gamblers, we conducted the ANOVA and *post hoc* comparisons (LSD) (Table 1). From the analyses, statistically significant differences emerged regarding coping avoidance strategies, $F(2, 272) = 5.81$, $p < 0.01$: the pathological gamblers scored higher [$M = 22.65$, $SD = 3.5$, MD (IJ) = 2.06, $p < 0.05$] than occasional gamblers [$M = 20.59$, $SD = 4.4$, MD (IJ) = -2.06 , $p < 0.05$]; hypercompetitiveness, $F(2, 272) = 11.21$, $p < 0.001$: pathological gamblers reported significantly higher scores [$M = 30.81$, $SD = 6.53$, MD (IJ) = 4.15, $p < 0.05$] than both occasional gamblers [$M = 26.66$, $SD = 5.9$, MD (IJ) = -4.15 , $p < 0.05$] and problem gamblers [$M = 27.58$, $SD = 6.86$, MD (IJ) = -3.23 , $p < 0.05$]. Finally, statistically significant differences emerged in relation to the complexity factor of creativity, $F(2, 271) = 3.03$, $p < 0.05$, where problem gamblers showed higher scores [$M = 26.54$, $SD = 3.12$, MD (IJ) = 1.17, $p < 0.05$] than occasional gamblers [$M = 25.37$, $SD = 3.2$, MD (IJ) = -1.17 , $p < 0.05$].

To further examine our data set, we conducted a linear regression model analysis to verify which variables among coping strategies, perceived social self-efficacy, creativity, and hyper-competitiveness were predictors of gambling. The model is significant, $F(2, 267) = 7.60$, $p < 0.001$, $R^2 = 15$) (Table 2). In particular, it suggested that the factors significantly connected to

TABLE 2 | Summary model with PG predictors.

Variables	β	SE	T	SIGN. (P)
Creativity (CU + CO)	0.03	0.021	0.51	0.60
Hyper-competitiveness	0.24	0.023	4.17	0.00***
Seeking social support	-0.09	0.03	-1.4	0.16
Problem-solving	0.04	0.03	0.55	0.58
Avoidance	0.15	0.04	2.30	0.02*
Self-efficacy	-0.12	0.02	-2.15	0.03*

p* < 0.05; *p* < 0.01; ****p* < 0.001. The bold values are statistically significant values.

gambling were high levels of avoidance coping strategy ($\beta = 0.13$, $SE = 0.04$, $p < 0.05$), high levels of the hypercompetitive attitude ($\beta = 0.24$, $SE = 0.023$, $p < 0.001$), and low levels of perceived social self-efficacy ($\beta = -0.12$, $SE = 0.02$, $p < 0.05$). Age was a control variable in this model without showing any significant effect.

DISCUSSION AND CONCLUSION

The aim of this exploratory study was to find a framework of defending and risking factors connected to the genesis of gambling in a sample of teenagers as well as to highlight the peculiarities of regular gamblers. From the analyses conducted on male adolescents involved in the study, it emerged that pathological gamblers manifest higher levels of coping avoidance strategies, especially in comparison with occasional gamblers. It is likely that an increase in gambling frequency would produce gamblers' troubles intensification, such as economic issues and relational and social problems, which cause the adolescent gambler's need to avoid and disregard those complications. Therefore, the use of avoidant coping strategies in pathological gamblers may signify efforts to fight off stressful events through disavowal (Gupta et al., 2004; Bergevin et al., 2006; Shead et al., 2010). Similarly, as they are now excessively involved in or even addicted to the compulsive behavior of gambling itself and because addictive behaviors affect social spheres and interpersonal relationships, pathological gamblers become at risk of social isolation, not considering the outside world as a resource to solve complex and problematic situations.

Moreover, our findings underline differences concerning occasional gamblers and problem gamblers regarding the “complexity” factor of the creative personality (Pascual-Leone et al., 2011). Adolescent problem gamblers scored higher than occasional gamblers on this adaptive factor, probably because they are not yet addicted to gambling. This result may be explicated by the fact that adolescents who are more creative and who like to solve tasks with complex scenarios are also those who are more likely to gamble, but only up to a certain level of risk. Moreover, what this finding likely shows is that problem gamblers perceive themselves as being more complex thinkers than occasional gamblers, in line with the fact that, in much research, PG has been found to be related to several cognitive illusions and distortions (e.g., Johansson et al., 2009; Passanisi et al., 2017).

This study also underlines pathological gamblers reporting higher levels of hypercompetitiveness than the other considered groups (Burger et al., 2006). In other words, these players, being now victims of the compulsive, unconstrained cycle of addictive behaviors (Perales et al., 2020), have developed a greater tendency to be hypercompetitive because, even unknowingly, they always want to have more, reach the maximum by challenging the group, thinking they are the best. Furthermore, according to Chantal et al. (1994), highly competitive persons are more intrinsically interested and more prone to use a greater emotional involvement and quantity of time in gambling actions than persons who are extrinsically motivated by money to engage in gambling behaviors. Thus, this excessive level of involvement between highly competitive people may result in a greater level of problem gambling.

In line with the literature, our finding underlines the strength of the model of joint risk and protective factors with a lack of perceived social self-efficacy (Jeong and Kim, 2011) and high levels of both coping avoidance (Bergevin et al., 2006) and hypercompetitiveness connected to gambling (Burger et al., 2006). Hypercompetitiveness may be considered a risk factor as it can cause the male teenager to implement an addictive behavior only to show others and himself that he is the strongest of the group, that he can take the risk, he can make it and win. Even if satisfying for the player, this can lead to the cycle of gambling addiction because the adolescent can easily lose contact with the reality of his possibilities. Further, poor perceived social self-efficacy can contribute to increasing the risk of PG because an adolescent who does not feel capable in his social skills might find the answer to his discomfort in the game. In this context, gambling becomes a maladaptive response to an adaptive need that is lacking. Finally, the excessive employment of an avoidance coping strategy, in accordance with massive research (Bergevin et al., 2006; Casey et al., 2017), may lead to an attitude of closure toward the outside world and to a socio-affective immaturity, resulting in regular gambling activities. Avoidance, a distinctive characteristic of addicted individuals (Verner-Filion et al., 2014), may make adolescents incapable of managing emotions at a social-cognitive level, consequently finding an apparent containment in gambling activities.

Although the study extends the reference literature, it must be considered in light of its limitations: First, the use of self-report questionnaires could provide information that is not pure because answers might be affected by social desirability. Future studies could, for instance, make use of structured interviews and other clinical measures.

Second, the present study did not consider the relevance of findings regarding impulsivity (e.g., Grant et al., 2016; Passanisi and Pace, 2017; Pace and Passanisi, 2018) and cognitive biases, for instance, magical thinking (Johansson et al., 2009; Passanisi et al., 2017), that also play a role in PG and that the authors as well as other scholars better explored in past research with a main focus on young adults and adolescents where gambling is usually not yet a structured disorder.

A third constraint is that the study was conducted among a male adolescent regular gambler sample, so generalizability of results is limited. Future studies may be conducted with female participants to test the present model on gambling behaviors with regard to the other gender.

Another limitation is the cross-sectional nature of the current research. Future research, indeed, could verify this model in a multi-time perspective as well as including family and social variables that can be configured as risk and/or protective factors for the etiology of gambling difficulties. Finally, a longitudinal perspective would enable a better exploration, through adolescent development, of the individual differences in terms of both cognitive and personality variables, mainly in adolescents at risk of behavioral addictions, such as regular gamblers, to inform good practice and prevention programs.

DATA AVAILABILITY STATEMENT

Any information about the data can be requested directly from the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Internal Review Board for Psychological Research of the UKE – Kore University of Enna. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AP made contributions to conception and design, gathered and analyzed the data, was involved in drafting the manuscript, revised it and approved the final version to be published. GD’U made analysis and interpretation of data and drafted the manuscript. AS revised the manuscript, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved. SR revised the manuscript and

agreed to be accountable for all aspects of the work. UP contributed to the first conception and design of the study, made analysis and interpretation of data, and drafted and revised the manuscript. All authors contributed to the article and approved the submitted version.

REFERENCES

- Abbott, M., Palmisano, B., and Dickerson, M. (1995). Video game playing, dependency and delinquency: a question of methodology? *J. Gambl. Stud.* 11, 287–301. doi: 10.1007/bf02104794
- Afifi, T. O., Brownridge, D. A., MacMillan, H., and Sareen, J. (2010). The relationship of gambling to intimate partner violence and child maltreatment in a nationally representative sample. *J. Psychiatr. Res.* 44, 331–337. doi: 10.1016/j.jpsychires.2009.07.010
- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*. Washington, DC: American Psychiatric Pub.
- Bandura, A., and Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *J. Pers. Soc. Psychol.* 45, 1017–1028. doi: 10.1037/0022-3514.45.5.1017
- Bastiani, L., Gori, M., Colasante, E., Siciliano, V., Capitanucci, D., Jarre, P., et al. (2013). Complex factors and behaviors in the gambling population of Italy. *J. Gambl. Stud.* 29, 1–13. doi: 10.1007/s10899-011-9283-8
- Bergevin, T., Gupta, R., Derevensky, J., and Kaufman, F. (2006). Adolescent gambling: understanding the role of stress and coping. *J. Gambl. Stud.* 22, 195–208. doi: 10.1007/s10899-006-9010-z
- Blaszczynski, A., and Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction* 97, 487–499. doi: 10.1046/j.1360-0443.2002.00015.x
- Burger, T. D., Dahlgren, D., and MacDonald, C. D. (2006). College students and gambling: an examination of gender differences in motivation for participation. *Coll. Stud. J.* 40, 704–715.
- Calado, F., Alexandre, J., and Griffiths, M. D. (2017). Prevalence of adolescent problem gambling: a systematic review of recent research. *J. Gamb. Stud.* 33, 397–424. doi: 10.1007/s10899-016-9627-5
- Casey, L. M., Oei, T. P., Raylu, N., Horrigan, K., Day, J., Ireland, M., et al. (2017). Internet-based delivery of cognitive behaviour therapy compared to monitoring, feedback and support for problem gambling: a randomised controlled trial. *J. Gamb. Stud.* 33, 993–1010. doi: 10.1007/s10899-016-9666-y
- Chantal, Y., Vallerand, R. J., and Vallieres, E. F. (1994). On the development and validation of the gambling motivation scale. *Soc. Leis.* 17, 189–212.
- Derevensky, J., Sklar, A., Gupta, R., and Messerlian, C. (2010). An empirical study examining the impact of gambling advertisements on adolescent gambling attitudes and behaviors. *Int. J. Mental Health Addict.* 8, 21–34. doi: 10.1007/s11469-009-9211-7
- Di Giunta, L., Eisenberg, N., Kupfer, A., Steca, P., Tramontano, C., and Caprara, G. V. (2010). Assessing perceived empathic and social self-efficacy across countries. *Eur. J. Psychol. Assess.* 26, 77–86. doi: 10.1027/1015-5759/a000012
- Dixon, R. W., Youssef, G. J., Hasking, P., Yücel, M., Jackson, A. C., and Dowling, N. A. (2016). The relationship between gambling attitudes, involvement, and problems in adolescence: Examining the moderating role of coping strategies and parenting styles. *Addict. Behav.* 58, 42–46. doi: 10.1016/j.addbeh.2016.02.011
- Ellenbogen, S., Derevensky, J., and Gupta, R. (2007). Gender differences among adolescents with gambling-related problems. *J. Gambl. Stud.* 23, 133–143. doi: 10.1007/s10899-006-9048-y
- Gardner, H. (1988). Creativity: an interdisciplinary perspective. *Creat. Res. J.* 1, 8–26. doi: 10.1080/10400418809534284
- Gecas, V. (1989). The social psychology of self-efficacy. *Ann. Rev. Sociol.* 15, 291–316.
- Grant, J. E., and Kim, S. W. (2005). Quality of life in kleptomania and pathological gambling. *Compr. Psychiatry* 46, 34–37. doi: 10.1016/j.comppsy.2004.07.022
- Grant, J. E., Odlaug, B. L., and Chamberlain, S. R. (2016). Neural and psychological underpinnings of gambling disorder: a review. *Prog. Neuropsychopharmacol. Biol. Psychiatry* 65, 188–193. doi: 10.1016/j.pnpbp.2015.10.007
- Guilford, J. P. (1950). Creativity. *Am. Psychol.* 5, 444–454.
- Guilford, J. P. (1967). *The Nature of Humane Intelligence*. New York, NY: McGraw-Hill.
- Gupta, R., Derevensky, J., and Marget, N. (2004). Coping strategies employed by adolescents with gambling problems. *Child Adolesc. Mental Health* 9, 115–120. doi: 10.1111/j.1475-3588.2004.00092.x
- Gupta, R., and Derevensky, J. L. (1998). An empirical examination of Jacobs' general theory of addictions: do adolescent gamblers fit the theory? *J. Gamb. Stud.* 14, 17–49.
- Gupta, R., and Derevensky, J. L. (2004). "A treatment approach for adolescents with gambling problems," in *Gambling Problems in Youth: Theoretical and Applied Perspectives*, eds J. Derevensky and R. Gupta (New York, NY: Kluwer Academic/Plenum Publishers), 165–188. doi: 10.1007/0-306-48586-9_9
- Gupta, R., Marget, N., and Derevensky, J. (2000). Adolescent problem gamblers: a preliminary analysis of their coping skills. *Paper presented at Annual Meeting of the Ontario Conference on Problem Gambling*, Niagara Falls, NY.
- Hyde, J., Hankins, M., Deale, A., and Marteau, T. M. (2008). Interventions to increase self-efficacy in the context of addiction behaviours: a systematic literature review. *J. Health Psychol.* 13, 607–623. doi: 10.1177/1359105308090933
- Jeong, E. J., and Kim, D. H. (2011). Social activities, self-efficacy, game attitudes, and game addiction. *Cyberpsychol. Behav. Soc. Network.* 14, 213–221. doi: 10.1089/cyber.2009.0289
- Johansson, A., Grant, J. E., Won, K. S., Odlaug, B. L., and Götestam, K. G. (2009). Risk factors for problematic gambling: a critical literature review. *J. Gamb. Stud.* 25:67. doi: 10.1007/s10899-008-9088-6
- Kardefelt-Winther, D., Heeren, A., Schimmenti, A., van Rooij, A., Maurage, P., Carras, M., et al. (2017). How can we conceptualize behavioural addiction without pathologizing common behaviours? *Addiction* 112, 1709–1715. doi: 10.1111/add.13763
- Kaur, I., Schutte, N. S., and Thorsteinsson, E. B. (2006). Gambling control self-efficacy as a mediator of the effects of low emotional intelligence on problem gambling. *J. Gamb. Stud.* 22, 405–411. doi: 10.1007/s10899-006-9029-1
- Ko, C. H., Yen, J. Y., Chen, C. C., Chen, S. H., and Yen, C. F. (2005). Gender differences and related factors affecting online gaming addiction among Taiwanese adolescents. *J. Nerv. Mental Dis.* 193, 273–277. doi: 10.1097/01.nmd.0000158373.85150.57
- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, T., and Scherlis, W. (1998). Internet paradox: a social technology that reduces social involvement and psychological well-being? *Am. Psychol.* 53, 1017–1031. doi: 10.1037/0003-066x.53.9.1017
- Lazarus, R. S. (1983). "The costs and benefits of denial," in *The Denial of Stress*, ed. S. Breznitz (New York, NY: International Universities Press), 1–30.
- Lesieur, H. R., and Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers. *Am. J. Psychiatry* 144, 1184–1188. doi: 10.1176/ajp.144.9.1184
- Marazziti, D., Picchetti, M., Baroni, S., Consoli, G., Ceresoli, D., Massimetti, G., et al. (2014). Pathological gambling and impulsivity: an Italian study. *Riv. Psichiatr.* 49, 95–99.
- Menesini, E., Tassi, F., and Nocentini, A. (2018). The competitive attitude scale CAS a multidimensional measure of competitiveness in adolescence. *J. Psychol. Clin. Psychiatry* 9, 240–244.
- Nigro, G. (1996). Coping strategies and anxiety in Italian adolescents. *Psychol. Rep.* 79, 835–839. doi: 10.2466/pr0.1996.79.3.835
- Nower, L., Gupta, R., Blaszczynski, A., and Derevensky, J. (2004). Suicidality and depression among youth gamblers: A preliminary examination of three studies. *Int. Gamb. Stud.* 4, 69–80. doi: 10.1080/1445979042000224412
- Pace, U., and Passanisi, A. (2018). Maladaptive personality traits and thinking styles among adolescent regular gamblers: a moderator mediation model. *Pers. Individ. Differ.* 132, 108–114. doi: 10.1016/j.paid.2018.05.030

ACKNOWLEDGMENTS

We are grateful to the students Erika Gelsomino, Federico Stissi, Miriam Galia, Riccardo Fiandaca, and Calogero Morreale for helping out with data collection.

- Pascual-Leone, A., Gomes, K., Orr, E. S., Kaploun, K. A., and Abeare, C. A. (2011). Affective and cognitive correlates of gambling behavior in university students. *J. Gamb. Stud.* 27, 401–408. doi: 10.1007/s10899-010-9226-9
- Passanisi, A., D'Urso, G., and Pace, U. (2019). The Interplay between maladaptive personality traits and mindfulness deficits among adolescent regular gamblers: a mediation model. *J. Gamb. Stud.* 35, 93–105. doi: 10.1007/s10899-018-9811-x
- Passanisi, A., and Pace, U. (2017). The unique and common contributions of impulsivity and decision-making strategies among young adult Italian regular gamblers. *Pers. Individ. Differ.* 105, 24–29. doi: 10.1016/j.paid.2016.09.029
- Passanisi, A., Pace, U., and Craparo, G. (2017). Magical thinking and decision-making strategies among late adolescent regular gamblers: a mediation model. *J. Adoles.* 59, 51–58. doi: 10.1016/j.adolescence.2017.05.016
- Perales, J. C., King, D. L., Navas, J. F., Schimmenti, A., Sescousse, G., Starcevic, V., et al. (2020). Learning to lose control: a process-based account of behavioral addiction. *Neurosci. Biobehav. Rev.* 108, 771–780. doi: 10.1016/j.neubiorev.2019.12.025
- Raylu, N., and Oei, T. P. (2002). Pathological gambling: a comprehensive review. *Clin. Psychol. Rev.* 22, 1009–1061.
- Roth, S., and Cohen, L. J. (1986). Approach, avoidance, and coping with stress. *Am. Psychol.* 41, 813–819. doi: 10.1037/0003-066x.41.7.813
- Ryckman, R. M., Libby, C. R., van den Borne, B., et al. (1997). Values of hypercompetitiveness and personal development competitive individuals. *J. Pers. Assess.* 69, 271–283. doi: 10.1207/s15327752jpa6902_2
- Sharpe, L., and Tarrier, N. (1993). Towards a cognitive-behavioral theory of problem gambling. *Br. J. Psychiatry* 162, 407–412. doi: 10.1192/bjp.162.3.407
- Shead, N. W., Derevensky, J. L., and Gupta, R. (2010). Risk and protective factors associated with youth problem gambling. *Int. J. Adoles. Med. Health* 22, 39–58.
- Sherer, M., and Adams, C. H. (1983). Construct validation of the self-efficacy scale. *Psychol. Rep.* 53, 899–902. doi: 10.2466/pr0.1983.53.3.899
- Smith, H. M., and Betz, N. E. (2000). Development and validation of a scale of perceived social self-efficacy. *J. Career Assess.* 8, 283–301. doi: 10.1177/106907270000800306
- Sylvain, C., Ladouceur, R., and Boisvert, J. M. (1997). Cognitive and behavioral treatment of pathological gambling: a controlled study. *J. Consult. Clin. Psychol.* 65, 727–732. doi: 10.1037/0022-006x.65.5.727
- Thombs, D. L., Olds, R. S., Bondy, S. J., Winchell, J., Baliunas, D., and Rehm, J. (2009). Undergraduate drinking and academic performance: a prospective investigation with objective measures. *J. Stud. Alcohol Drugs* 70, 776–785. doi: 10.15288/jsad.2009.70.776
- Verner-Filion, J., Vallerand, R. J., Donahue, E. G., Moreau, E., Martin, A., Mageau, G. A., et al. (2014). Passion, coping, and anxiety in sport: the interplay between key motivational and self-regulatory processes. *Int. J. Sport Psychol.* 45, 516–537.
- Walters, G. D. (1994). The gambling lifestyle: I. Theory. *J. Gamb. Stud.* 10, 159–182. doi: 10.1007/bf02109938
- Williams, F. (1994). *Test TDC: Test della creatività e del pensiero divergente. (Original Work Published 1993 as Creativity Assessment Packet. Austin, TX: PRO-ED).* Trento: Erickson.

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 Passanisi, D'Urso, Schimmenti, Ruggieri and Pace. 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 Correlative Study Between Personality Traits and the Preference of Site Selection in Cosmetic Treatment

Huan Qian¹, Yuxiao Ling², Chen Wang¹, Cameron Lenahan^{3,4}, Mengwen Zhang¹, Min Zheng^{5*} and Anwen Shao^{6*}

¹ Department of Plastic Surgery, The Second Affiliated Hospital, School of Medicine, Zhejiang University, Hangzhou, China, ² School of Public Health, Hangzhou Medical College, Hangzhou, China, ³ Center for Neuroscience Research, Loma Linda University School of Medicine, Loma Linda, CA, United States, ⁴ Burrell College of Osteopathic Medicine, Las Cruces, NM, United States, ⁵ Department of Dermatology, The Second Affiliated Hospital, School of Medicine, Zhejiang University, Hangzhou, China, ⁶ Department of Neurosurgery, The Second Affiliated Hospital, School of Medicine, Zhejiang University, Hangzhou, China

OPEN ACCESS

Edited by:

Alessia Passanisi,
Kore University of Enna, Italy

Reviewed by:

Ziqing Deng,
Beijing Genomics Institute (BGI), China
Jianming Zhu,
Second Affiliated Hospital of
Nanchang University, China

*Correspondence:

Anwen Shao
shaowanwen@zju.edu.cn
Min Zheng
minz@zju.edu.cn

Specialty section:

This article was submitted to
Psychopathology,
a section of the journal
Frontiers in Psychiatry

Received: 01 January 2021

Accepted: 26 April 2021

Published: 19 May 2021

Citation:

Qian H, Ling Y, Wang C, Lenahan C, Zhang M, Zheng M and Shao A (2021) A Correlative Study Between Personality Traits and the Preference of Site Selection in Cosmetic Treatment.
Front. Psychiatry 12:648751.
doi: 10.3389/fpsy.2021.648751

Background: Cosmetic treatment was closely associated with beauty seekers' psychological well-being. Patients who seek cosmetic surgery often show anxiety. Nevertheless, not much is known regarding how personality traits relate to the selection of body parts that receive cosmetic treatment.

Aims: This study aims to investigate the correlation between personality traits and various selection sites for cosmetic treatment via Eysenck Personality Questionnaire (EPQ).

Methods: A cross-sectional approach was adopted to randomly recruited patients from a general hospital planning to undergo cosmetic treatments. All respondents completed the EPQ and provided their demographic information. The EPQ involves four scales: the extraversion (E), neuroticism (N), psychoticism (P), and lying scales (L). Psychological scales were evaluated to verify that people who selected different body sites for cosmetic intervention possessed different personality portraits.

Results: A total of 426 patients with an average age of 32.14 ± 8.06 were enrolled. Among them, 384 were females, accounting for more than 90% of patients. Five treatment sites were analyzed, including the body, eye, face contour, nose, and skin. Comparatively, patients with neuroticism were more likely to undergo and demand rhinoplasty (OR 1.15, 95% CI 1.07–1.24, $P < 0.001$). Face contour treatment was commonly associated with extraversion (OR 1.05, 95% CI 1.00–1.11, $P = 0.044$), psychoticism (OR 1.13, CI 1.03–1.25, $P = 0.013$), and neuroticism (OR 1.05, CI 1.01–1.10, $P = 0.019$).

Conclusions: This novel study attempted to determine the personality profiles of beauty seekers. The corresponding assessments may provide references for clinical treatment options and enhance postoperative satisfaction for both practitioners and patients.

Keywords: personality traits, cosmetic, personality questionnaire, rating scale, surgery

INTRODUCTION

The pursuit of physical beauty is on the rise (1). Cosmetic treatment refers to modifications made to the human body's appearance in the absence of disease, injury, wound, congenital, or hereditary deformity, while also improving the quality of life (2). According to the American Society for Aesthetic Plastic Surgery (ASAPS), Americans splurged over \$15 billion on cosmetic procedures in 2016 (3). In 2018, the total number of surgical and non-surgical procedures surged to 21.5 and 30.5%, respectively, over the last 5 years (4). The International Society of Aesthetic Plastic Surgery (ISAPS) ranked China second in this specific growth trend (5). As the demand for aesthetic procedures grows, people wish to transform their physical appearance to improve their psychological profile and psychosocial well-being (6).

People undergoing plastic surgery are not traditional patients with physical health issues. Psychological factors greatly motivate them to pursue surgery. Previous studies pertaining to aesthetic psychology mainly focused on cosmetic patients suffering from mental illnesses. Body dysmorphic disorder (BDD) is among the three most common psychiatric disorders in cosmetic patients (7). BDD patients are especially sensitive to minor flaws in their appearance (8) and demonstrate a tendency for dissatisfaction with surgical outcomes (9). Another common observation by past studies is borderline personality disorder (BPD), which was linked to emotional imbalance, impulsiveness, and self-image issues (10). These patients relentlessly demand and seek cosmetic surgery for self-injury. Hence, surgical treatment is best avoided in these patients (11).

Personality disorders are founded on the scientific principles of personality traits (12). However, the normal personality profiles in an average population are underreported. Here, some personality aspects of the general population seeking cosmetic treatments are analyzed. Various reports were linked with neuroticism and negative personality aspects; neuroticism is the most common personality trait in rhinoplasty patients (13). Perception of attractiveness increase in these rhinoplasty patients, improving their evaluation of their own attractiveness (14). Neuroticism is closely related to depression as a stable and heritable personality trait (15). Depression was also commonly seen in patients seeking aesthetic therapies. For example, patients who received breast implants exhibited high rates of suicidal ideation (16). Conversely, in other patients, breast augmentation effectively improved one's self-assessment (17). The negative correlation between cosmetic improvement and the intention in surgery suggested that cosmetic treatment helps increase life satisfaction.

Personality is described as a way of perceiving and relating the environment to oneself, and is affected by both genetics and the acquired environment. Relevant aspects of personality exist in a wide range of contexts, and are relatively stable over time (18). According to Eysenck, personality encompasses three major dimensions. Extraversion refers to sociability, vivacity, enthusiasm, and impulsivity. Neuroticism epitomizes depression, anxiousness, and emotional instability. Psychoticism signifies solitude, coldness, aggressiveness, and egocentricity (19).

There exists an inadequate number of reports concerning the assessment of personality traits in patients prior to undergoing cosmetic procedures. Participants possessing psychopathological traits in the cosmetic industry were lower than expected, and their levels of anxiety did not cause dysfunction (20). Integral personality scales have rarely been applied to elucidate aesthetic orientation. How can we provide treatment options that match one's personality?

It is necessary to explore the association between personality profiles and the decision made in undergoing cosmetic treatment. Differences in personality lead to diverse choices, which are significant references for doctors and beauty seekers regarding recovery period, postoperative expectations, and design of the operation. Moreover, compared to the widely consumption beauty markets, cosmetology psychology in China is still in its infancy. In terms of plastic surgery, this study is the first to conduct personality questionnaires. It is hypothesized that different personality traits will influence the selection of treatment sites. This study may also assist in the clarification of psychological profiles, how they relate to an individuals' aesthetic tendency, and may contribute to optimal outcomes in therapy.

MATERIALS AND METHODS

Participants

This was an observational cross-sectional study conducted at the Second Affiliated Hospital of Zhejiang University between September 1 and December 6, 2019. The inclusion criteria were: (1) participants were capable of filling out questionnaires independently; (2) participants demonstrated physical fitness without evidence of deformities, scars, or severe systemic diseases. Participants completed a demographic self-questionnaire with their name, gender, age, height, weight, income, marital status, education, smoking and drinking history, sleep duration, type of cosmetic treatment, and psychological scales. A total of 473 patients were investigated by random sampling. Finally, 426 questionnaires were included in the analysis, excluding questionnaires that rejected the survey, provided incomplete questionnaire information or untrue information.

The study was approved by the hospital Ethics Committee. All patients were informed of the objectives of the study, and they provided their informed consent.

We use the term "cosmetic treatment," which is inclusive of surgeries (e.g., blepharoplasty, rhinoplasty, and liposuction) and non-surgical treatments (e.g., Botulinum toxin or filler injections and lasers).

Measures

The EPQ (an 88-item self-reporting scale revised in China) was utilized in this study due to its excellent reliability and validity, which involves four scales: the extraversion (E), neuroticism (N), psychoticism (P) and lying scales (L). The higher the score, the more likely the personality traits listed in the scale are shown.

Based on the total score that each participant received in each scale, the standard score [$T = 50 + 10 \cdot (X - M) / SD$] was obtained by conversion. M and SD refer to the mean

and standard deviation of the original scores achieved by the normal groups, respectively. Depending on the levels of the internal and external propensity scales and the neuroticism scale, the participants in the study were split into four classic temperaments: sanguineous (extroverted, stable), choleric (extroverted, unstable), phlegmatic (introverted, stable), and melancholic (introverted, unstable) (19).

Statistical Analysis

Based on the statistics from 2000 (21), the average normal population in each dimension was calculated using the total scores of males and females in each dimension (number*mean) divided by the total number of participants. Participants who had or were predisposed to cosmetic treatment were considered the case group, with the remainder being the control group.

The data were input into Epidata 3.1 software, and Stata 15.1 was used for statistical analysis. All EPQ scores and demographic data were analyzed using descriptive statistics. Age, body mass index (BMI), sleep duration, and EPQ scores were regarded as continuous variables, whereas the cosmetic treatment tendency, results, and demographic parameters were considered categorical variables. The continuous variables were indicated by their mean and standard deviation (SD), and categorical variables were expressed as numbers (*N*) and percentages (%). A One-sample *t*-test was conducted to analyze the differences in EPQ scores at different sites. Moreover, a binary logistic regression analysis was conducted to investigate the correlation between EPQ scores at different sites and the demographic variables. $P < 0.05$ was regarded as being statistically significant.

RESULTS

The general information of all participants is presented in **Table 1**. There were 426 eligible patients included in this study, which was comprised of 384 (90.14%) females and 42 (9.86%) males. The age of the sample group ranged from 17 to 64.5 years (Mean = 32.14, SD = 8.06). Additionally, 310 (72.77%) participants possessed a bachelor's degree or higher, and 213 (50%) were married. Over 60% of participants exhibited a BMI within the normal range.

Of the 426 participants, the preferred treatment sites were the skin, eyes (including eyebrows and lacrimal sulcus area), nose, face contour, and body (including breasts, abdomen, leg, shoulder, and labia minora). Cosmetic treatments involved laser rejuvenation, blepharoplasty, rhinoplasty, breast augmentation, chin augmentation, liposuction, botulinum toxin, or filler injections.

The mean and standard deviation values of the E score reached 11.48 ± 3.34 , P score of 4.80 ± 2.32 , N score of 11.39 ± 5.63 , and L score of 11.67 ± 3.40 , as shown in **Table 1** and **Figure 1** indicates the EPQ scores for participants with or without cosmetic treatment according to treatment sites. In the general population, the average of E was 11.50, while the averages of P, N, and L were 5.67, 10.88, and 12.56, respectively (21). Comparatively, three of the scales (E, P, and L) scored lower than the normal average, but N was higher than the normal average. As for L, lying signifies unsophisticated dissimulation,

TABLE 1 | General information of the participants included ($n = 426$).

Characteristics	Means or proportions
Age (years, mean \pm SD)	32.14 \pm 8.06
Gender, <i>n</i> (%)	
Male	42 (9.86)
Female	384 (90.14)
Education, <i>n</i> (%)	
Bachelor degree or below	116 (27.23)
Bachelor degree or above	310 (72.77)
BMI, <i>n</i> (%)	
<18.5	108 (25.35)
18.5–24	288 (67.61)
≥ 24	30 (7.04)
Marital, <i>n</i> (%)	
Single	213 (50)
Married	213 (50)
Income, <i>n</i> (%)	
Stable	128 (30.05)
Unstable	298 (69.95)
Smoke, <i>n</i> (%)	
Current/ever	26 (6.10)
Never	400 (93.90)
Drink, <i>n</i> (%)	
Current/ever	44 (10.33)
Never	382 (89.67)
Sleep duration, <i>n</i> (%)	
<7 h	51 (11.97)
7–8 h	174 (40.85)
≥ 8 h	201 (47.18)
Eysenck Personality Scale, mean \pm SD	
E score	11.48 \pm 3.34
P score	4.80 \pm 2.32
N score	11.39 \pm 5.63
L score	11.67 \pm 3.40
Sites, <i>n</i> (%)	
Skin	189 (44.37)
Nose	36 (8.45)
Face contour	119 (27.93)
Eye	103 (24.18)
Body	41 (9.62)

E, extraversion; N, neuroticism; P, psychoticism; L, lying.

where participants scored lower than those in the normal population. A difference was found between participants with or without face contours in psychoticism (P for heterogeneity = 0.002). Moreover, there were significant differences regarding site location and neuroticism, such as in the eye ($P = 0.045$), face contour ($P = 0.002$), nose ($P < 0.001$), or skin ($P = 0.004$).

The association between the choice of cosmetic site and the EPQ scores for participants choosing to undergo treatment is depicted in **Table 2**. The model was adjusted with respect to age, gender, BMI, education, marital status, incomes, smoking and drinking history, and sleep duration. A statistically negative association was observed between skin treatment and N score

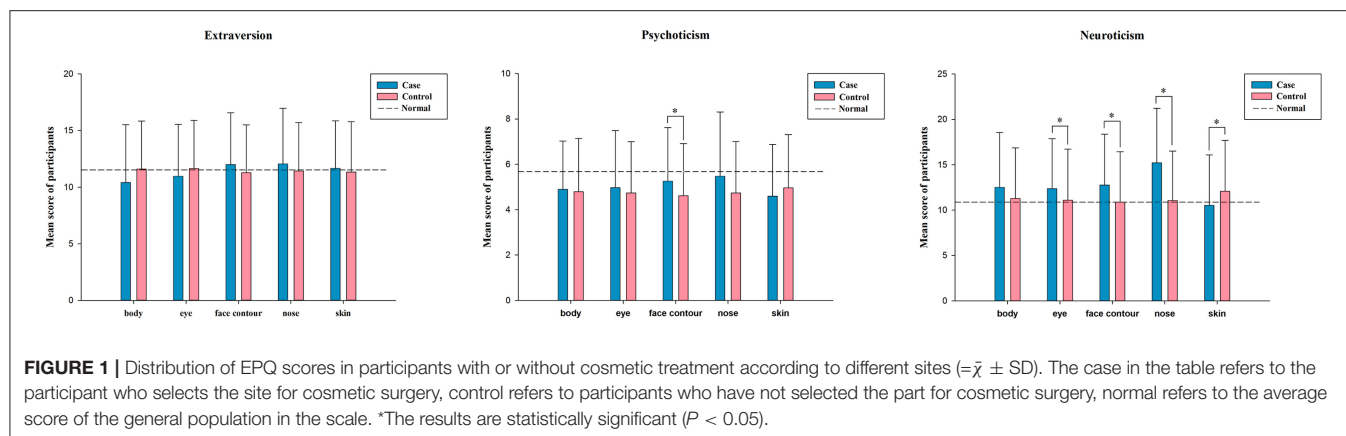


FIGURE 1 | Distribution of EPQ scores in participants with or without cosmetic treatment according to different sites ($=\bar{x} \pm SD$). The case in the table refers to the participant who selects the site for cosmetic surgery, control refers to participants who have not selected the part for cosmetic surgery, normal refers to the average score of the general population in the scale. *The results are statistically significant ($P < 0.05$).

TABLE 2 | Association between cosmetic surgery choice and EPQ scores in participants according to different sites ($n = 426$).

	Skin		Nose		Face contour		Eye		Body	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
E score	1.02 (0.98, 1.07)	0.370	1.01 (0.92, 1.10)	0.863	1.05 (1.00, 1.11)	0.044	0.95 (0.90, 1.01)	0.076	0.94 (0.87, 1.02)	0.131
P score	0.95 (0.87, 1.04)	0.285	1.11 (0.95, 1.29)	0.184	1.13 (1.03, 1.25)	0.013	1.03 (0.93, 1.14)	0.575	1.03 (0.89, 1.19)	0.717
N score	0.96 (0.92, 1.00)	0.031	1.15 (1.07, 1.24)	<0.001	1.05 (1.01, 1.10)	0.019	1.04 (1.00, 1.09)	0.068	1.05 (0.98, 1.12)	0.143
Phlegmatic	0.89 (0.19, 4.24)	0.888	—	—	—	—	2.40 (0.50, 11.46)	0.272	—	—
Melancholic	0.76 (0.46, 1.27)	0.301	1.62 (0.68, 3.87)	0.276	0.88 (0.51, 1.55)	0.668	1.26 (0.71, 2.24)	0.432	2.49 (1.21, 5.12)	0.013
Sanguineous	1.60 (0.80, 3.20)	0.186	1.03 (0.28, 3.78)	0.961	0.67 (0.27, 1.62)	0.371	0.55 (0.22, 1.39)	0.206	0.88 (0.25, 3.08)	0.840
Choleric	1.02 (0.66, 1.57)	0.924	0.74 (0.34, 1.61)	0.445	1.40 (0.85, 2.32)	0.185	0.95 (0.57, 1.57)	0.846	0.53 (0.27, 1.05)	0.067

OR, odds ratio; CI, confidence interval; E, extraversion; P, psychoticism; N, neuroticism.

Logistic regression adjusted for age, gender, BMI, education, marital status, income, smoking, drinking and sleep duration.

The values in bold mean that the results are statistically significant ($P < 0.05$).

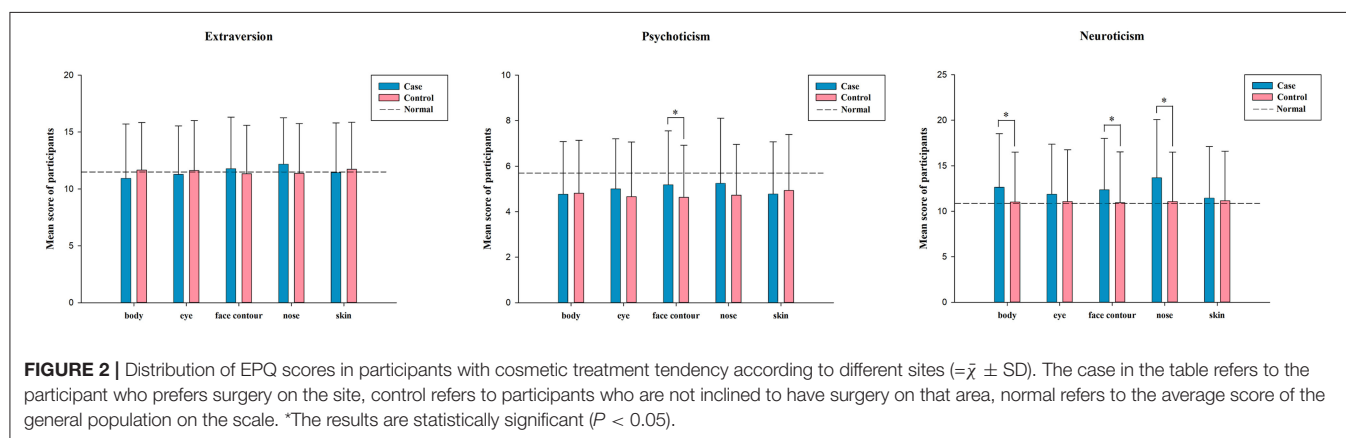


FIGURE 2 | Distribution of EPQ scores in participants with cosmetic treatment tendency according to different sites ($=\bar{x} \pm SD$). The case in the table refers to the participant who prefers surgery on the site, control refers to participants who are not inclined to have surgery on that area, normal refers to the average score of the general population on the scale. *The results are statistically significant ($P < 0.05$).

risk (OR 0.96, 95% CI 0.92–1.00, $P = 0.031$). Those in the skin treatment group, which serves as an option in conventional medical rejuvenation, demonstrated lower levels of anxiety. A significant positive association was observed between cosmetic treatments performed on nose and N score risk (OR 1.15, 95% CI 1.07–1.24, $P < 0.001$), and a positive association was identified between face contour treatment and E, P, and N scores (OR 1.05, 95% CI 1.00–1.11, $P = 0.044$; OR 1.13, CI 1.03–1.25, $P = 0.013$; OR 1.05, CI 1.01–1.10, $P = 0.019$). In addition,

regarding the four personality portraits, melancholic personality demonstrated a positive association with body treatment risk (OR 2.49, CI 1.21–5.12, $P = 0.013$). However, other personality traits were not statistically significant with respect to the choice in treatment sites.

The distribution of EPQ scores for participants with a tendency to receive cosmetic treatment according to different sites on their body is illustrated in **Figure 2**. This tendency suggests that participants wanted to achieve

TABLE 3 | Association between cosmetic surgery tendency and EPQ scores in participants according to different sites ($n = 426$).

	Skin		Nose		Face contour		Eye		Body	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
E score	0.98 (0.92, 1.04)	0.452	1.03 (0.96, 1.11)	0.403	1.03 (0.98, 1.08)	0.241	0.98 (0.93, 1.02)	0.328	0.96 (0.91, 1.01)	0.135
P score	0.97 (0.87, 1.09)	0.663	1.06 (0.93, 1.20)	0.408	1.09 (0.99, 1.20)	0.067	1.10 (1.00, 1.20)	0.046	0.98 (0.89, 1.09)	0.770
N score	1.02 (0.97, 1.07)	0.534	1.07 (1.01, 1.14)	0.018	1.03 (0.99, 1.07)	0.212	1.04 (1.00, 1.08)	0.035	1.06 (1.01, 1.10)	0.018
Phlegmatic	–		1.42 (0.15, 13.39)	0.760	1.16 (0.20, 6.62)	0.865	1.02 (0.22, 4.81)	0.982	1.51 (0.27, 8.50)	0.638
Melancholic	1.23 (0.62, 2.44)	0.562	0.58 (0.25, 1.39)	0.224	0.92 (0.53, 1.58)	0.761	1.15 (0.70, 1.91)	0.578	1.46 (0.83, 2.55)	0.188
Sanguineous	0.87 (0.36, 2.13)	0.766	1.43 (0.51, 4.03)	0.499	0.84 (0.37, 1.90)	0.670	0.60 (0.29, 1.23)	0.161	0.65 (0.26, 1.63)	0.356
Choleric	0.81 (0.45, 1.44)	0.470	1.23 (0.62, 2.47)	0.554	1.12 (0.70, 1.81)	0.634	1.09 (0.71, 1.69)	0.687	0.83 (0.50, 1.37)	0.473

OR, odds ratio; CI, confidence interval; E, extraversion; P, psychoticism; N, neuroticism.

Logistic regression adjusted for age, gender, BMI, education, marital status, income, smoking, drinking and sleep duration.

The values in bold mean that the results are statistically significant ($P < 0.05$).

cosmetic transformation, but had yet to undergo an operation. Statistics showed that neuroticism held the highest mean EQP score, while psychoticism had the lowest mean score for different sites. A difference was discovered between the groups which with or without face contour treatment tendencies in those with psychoticism ($P = 0.022$). Additionally, there were significant differences existing in patients with neuroticism regarding body ($P = 0.010$), face contour ($P = 0.017$), or nose ($P = 0.001$) cosmetic treatment tendencies.

As shown in **Table 3**, an association is evident between the cosmetic treatment tendency and EPQ scores according to various sites. In terms of treatment tendency of cosmetic, the participants who preferred cosmetic surgery on nose (OR 1.07, CI 1.01–1.14, $P = 0.018$), eyes (OR 1.04, CI 1.00–1.08, $P = 0.035$) or body (OR 1.06, CI 1.01–1.10, $P = 0.018$) site had statistical difference in N score. Moreover, the tendency of eye surgery showed an association with the P score (OR 1.10, CI 1.00–1.20, $P = 0.046$). No significant differences were observed between the other scores and the four personality traits at different sites.

DISCUSSION

To our knowledge, this is the first study employing EPQ to assist with the psychometric analysis of cosmetic treatment. Participant profiles were predominantly young females with a high level of education, healthy lifestyle, and insecure incomes. These findings were consistent with Wei's study in regard to the general information (22). In their study, young women were the main patients, including some high school and college students. Women were more dissatisfied with their body compared to men (23). With the change in aesthetics and the influence of social media, women pay more attention to their personal appearance, physical dissatisfaction may have a negative impact on the patient's self-image, social status, employability and interpersonal relationships (24). Health conditions and depression also participate in encouraging people to have cosmetic surgery (25, 26). Additionally, public perception of cosmetic surgery has also changed as more people have become educated (1).

Further studies have found that psychological factors, such as the pursuit of beauty and body satisfaction have a greater impact on cosmetic surgery patients than social factors, like having higher social standing and building good interpersonal relationships (27). We investigated the psychological characteristics to determine the treatment preferences of different groups in hopes of achieving improved treatment effects and outcomes.

The most popular surgical sites were the skin, face contour, and eyes in our study, which align with other findings (28). Patients <20-year-old were likely to choose minor interventions, such as skin treatment, while those over 45 preferred rejuvenation procedures (29). Moreover, as Chinese are more conservative regarding aesthetics, indications for surgery are also more conservative than in other countries (30), breast augmentation is less considered. In view of treatment choices, participants showed a distinguished personality profile. First, the inward- and outward-leaning personality types are the most prominent psychological types proposed by Carl Jung. This dimension relates to the intensity of excitability and inhibition of the central nervous system. Extroverts tend to have additional social needs, seek more social interaction and value their appearance to gain energy from their environment (31). Hence, they may be more motivated to attain beauty through medical procedures. Second, neuroticism was the most common psychological trait motivating patients to undergo cosmetic surgery on the nose, eyes, and other body parts (e.g., breast, legs and shoulders). Neuroticism may be represented by depression, anxiety, and emotional instability. Patients manifesting depressive symptoms often possess lower levels of self-esteem (32). They expect to achieve their desired body image and hope to reduce their anguish and dissatisfaction. Third, patients with a high degree of psychoticism scores have a potential psychopathological-associated personality trait. They are likely to feel lonely and ignore others, and they tend to exhibit peculiar behavior like suicide while disregarding danger (33). Therefore, when they consider undergoing plastic surgery, they may ignore the risks.

Among the patients who have undergone plastic surgery, neuroticism scores for the nose were the highest, which

referred to its susceptibility for negative impacts, such as negative emotions (34). A high level of consistency was present where neurotic patients demonstrated interest in having nose treatments and followed through with receiving a rhinoplasty. According to Brucoli, rhinoseptoplasty patients are characterized by anxiety, depression, and less pronounced passivity, but exhibit higher levels of self-esteem (35). Patients who sought rhinoplasty for aesthetic motivations felt more depressed than those seeking functional rhinoplasty (36). In addition, obsessiveness and narcissism were detected in patients seeking rhinoplasty (13, 37). The human nose is considered the most prominent midline projection of the face (38), and is considered the most noticeable and concerning site regarding one's personal characteristics. Moreover, congenital defects or aesthetic needs of the nose may lead to dissatisfaction and negative long-term effects on self-esteem. Low levels of self-acceptance confer significant impacts on psychological resilience by causing anxiety and depression. This study confirmed the presence of a significant difference in the N score, which shows that the most attention was given to the nose. Patients who were satisfied with their rhinoplasty outcomes found that the procedure helped improve their body image and quality of life while boosting their self-confidence and self-esteem (39).

However, in those repeatedly dissatisfied with their surgical outcomes, consideration should be given to BDD patients (9). Identifying BPD patients or even those with psychotic personalities is necessary, as they may frequently demand treatments for multiple sites (11). They figuratively choose to attack the most prominent part of the face to alleviate the discomfort caused by their personality disorder. The EPQ questionnaire is limited to a screening questionnaire. Consideration can be given to the Adverse Childhood Experiences questionnaire and the Structured Interview of Personality Organization (STIPO) to carry out a more comprehensive screening.

Facial contour adjustment was indicative of extraversion, psychoticism, and neuroticism. Furthermore, the score of EPQ was higher than the control group. In previous studies, similar results were obtained. Participants with experience in masseter injections or mandibular therapies scored high in extraversion, agreeableness, openness, and neuroticism (40). These traits were often reflected in behavior rather than in psychoticism (37). Essentially, they resorted to cosmetic treatments due to a lack of confidence, which was associated with specific physical defects and the desire to socialize (41). In addition, the contour of the mandibular angle was significant to the facial shape of Asian women, who believe that women with wide and square faces were more likely to be unhappy (42). Therefore, these patients are obsessed with having oval shaped faces, smooth tapered jaws, and round, pointy chins following treatment (43).

In this study, participants who underwent treatment on certain body parts showed melancholic personality traits. Evidence showed that participants shifted from substantially alleviated depression following treatment, and from self-loathing to self-appreciation, illustrating an improved outlook on life (44). Certain depressed patients shown

psychosomatic manifestations, and they improved their self-esteem and depressive symptoms following cosmetic surgery (45).

Regarding the tendencies for cosmetic treatment, a significant difference existed in the N score of the treatment of body sites, which is likely delayed in actuality. For example, liposuction or breast augmentation may carry high risks and a lengthy recovery. Interestingly, the human eye is another focus on the face, indicating the personality traits of neuroticism and psychoticism as well. However, the eyes can be refined by the use of cosmetics, glasses, and other modifications. Therefore, no significant difference was observed in our final results.

Our study contains several limitations. First, the majority of participants were located in east China, which may cause selection bias. Second, male data ($n = 42$) was inadequate in comparison with that of females. Third, the EPQ self-reporting scale is the most commonly conducted personality test in China due to its convenient implementation. It reflects a relatively limited range of personality types, making it difficult to conduct a more precise personality assessment. The different dimensions of the personality questionnaire should be further expanded, such as the Cattell Sixteen Personality Factor or the Big Five Personality Inventory. Despite these limitations, this study's findings highlight the impact of personality traits on different sites of cosmetic surgeries. In the future, postoperative satisfaction should be assessed, and more screening procedures should be designed for clinical intervention to avoid unnecessary surgeries.

CONCLUSION

The personality profile of participants receiving cosmetic treatment was more depression, anxiety, emotional instability and non-sophisticated. Different personality traits influence the site selection for cosmetic therapy. Physicians should consider neuroticism in patients seeking rhinoplasty. If experienced surgeons identify personality traits prior to undergoing cosmetic surgery, patients may benefit from better rehabilitation and increased satisfaction.

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 and Research Ethics committees of the Second Hospital of Zhejiang University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin. Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication

of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

AS and MZhe: conceptualization and methodology. HQ: writing- original draft preparation. YL: formal analysis. MZha: data curation. CW: investigation. CL: review and editing. All authors contributed to the article and approved the submitted version.

REFERENCES

- Haas CF, Champion A, Secor D. Motivating factors for seeking cosmetic surgery: a synthesis of the literature. *Plast Surg Nurs.* (2008) 28:177–82. doi: 10.1097/PSN.0b013e31818ea832
- Breuning EE, Oikonomou D, Singh P, Rai JK, Mendonca DA. Cosmetic surgery in the NHS: applying local and national guidelines. *J Plast Reconstr Aesthet Surg.* (2010) 63:1437–42. doi: 10.1016/j.bjps.2009.08.012
- The American Society for Aesthetic Plastic Surgery. The American Society for Aesthetic Plastic Surgery's Cosmetic Surgery National Data Bank: Statistics 2016. *Aesthet Surg J.* (2016) 39:1–27.
- American Society for Aesthetic Plastic Surgery. The American Society for Aesthetic Plastic Surgery's Cosmetic Surgery National Data Bank: Statistics 2018. *Aesthet Surg J.* (2019) 39(Suppl_4):1–27. doi: 10.1093/asj/sjz164
- Qing ke Research Center. Retrieved from: www.pedata.cn (accessed April 14, 2021).
- Spataro EA, Kandathil CK, Saltychev M, Olds CE, Most SP. Correlation of the standardized cosmesis health nasal outcomes survey with psychiatric screening tools. *Aesthet Surg J.* (2020) 40:1373–80. doi: 10.1093/asj/sjaa004
- Shridharani SM, Magarakis M, Manson PN, Rodriguez ED. Psychology of plastic and reconstructive surgery: a systematic clinical review. *Plast Reconstr Surg.* (2010) 126:2243–51. doi: 10.1097/PRS.0b013e3181f445ae
- Kuhn H, Cunha PR, Matthews NH, Kroumpouzos G. Body dysmorphic disorder in the cosmetic practice. *Ital Dermatol Venerol.* (2018) 153:506–15.
- Wang Q, Cao C, Guo R, Li X, Lu L, Wang W, et al. Avoiding psychological pitfalls in aesthetic medical procedures. *Aesthetic Plast Surg.* (2016) 40:954–61. doi: 10.1007/s00266-016-0715-9
- Lieb K, Zanarini MC, Schmahl C, Linehan MM, Bohus M. Borderline personality disorder. *Lancet.* (2004) 364:453–61. doi: 10.1016/S0140-6736(04)16770-6
- Morioka D, Ohkubo F. Borderline personality disorder and aesthetic plastic surgery. *Aesthetic Plast Surg.* (2014) 38:1169–76. doi: 10.1007/s00266-014-0396-1
- Lilienfeld SO. Longitudinal studies of personality disorders: four lessons from personality psychology. *J Pers Disord.* (2005) 19:547–56; discussion 594–46. doi: 10.1521/pedi.2005.19.5.547
- Zojaji R, Arshadi HR, Keshavarz M, Mazloun Farsibaf M, Golzari F, Khorashadizadeh M. Personality characteristics of patients seeking cosmetic rhinoplasty. *Aesthetic Plast Surg.* (2014) 38:1090–3. doi: 10.1007/s00266-014-0402-7
- Parsa KM, Gao W, Lally J, Davison SP, Reilly MJ. Evaluation of personality perception in men before and after facial cosmetic surgery. *JAMA Facial Plast Surg.* (2019) 21:369–74. doi: 10.1001/jamafacial.2019.0463
- Li JJ, Hilton EC, Lu Q, Hong J, Greenberg JS, Mailick MR. Validating psychosocial pathways of risk between neuroticism and late life depression using a polygenic score approach. *J Abnorm Psychol.* (2019) 128:200–11. doi: 10.1037/abn0000419
- de Paula PR, Fortes de Arruda FC, Prado M, Neves CG. Prevalence of depressive symptoms in patients requesting cosmetic breast surgery in midwestern Brazil. *Plast Reconstr Surg Glob Open.* (2018) 6:e1899. doi: 10.1097/GOX.0000000000001899
- Rzepa T, Grzesiak W, Zaborski D, Modrzejewski A, Pastucha M. Physical attractiveness and self-assessment before and after breast augmentation.

FUNDING

This work was funded by Zhejiang Provincial Natural Science Foundation of China (LGD21H150001).

ACKNOWLEDGMENTS

We acknowledge the contribution of participating patients and medical students for data collection. Furthermore, we gratefully thank Dr. Li Yingjun for contribution in statistics.

- Ann Plast Surg.* (2014) 72:618–24. doi: 10.1097/SAP.0b013e31826aeffe
- Battle DE. Diagnostic and statistical manual of mental disorders (DSM). *Codas.* (2013) 25:191–2. doi: 10.1590/s2317-17822013000200017
- Gong L, Dong JY. Patient's personality predicts recovery after total knee arthroplasty: a retrospective study. *J Orthop Sci.* (2014) 19:263–9. doi: 10.1007/s00776-013-0505-z
- Del Aguila E, Martinez JR, Pablos JL, Huanuco M, Encina VM, Rhenals AL. Personality traits, anxiety, and self-esteem in patients seeking cosmetic surgery in Mexico City. *Plast Reconstr Surg Glob Open.* (2019) 7:e2381. doi: 10.1097/GOX.0000000000002381
- Lyu Y. *Study on the Reliability and Validity of the Second Eysenck Personality Questionnaire* (master). Changsha: Cnki; Central South University (in Chinese) (2008).
- Wei L, Ge C, Xiao W, Zhang X, Xu J. Cross-sectional investigation and analysis of anxiety and depression in preoperative patients in the outpatient department of aesthetic plastic surgery in a general hospital in China. *J Plast Reconstr Aesthet Surg.* (2018) 71:1539–46. doi: 10.1016/j.bjps.2018.07.015
- Quittkat HL, Hartmann AS, Dusing R, Buhlmann U, Vocks S. Body dissatisfaction, importance of appearance, and body appreciation in men and women over the lifespan. *Front Psychiatry.* (2019) 10:864. doi: 10.3389/fpsy.2019.00864
- Hekmatpanah J. Evidence-based treatment of cavernous sinus meningioma. *Surg Neurol Int.* (2019) 10:228. doi: 10.25259/SNI_268_2019
- Nerini A, Matera C, Stefanile C. Psychosocial predictors in consideration of cosmetic surgery among women. *Aesthetic Plast Surg.* (2014) 38:461–6. doi: 10.1007/s00266-014-0294-6
- Cheraghian B, Fereidooni-Moghadam M, Babadi H, Dashtbozorgi B. Psychological and personality characteristics of applicants for facial cosmetic surgery. *Aesthetic Plast Surg.* (2020) 44:780–7. doi: 10.1007/s00266-020-01682-6
- Babadi H, Fereidooni-Moghadam M, Dashtbozorgi B, Cheraghian B. Investigating psychosocial causes of the tendency for facial cosmetic surgery. *Aesthetic Plast Surg.* (2018) 42:1157–63. doi: 10.1007/s00266-018-1078-1
- Javo IM, Sorlie T. Psychosocial characteristics of young Norwegian women interested in liposuction, breast augmentation, rhinoplasty, and abdominoplasty: a population-based study. *Plast Reconstr Surg.* (2010) 125:1536–43. doi: 10.1097/PRS.0b013e3181d5135a
- Rini IS, Krisna MA, Basuki A, Djarot KR. The characteristics of private plastic surgery practice in developing country: an epidemiological study. *Indian J Plast Surg.* (2018) 51:309–15. doi: 10.4103/ijps.IJPS_11_18
- Luo CX, Wen ZH, Zhen Y, Wang ZJ, Mu JX, Zhu M, et al. Chinese research into severe ulcerative colitis has increased in quantity and complexity. *World J Clin Cases.* (2018) 6:35–43. doi: 10.12998/wjcc.v6.i3.35
- Rodriguez-Enriquez M, Bennasar-Veny M, Leiva A, Yanez AM. Alcohol and tobacco consumption, personality, and cybervictimization among adolescents. *Int J Environ Res Public Health.* (2019) 16:3123. doi: 10.3390/ijerph16173123
- Sertoz OO, Doganavsargil O, Elbi H. Body image and self-esteem in somatizing patients. *Psychiatry Clin Neurosci.* (2009) 63:508–15. doi: 10.1111/j.1440-1819.2009.01994.x
- Fonseca-Pedrero E, Ortuno-Sierra J, Inchausti F, Rodriguez-Testal JE, Debbane M. Beyond clinical high-risk state for psychosis: the network

- structure of multidimensional psychosis liability in adolescents. *Front Psychiatry*. (2019) 10:967. doi: 10.3389/fpsy.2019.00967
34. Klammer S, Schwarz L, Kruger O, Koch K, Erb M, Scheffler K, et al. Association between neuroticism and emotional face processing. *Sci Rep*. (2017) 7:17669. doi: 10.1038/s41598-017-17706-2
 35. Brucoli M, Baena RRY, Boffano P, Benech A. Psychological profiles in patients undergoing orthognathic surgery or rhinoplasty: a preoperative and preliminary comparison. *Oral Maxillofac Surg*. (2019) 23:179–86. doi: 10.1007/s10006-019-00758-1
 36. Naraghi M, Atari M. A comparison of depression scores between aesthetic and functional rhinoplasty patients. *Asian J Psychiatr*. (2015) 14:28–30. doi: 10.1016/j.ajp.2015.01.009
 37. Zojaji R, Javanbakht M, Ghanadan A, Hosien H, Sadeghi H. High prevalence of personality abnormalities in patients seeking rhinoplasty. *Otolaryngol Head Neck Surg*. (2007) 137:83–7. doi: 10.1016/j.otohns.2007.02.027
 38. Wright MR. The psychology of rhinoplasty. *Facial Plast Surg*. (1988) 5:109–13. doi: 10.1055/s-2008-1064743
 39. Borujeni LA, Pourmotabed S, Abdoli Z, Ghaderi H, Mahmoodnia L, Sedehi M, et al. A comparative analysis of patients' quality of life, body image and self-confidence before and after aesthetic rhinoplasty surgery. *Aesthetic Plast Surg*. (2020) 44:483–90. doi: 10.1007/s00266-019-01559-3
 40. Scharschmidt D, Mirastschijski U, Preiss S, Brahler E, Fischer T, Borkenhagen A. Body image, personality traits, and quality of life in botulinum toxin A and dermal filler patients. *Aesthetic Plast Surg*. (2018) 42:1119–25. doi: 10.1007/s00266-018-1165-3
 41. Meningaud JP, Benadiba L, Servant JM, Herve C, Bertrand JC, Pelicier Y. Depression, anxiety and quality of life: outcome 9 months after facial cosmetic surgery. *J Craniomaxillofac Surg*. (2003) 31:46–50. doi: 10.1016/S1010-5182(02)00159-2
 42. Kim SK, Han JJ, Kim JT. Classification and treatment of prominent mandibular angle. *Aesthetic Plast Surg*. (2001) 25:382–7. doi: 10.1007/s002660010150
 43. Samizadeh S, Wu W. Ideals of facial beauty amongst the Chinese population: results from a Large National Survey. *Aesthetic Plast Surg*. (2018) 42:1540–50. doi: 10.1007/s00266-018-1188-9
 44. Gilmartin J, Long AF, Soldin M. Changing body image and well-being: following the experience of massive weight loss and body contouring surgery. *Healthcare*. (2014) 2:150–65. doi: 10.3390/healthcare2020150
 45. Golshani S, Mani A, Toubaei S, Farnia V, Sepehry AA, Alikhani M. Personality and psychological aspects of cosmetic surgery. *Aesthetic Plast Surg*. (2016) 40:38–47. doi: 10.1007/s00266-015-0592-7

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 Qian, Ling, Wang, Lenahan, Zhang, Zheng and Shao. 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 Prevalence of Compulsive Buying and Hoarding Behaviours in Emerging, Early, and Middle Adulthood: Multicentre Epidemiological Analysis of Non-clinical Chinese Samples

Jiawen Ye¹, Simon Ching Lam^{2*} and Heping He³

¹ Department of Applied Psychology, Lingnan University, Tuen Mun, Hong Kong SAR, China, ² School of Nursing, Tung Wah College, Ho Man Tin, Hong Kong SAR, China, ³ College of Management, Shenzhen University, Shenzhen, China

OPEN ACCESS

Edited by:

Alessia Passanisi,
Kore University of Enna, Italy

Reviewed by:

Bess Yin-Hung Lam,
Hong Kong Shue Yan University,
Hong Kong SAR, China
Yasir Ali Soomro,
King Abdulaziz University,
Saudi Arabia

*Correspondence:

Simon Ching Lam
simlc@alumni.cuhk.net;
simonlam@twc.edu.hk

Specialty section:

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

Received: 31 May 2020

Accepted: 18 November 2021

Published: 09 December 2021

Citation:

Ye J, Lam SC and He H (2021)
The Prevalence of Compulsive Buying
and Hoarding Behaviours
in Emerging, Early, and Middle
Adulthood: Multicentre
Epidemiological Analysis
of Non-clinical Chinese Samples.
Front. Psychol. 12:568041.
doi: 10.3389/fpsyg.2021.568041

Behavioural addictions, such as compulsive buying (CB) and hoarding, are increasingly recognised in the current psychiatric nosology, particularly in developed countries. The prevalence of these disorders may not be static but possibly altered across different age groups. However, studies on this area are rare, and only few have focused on Chinese population. This epidemiological study employs population-based cross-sectional design and collects data in two regions, i.e., Hong Kong and Mainland China. A self-reported questionnaire is constructed based on carefully validated Chinese versions of Richmond Compulsive Buying Scale and Hoarding Rating Scale. A total of 2,439 valid samples are collected and divided into three age groups, i.e., emerging, early and middle adulthood. CB and hoarding behaviours have displayed an inverted u-shaped pattern across the above age groups. In addition, the strength of correlation between the two compulsive behaviours is consistent and maintained across different age groups. These results suggest that the compulsive behaviours vary among different stages of adulthood in major cities in China. This newly discovered pattern of compulsive disorders in Chinese population is different from those in American and European populations.

Keywords: compulsive buying, compulsive hoarding, non-clinical Chinese sample, Richmond Compulsive Buying Scale, Hoarding Rating Scale, multi-center

INTRODUCTION

Shopping is a common behaviour in modern life. People shop to buy their needs or relax and reward themselves. However, shopping can become a harmful and destructive behaviour to one's life when it becomes extreme and unmanageable, which can lead to "compulsive buying" (CB). According to Ridgway et al. (2008), CB has two components, i.e., obsessive compulsive and impulsive control disorders (OCD and ICD, respectively). Compulsive buying is defined as "a consumer's tendency to

be preoccupied with buying that is revealed through repetitive buying and a lack of impulse control over buying” (Ridgway et al., 2008, p. 622).

CB behaviour (CBB) has attracted research attention since 1990s in developed societies because of its significant personal and social effects. Evidence has shown that CB may lead to large debts (58.3%), guilt (45.8%), inability to meet payments (41.7%), criticism from acquaintances (33.3%), legal and financial consequences (8.3%) and criminal legal problems (8%) (Christenson et al., 1994). In addition to financial and legal consequences, people with CBB may also suffer from an increasing level of anxiety and urge, which can only be relieved by acquiring a sense of completion after shopping (Black, 2007; Yi, 2013). Previous research has shown that compulsive buyers demonstrate anxiety disorders with obsessive thoughts and compulsive behaviours that lead to distress and disturbance to their everyday life (Billieux et al., 2008).

Although CBB has been proven to cause financial and psychological distress and can be considered as a type of behavioural addiction (Griffiths, 2005), CB is not listed as a separate category or a behavioural addiction in the American Psychiatric Association’s DSM-5 (American Psychiatric Association, 2013) or the World Health Association’s International Statistical Classification of Diseases and Related Health Problems, 10th revision (World Health Organization, 1992). One of the reasons is that CBB has no clear diagnostic criteria and sufficient data, and thus it merely overlaps with other mental disorders, such as OCDs, anxiety and/or depression (Weinstein et al., 2016). Moreover, existing research on CBB has used samples from industrialised countries in Europe and North America. Thus, evidence of CBB in Asian societies is little to none. Amongst existing studies on the prevalence of CBB that have used a population-based samples (excluding those that have used student samples because of their limited representativeness), the CB prevalence rates are found to be 5.8%, 6.9%, and 7.1% in 2,153 American, 2,350 German and 2,195 Spanish samples, respectively (Koran et al., 2006; Mueller et al., 2010; Otero-López and Villardefrancos, 2014). A meta-analysis research in 2016 has indicated that adult representative data with Chinese samples is scarce (Maraz et al., 2016). Amongst the few studies that have investigated university students, a study conducted in Mainland China using German Compulsive Buying Scale (Raab et al., 2005) has shown a CB prevalence rate of 6.7% (Li et al., 2014). Another research with Taiwanese undergraduate samples has suggested a prevalence rate of 29.8% with the adaptation of Faber and O’Guinn (1992) compulsive buying scale. The discrepancy between these two reported prevalence rates may be due to the different scales of CB used in these two studies. The scales used in the above studies are also not well validated in Chinese population. Therefore, a clear picture of CB in Chinese population awaits further investigation with a carefully validated Chinese version of CB scale. To investigate CBB in China, this epidemiological study adopts the Chinese version of Richmond Compulsive Buying Scale (RCBS), which has been recently validated by a group of researchers in Hong Kong (Lam et al., 2018). This study obtains sample data from Chinese residents of Hong Kong and Shenzhen, Mainland

China, the two major Chinese cities with similar GDP (HK\$2.85 trillion vs. HK\$2.87 in 2018, Chan and Leung, 2019). Thus, the findings of this study are comparable to the past general population results found in western societies and significantly contribute to existing literature.

The tendency of CBB is found correlated to age. Specifically, young people seem to be prone to CBB. Research on the estimated prevalence of CBB in the United States has found that the identified compulsive buyers have a significantly lower mean age than other respondents (Koran et al., 2006). Dittmar’s (2005b) two empirical studies with student samples have provided unanimous findings that young consumers are engaged in more compulsive buying and showed concern that the younger generation’s CBB may negatively affect their finance and lead to great personal debts. Recruiting participants through various methods (e.g., university student research experience program, word of mouth, and media promotions, etc.), a study in Australia has studied adults aged 18–65 years and found that younger age predicted significantly severe excessive buying (Kyrios et al., 2020). One of the possible reasons for young adults’ vulnerability of CBB could be explained by the idea that CBB is an identity-seeking behaviour (Dittmar, 2005b). Younger adults are still in the stage of life to establish a sense of self and they may use shopping as an easy way to improve their self-image and move closer to their ideal self (Dittmar, 2005a). Most of the existing CBB studies have been conducted in western and developed societies. In Asia, research on CBB or excessive buying behaviours is still on its early stages and has been focused on adolescents and young adults. A comparison between Thailand and Chinese junior high school students has found that approximately 19% Chinese and 25% Thai adolescents are classified as compulsive buyers (Guo and Cai, 2011). A study conducted in Yantai, China has found that only 5.99% of the college student sample have CB tendency (Jiang and Shi, 2016). However, research on a more general population with people of different ages is scarce, and the prevalence of CBB may not be static but vary among different age groups as found in western societies, such as the United Kingdom, Spain and the United States (Dittmar, 2005b; Koran et al., 2006; Otero-López and Villardefrancos, 2014). To provide a comprehensive picture of the prevalence of CBB throughout the adulthood, a general population sample is adopted in this study to explore the relationship between age and CBB in China from emerging adulthood to middle adulthood, which includes the mostly studied young adults and seldom researched middle aged individuals. It is hypothesized that age is correlated to CBB, and younger individuals are more likely to demonstrate CBB (Hypothesis 1).

Studies on CB have consistently demonstrated that women are highly vulnerable to CBB. Women tend to consider shopping a positive leisure activity, whereas men perceive buying relatively negative and treat it as a task they have to finish (Campbell, 2000). Women usually score significantly higher than men on CB scales (Scherhorn et al., 1990; Dittmar, 2005b). Women have a greater level of susceptibility to CB in order to regulate emotions and moods (Davis et al., 2014). Another study findings suggested that female compulsive buyers may use excessive buying to cope with stress and negative feelings (Challet-Bouju et al., 2020). The

pleasures and joy experienced in shopping exerted more strongly impacts women than men (Tarka et al., 2022). However, some studies with adolescent and university student sample in western countries have failed to find any gender differences (Roberts and Tanner, 2000; Lee and Workman, 2018). Another research with 410 German undergraduate student samples has even found that females have reported significantly lower levels of CBB than their male counterparts (Mueller et al., 2011). Therefore, the commonly assumed gender differences in CB are actually not that robust based on the existing evidence from western societies. On the other hand, in one of the few studies with Chinese sample, researchers have demonstrated that female college students in Hong Kong and Macau have scored significantly higher than their male counterparts in Edwards Compulsive Buying Scale (Ching et al., 2016). In consistent with the Western findings, a Chinese study on online compulsive buying among women also suggested that when experiencing high level of stress, some women may engage in online compulsive buying as a stress coping strategy, even though it is a negative one (Zheng et al., 2020). Hence, this study further explores the gender differences in a general Chinese sample and hypothesizes that women are more prone to CB than men (Hypothesis 2).

The relationship between compulsive hoarding (CH) and CB has attracted increasing research attention recently. Compulsive hoarding behaviours are described as obtaining a large number of possessions but failing to discard, which leads to substantial clutter that greatly affects the living space of an individual and his/her normal functioning (Tolin et al., 2010). The prevalence of CH ranges from 2% to 6% in general community samples of western developed countries, such as Germany and the United States (Iervolino et al., 2009; Timpano et al., 2011). In China, only few studies have investigated CH behaviours (Timpano et al., 2015; Xu et al., 2015), and the prevalence of compulsive hoarding disorder has not been systematically studied. A study with a large-scale representative sample conducted in Germany has shown that approximately two-thirds of participants who have exhibiting CH are also suffering from CB, which suggests a close association between these two compulsive behaviours (Mueller et al., 2009). Hoarding compulsive buyers have reported more severe buying symptoms and obsessive-compulsive symptoms (Mueller et al., 2007). This may be explained by the fact that excessive or maladaptive object attachment is the defining characteristic of both CH and the acquisition process within CB (Moulding et al., 2021). For compulsive hoarders, they develop an excessive attachment to the things they possess and fail to discard, while for the compulsive buyers, they display an uncontrollable desire to own something immediately, which can also be considered is a kind of maladaptive object attachment. Therefore, it is possible that both CH and CB can be displayed by the same individual and the desire to hoard may lead to CB to some extent. Taking these findings together, this study explores the compulsive hoarding behaviours in China and further hypothesizes that CH behaviours are closely related to and predictive of CBB (Hypothesis 3).

This research examines CBB in China using a general community sample in Hong Kong and Mainland

China and explores the relationships amongst CBB, CH behaviours, age and gender.

METHODS

Participants

This epidemiological study employed population-based cross-sectional design. The inclusion criteria were age of 18 years old or older, living in the studied regions, and able to understand Chinese. A sample of 2,305 Chinese participants (based on Cochran formula, Lwanga and Lemeshow, 1991) was planned to recruit from Hong Kong and Shenzhen, a major city of Mainland China.

Measures

This research constructed a self-reported questionnaire with three sections, i.e., demographics, Richmond Compulsive Buying Scale-Traditional Chinese version (RCBS-TC, He et al., 2018; Lam et al., 2018) and Chinese version of Hoarding Rating Scale (CHRS, Tolin et al., 2010; Liu et al., 2020). RCBS-TC was composed of six items measured with seven-point Likert scale ranging from “1 = totally disagree” to “7 = totally agree.” The total score could range from 7 to 42, wherein the higher the score, the greater the CBB. A sample item was ‘Others may consider me a shopaholic’. RCBS-TC was proven to be well adapted to the Chinese population with a satisfactory internal consistency (Cronbach’s $\alpha = 0.88$), stability (two-week test-retest intraclass correlation coefficient = 0.82) and two-factor model structure (goodness-of-fit indices: $\chi^2/df = 8.56$, CFI = 0.99, NFI = 0.98, IFI = 0.99 and RMSEA = 0.09) (Lam et al., 2018). He et al. (2018) re-examined the cut-off value and recommended the value of 29 for determining CB in Chinese population, applicable to Mainland Chinese and Hong Kong (He et al., 2021).

The five-item self-reported CHRS contained items of clutter, difficulty discarding, excessive acquisition, distress and impairment (Liu et al., 2020). Each item was measured on a nine-point scale ranging from 0 (none) to 8 (extreme). The total score could range from 0 to 40, wherein the higher the score, the more severe the hoarding behaviours. Based on the latest adaptation studies (Liu et al., 2020), the reliability of CHRS was satisfactory (Cronbach’s $\alpha = 0.86$, corrected item-total correlation coefficients = 0.60–0.74 and two-week test retest intraclass correlation coefficient = 0.78). The content (CVI = 0.80–1.00 from six healthcare and social science experts in CB), face validity (100% comprehensibility from 20 public samples), factorial validity (exploratory and confirmatory factor analysis) were all satisfactory. One-factor model of CHRS was identified in Chinese population samples (goodness-of-fit indices: $\chi^2/df = 2.26$, CFI = 0.99, NFI = 0.99, IFI = 0.99 and RMSEA = 0.049).

Previous study has adopted CHRS and RCBS-TC as measurement scales for self-reported correlational research and concluded that common method bias between compulsive hoarding and buying as measured by self-reported method is not demonstrated in obsessive-compulsive continuum, which hence provided satisfactory evidence that both scales is applicable in

Chinese (He et al., 2021). **Supplementary Materials 1, 2** provided the items and format of RCBS-TC and CHRS.

Demographic items, such as age, gender, marital status, education level and monthly income, were also recorded for analysis.

Procedure

Electronic and paper-based data collections were used complementarily. Some participants were recruited from the general public in three districts of Hong Kong, i.e., Kowloon, Hong Kong Island and New Territories, thereby exhibiting a fair mix of people with different backgrounds. Research assistants invited pedestrians to complete self-administrated questionnaires (including demographic questionnaires, RBCS-TC and CHRS). The paper-and-pencil method was also used for the data collection. Participants from Shenzhen were recruited online and completed the online survey voluntarily. Ethical approval was sought from the ethical committee of a local university and the collaborative organisation. Informed consent was obtained from the participants through appropriate method (e.g., verbal consent for the general public participants recruited in railway stations and written consent in the online questionnaire).

RESULTS

A total of 2,439 valid samples (response rate = ~38%) were collected. With regard to participants' demographic characteristics, 47.8% (52.2%) were males (females) and their ages ranged from 18 to 59 years. The valid samples were divided into three age groups, i.e., emerging adulthood (ages 18–29 years, $n = 1,203$), early adulthood (ages 30–39 years, $n = 642$) and middle adulthood (ages 40–59, $n = 594$). **Table 1**

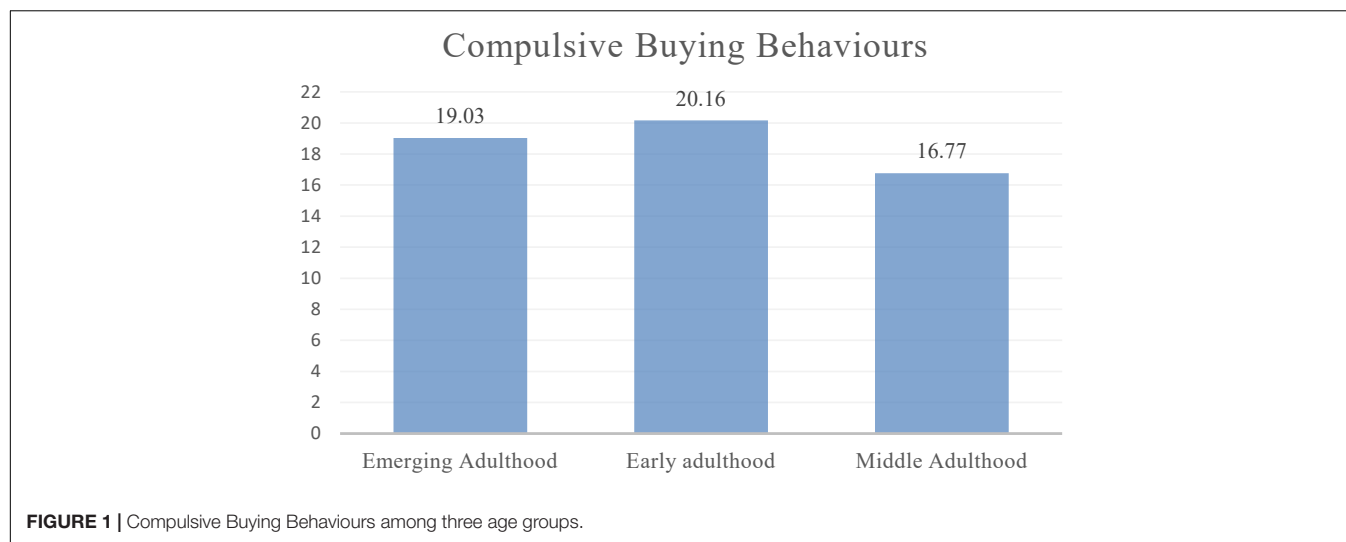
summarized sample demographics and means of compulsive buying. A significant age difference was found across the three age groups ($F = 30.98$, $p < 0.001$, see **Figure 1**). CBB reached its peak for the early adulthood group ($M_{\text{early}} = 20.16$, $SD = 8.09$) and then dropped in the middle adulthood group ($M_{\text{middle}} = 16.81$, $SD = 7.60$), which was less severe than the emerging adulthood group ($M_{\text{emerging}} = 19.03$, $SD = 7.39$). By using the value of 29 as the cut-off point to separate compulsive from non-compulsive buyers (He et al., 2018; Lam et al., 2018), the prevalence of CBB across the three age groups was 11.3%, 18.5% and 8.1%, respectively. Thus, Hypothesis 1 was partly supported. In particular, the findings showed that younger adults (i.e., emerging and early adulthoods) were more prone to CBB. The screening of hoarding behaviours displayed a similar inverted u-shaped development ($F = 14.34$, $p < 0.001$, $M_{\text{emerging}} = 15.10$, $SD = 7.66$; $M_{\text{early}} = 16.04$, $SD = 7.71$; $M_{\text{middle}} = 13.68$, $SD = 8.10$).

Females demonstrated more compulsive buying behaviours than males in all three age groups (See **Table 1**). Thus, Hypothesis 2 is supported. The participants with partner showed significantly less CBB than those without partner in their emerging and early adulthood ($t_{\text{emerging}} = -4.50$, $p < 0.001$; $t_{\text{early}} = -4.80$, $p < 0.001$). However, the differences were not observed in the middle adulthood ($t_{\text{middle}} = 0.61$, $p > 0.05$). As shown in **Table 1**, the participants with different education levels showed significantly different tendencies of CBB in both early and middle adulthood ($F_{\text{early}} = 4.92$, $p < 0.01$; $F_{\text{middle}} = 7.99$, $p < 0.001$), whereas not in the emerging adulthood ($F_{\text{emerging}} = 0.27$, $p > 0.05$). Across three age groups, there was no significant effect of income on CBB.

Compulsive buying (CB) was found significantly and positively correlated with CH in all three age groups ($r_{\text{emerging}} = 0.47$, $r_{\text{early}} = 0.53$, $r_{\text{middle}} = 0.47$). To investigate further the salient predictors for CBB in each age group, binary

TABLE 1 | Sample demographics and means of compulsive buying by age group.

		Emerging adulthood		Early adulthood		Middle adulthood	
		N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
Gender	Male	552	16.6(6.92)	295	18.04(7.77)	317	15.28(7.29)
	Female	649	21.09(7.15)	347	21.96(7.93)	277	18.56(7.58)
		$t = -11.00$	$p < 0.001$	$t = -6.31$	$p < 0.001$	$t = -5.37$	$p < 0.001$
Partners	Without	1013	18.62(7.34)	229	18.14(8.06)	125	17.18(7.42)
	With	188	21.23(7.28)	413	21.28(7.89)	469	16.71(7.65)
		$t = -4.50$	$p < 0.001$	$t = -4.80$	$p < 0.001$	$t = 0.61$	$p > 0.05$
Education	Primary school or below	39	19.59(8.60)	17	15.59(8.16)	76	13.38(6.42)
	Secondary school	302	18.68(8.09)	134	18.36(8.26)	205	16.14(7.30)
	Higher education	295	19.19(6.89)	105	21.02(8.26)	89	16.96(7.61)
	Bachelor's degree	522	19.08(7.09)	312	21.15(7.89)	172	18.92(8.08)
	Master's degree or above	43	19.14(8.17)	74	19.09(7.45)	52	17.19(6.68)
		$F = 0.27$	$p > 0.05$	$F = 4.92$	$p < 0.01$	$F = 7.99$	$p < 0.001$
Income	< 10000	324	18.30(7.17)	20	20.60(5.92)	33	13.97(6.93)
	10001–20000	345	19.46(7.40)	151	18.76(8.02)	134	16.41(7.43)
	20001–40000	318	19.07(7.43)	228	20.76(7.74)	149	17.30(7.59)
	40001–60000	139	19.71(7.38)	142	19.54(8.37)	139	16.83(7.73)
	> 60001	68	18.31(7.95)	61	20.05(8.25)	94	17.01(7.20)
		$F = 1.55$	$p > 0.05$	$F = 1.57$	$p > 0.05$	$F = 1.44$	$p > 0.05$

**TABLE 2 |** Binary logistical regression predicting compulsive buying.

Age group		B	S.E.	Wald	df	Sig.	Exp(B)	95% CI	
								Lower	Upper
Emerging adulthood	Hoarding	0.126	0.015	73.110	1	0.000	1.135	0.098	0.157
	Gender	1.066	0.227	22.096	1	0.000	2.905	0.673	1.537
	Partner	0.557	0.233	5.708	1	0.017	1.745	0.047	1.006
	Education	-0.131	-0.104	1.582	1	0.209	0.877	-0.372	0.096
	Constant	-4.715	-0.469	101.099	1	0.000	0.009	-5.858	-3.749
Early adulthood	Hoarding	0.143	0.017	69.313	1	0.000	1.154	0.110	0.186
	Gender	0.806	0.243	10.970	1	0.001	2.239	0.343	1.292
	Partner	0.420	0.257	2.675	1	0.102	1.522	-0.097	0.939
	Edu	0.163	0.120	1.853	1	0.173	1.177	-0.097	0.435
	Constant	-5.496	0.622	78.094	1	0.000	0.004	-7.049	-4.331
Middle adulthood	Hoarding	0.130	0.022	34.949	1	0.000	1.139	0.082	0.190
	Gender	0.455	0.327	1.935	1	0.164	1.577	-0.147	1.182
	Partner	-0.291	0.401	0.528	1	0.468	0.747	-1.000	0.586
	Edu	0.301	0.140	4.626	1	0.031	1.351	0.066	0.546
	Constant	-5.571	0.722	59.524	1	0.000	0.004	-7.457	-4.275

logistic regressions were conducted with the probability to be a compulsive buyer as dependent measurement and compulsive hoarding and demographic variables as predictors. Because of the insignificant effect of income found across the three age groups, income was not included in the binary logistic regressions. As shown in **Table 2**, in the emerging adulthood, significant effects of CH, gender, and partner were observed. However, education level and partner, the variables originally affected CBB in early adulthood were found insignificant in predicting CBB while the effects of CH and gender remained significant. As for the middle adulthood, only CH and education level were the significant predictors of CBB, which is contradicted to the findings reported above where gender difference was found significantly in CBB for this age group. In summary, Hypothesis 3 was supported.

DISCUSSION AND CONCLUSION

This research aimed to provide a clear picture of the prevalence of CB and CH in a general Chinese sample from emerging to

middle adulthood. CB and CH behaviours displayed an inverted u-shaped pattern across three different age groups. This finding partially supported Hypothesis 1 and showed that younger adults were strongly affected by CBB compared with older adults. The prevalence of CBB across the three age groups was 11.3%, 18.5%, and 8.1%, respectively. In addition, the strength of correlation between the two compulsive behaviours was consistent and maintained across the three age groups. These results suggested that CB may continually increase (or perhaps develop) in the emerging adulthood, reach the peak at the early adulthood and drop slightly in the middle adulthood in these two major cities of China. This newly discovered pattern of compulsive disorders in Chinese population was quite different from the findings based on American and European population. By studying the data obtained from the United Kingdom, Dittmar (2005b) found that age and CBB were significantly and negatively correlated and European participants under 35 years old scored much higher than those over 35 years old. However, in this study, the participants in the early adulthood displayed more CBB than their younger and older counterparts. These differences could

be due to cultural differences among these societies. In Chinese societies, Confucianism exerted great impact on individuals' thoughts and behaviours. Confucius once said, "since 30, I have been well established (i.e., *San shi er li*, "三十而立")." Thus, Chinese people in their thirties were expected to be accomplished and have acquired certain social status. Meanwhile, the unique concept of face (i.e., *Mianzi*) in Chinese culture could be used to explain the high prevalence of CB amongst online buyers who were found to shop more often to show off their social statuses and success (He et al., 2018). Therefore, early adulthood individuals who have already been working for several years after their college graduation were more inclined to exhibit excessive shopping behaviours and own a large number of possessions to maintain and enhance their social status. By contrast, the younger adults were free from the strong urge to exhibit such behaviours, given that they were still young and studying in universities. Thus, future studies could explore whether individuals in the early adulthood demonstrate higher rate of observed buying than unobserved ones in comparison with other age groups to examine further the impact of culture on individuals' CB and CH behaviours. However, the overall prevalence of CBB in the middle adulthood in the current study is significantly lower compared with the other two younger groups, which may be explained by the cognitive maturity of men and women in this age group. As they enter their 40s and 50s, their urge to show off their social statuses and success may decrease as mature adults and they may also learn to use a better way to cope with their negative feelings, which could lead to fewer compulsive buying and hoarding behaviours.

Consistent with the findings of studies conducted in Western societies and as predicted in Hypothesis 2, Chinese females with ages between 18 and 39 years were more prone to CB and CH behaviours, which is consistent with the past findings. Both Chinese and Western studies suggested that young female compulsive buyers may use excessive shopping to cope with their stress and negative feelings (Challet-Bouju et al., 2020; Zheng et al., 2020). However, as people grow older, both genders seemed to be influenced by these compulsive behaviours equally as gender was considered insignificant predictor of CBB in the middle adulthood. The gender differences observed in CBB in this study could be at least partially explained by the traditional gender roles in a Chinese family. In a traditional Chinese family, females were expected to take care of the whole family and perform all the grocery shopping for the family, which could lead to females spending more time in supermarkets and shopping malls (Sun, 2013). Therefore, shopping for Chinese females could be perceived as an enjoyable leisure activity and part of their expected responsibilities to their families. By contrast, Chinese males were shaped as breadwinners who support the family financially, which could decrease their inclination in shopping and spending money, especially in their emerging and early adulthood when they should be striving for their career success and busy earning money for their future family (Sun, 2013). However, when Chinese males enter into their middle or older adulthood, their careers were already on the right track and they had succeeded in fulfilling social obligations to their family. Thus, Chinese males could start to satisfy their own needs and

wants, which would lead to compensatory buying or CB. Chinese males could also exhibit such behaviours to deal with the negative emotions they developed from their stressful work and failure in supporting their family. In this case, shopping and hoarding could offer a way out. For instance, a study investigating Italian elderly men's shopping behaviours showed that approximately 30% of the elderly men were affected by CBB and exhibited problematic shopping behaviours as a means to deal with their suppressed feelings (Varveri et al., 2014). These findings could explain why the gender differences in CBB disappear when individuals enter into their middle or older adulthood.

The association between CB and CH was proven in this research (supported Hypothesis 3), which was consistent with existing literature. In a study conducted in Germany, two-thirds of the participants who were suffering from compulsive hoarding were also classified as compulsive buyers (Mueller et al., 2009). Similar findings were also found in studies with American samples (Frost et al., 2002). Thus, scholars argued that compulsive buyers could share similar beliefs of possession and buying as compulsive hoarders (Kyrios et al., 2004). Compulsive hoarding behaviours were found to be a robust predictor of CBB across the three age groups, which indicated that compulsive buyers shop, at least to some extent, because of their needs of possession and hoarding. This is in line with the past literature that both CH and the acquisition process withing CB involve individuals' excessive or maladaptive object attachment (Moulding et al., 2021). However, a study in Taiwan suggested the other way around and their data showed that Taiwanese compulsive buyers were driven by an obsessive need to acquire products rather than the need to collect and hoard these products (Lo and Harvey, 2014). However, the sample size in the above study was relatively small with less than 200 participants. To further elaborate existing understanding of the relationship between CB and CH, more research with larger sample size and representative population should be conducted in future.

The findings of this study could potentially have important society and treatment implications. The inverted u-shaped pattern across the three age groups of CB and CH suggested that society should care about the mental health of individuals in the early adulthood. Establishing identity, one of the developmental tasks of young adults (Havighurst, 1972), together with the influence of Confucian teachings (i.e., "since 30, I have been well established") may exert impact on the Chinese CB and CH behaviours. CB and CH were also considered identity substitutes and associated with materialistic value endorsement and depression (Claes et al., 2016). Mass media should reduce their emphasis on materialistic values to prevent further increase in the prevalence of CB and CH. From the findings of the binary logistic regression, gender differences were only found in the participants of the emerging and early adulthood groups, but not in the middle adulthood group. The disappearance of gender differences in CB and CH in this age group showed that both male and female middle adulthood consumers could benefit from "retail therapy." On the other hand, these findings also serve as a signal that the helping professionals in the field of mental health should pay more attention to the middle-aged males' buying behaviours, which previously was seldom the focus of CBB, to

identify their problematic coping with the stress and negative feelings. Besides, the association between CB and CH found in the current research showed that the clinical experts should think over the comorbidity of the two psychological disorders.

Despite of significant contributions of this study, some limitations should be observed. Firstly, we adopted two well validated scales for screening two compulsive behaviours. However, precluding response bias was difficult due to the nature of self-reported answers. Secondly, due to the limitation of funding, we were unable to recruit psychiatrists to perform the diagnosis of CB and CH that was regarded as gold standard for all 2,439 participants. Such shortcomings could affect the accuracy of categorisation of compulsive and non-compulsive group. Lastly, this study recruited large-scale participants to represent Chinese general population. However, the age distribution was uneven. The number of the participants composing the early and middle adulthood was half of that of the emerging adulthood.

To the best of our knowledge, this study was one of the pioneers to explore the prevalence of CB and CH behaviours in a Chinese community sample. The prevalence of these compulsive behaviours was displayed in an inverted u-shaped pattern, which was different from those of western societies. Demographic variables, such as gender, marital status, income and education level, were found to affect these compulsive behaviours, especially in the emerging and early adulthood. These newly discovered Chinese findings could be explained by the unique Chinese culture. Thus, future research should further explore how culture influences existing understanding of CBB.

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 Ethical Review Regarding Human Research,

The Open University of Hong Kong (Ref no. HE20Jul2017-S&T2017/01). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SL and HH: conceptualization and funding acquisition. JY, SL, and HH: methodology and writing – review and editing. JY and SL: writing – original draft preparation. SL: project administration. All authors contributed to the article and approved the submitted version.

FUNDING

This work was supported by the School of Science and Technology Unit Fund, The Open University of Hong Kong, Hong Kong (grant number: ST-17/18-1), and S. Living Campaign 2017, Wofoo Community Service Network, Wofoo Social Enterprises, Hong Kong, and National Natural Science Foundation of China, China (Grant No. 71832015).

ACKNOWLEDGMENTS

We thank the participants for their contributions to this study. We thank Zoe Sze-long Chan, Andy Chun-yin Chong and Wendy Wing-chi Wong for their participation in the proposal of project; Eliza Yi-ni Wong, Ching-yuk Hon, Rochelle Tzs-wai Tang, Holly Hoi-tung Lam, Ming Tsang, and Lena Lok-ki Sung for their assistance in the data collection and data input.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.568041/full#supplementary-material>

REFERENCES

- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders*, 5th Edn. Washington DC: American Psychiatric Association.
- Black, D. W. (2007). A review of compulsive buying disorder. *World Psychiatry* 6, 14–18.
- Billieux, J., Rochat, L., Rebetez, M. M. L., and Van der Linden, M. (2008). Are all facets of impulsivity related to self-reported compulsive buying behavior? *Pers. Individ. Differ.* 44, 1432–1442. doi: 10.1016/j.paid.2007.12.011
- Campbell, C. (2000). “Shopaholics, spendaholics, and the question of gender,” in *I shop, therefore I am: Compulsive Buying and the Search for Self*, ed. A. Benson (New York, NY: Aronson), 57–75.
- Challet-Bouju, G., Mariez, J., Perrot, B., Grall-Bronnec, M., and Chauchard, E. (2020). A typology of buyers grounded in psychological risk factors for compulsive buying (Impulsivity, Self-Esteem, and Buying Motives): latent class analysis approach in a community sample. *Front. Psychiatry* 11:277. doi: 10.3389/fpsyg.2020.00277
- Chan, E., and Leung, S. (2019). *Hong Kong Economy Surpassed by Neighbour Shenzhen for First Time*. Hong Kong: South China Morning Post.
- Ching, T. H., Tang, C. S., Wu, A., and Yan, E. (2016). Gender differences in pathways to compulsive buying in Chinese college students in Hong Kong and Macau. *J. Behav. Add.* 5, 342–350. doi: 10.1556/2006.5.2016.025
- Christenson, G. A., Faber, R. J., de Zwaan, M., Raymond, N. C., Specker, S. M., Ekern, M. D., et al. (1994). Compulsive buying: descriptive characteristics and psychiatric comorbidity. *J. Clin. Psychiatry* 55, 5–11.
- Claes, L., Müller, A., and Luyckx, K. (2016). Compulsive buying and hoarding as identity substitutes: the role of materialistic value endorsement and depression. *Compr. Psychiatry* 68, 65–71. doi: 10.1016/j.comppsy.2016.04.005
- Davis, R., Lang, B., and San Diego, J. (2014). How gender affects the relationship between hedonic shopping motivation and purchase intentions? *J. Consumer Behav.* 13, 18–30.
- Dittmar, H. (2005b). Compulsive buying - a growing concern? an examination of gender, age, and endorsement of materialistic values as predictors. *Br. J. Psychol.* 96, 467–491. doi: 10.1348/000712605x53533
- Dittmar, H. (2005a). A new look at “compulsive buying”: self-discrepancies and materialistic values as predictors of compulsive buying tendency. *J. Soc. Clin. Psychol.* 24, 832–859. doi: 10.1521/jscp.2005.24.6.832
- Griffiths, M. (2005). A ‘components’ model of addiction within a biopsychosocial framework. *J. Subst. Use* 10, 191–197. doi: 10.1080/14659890500114359

- Faber, R. J., and O'Guinn, T. C. (1992). A clinical screener for compulsive buying. *J. Consumer Res.* 19, 459–469.
- Frost, R. O., Steketee, G., and Williams, L. (2002). Compulsive buying, compulsive hoarding and obsessive compulsive disorder. *Behav. Therapy* 33, 201–214. doi: 10.1016/s0005-7894(02)80025-9
- Guo, Z., and Cai, Y. (2011). Exploring the antecedents of compulsive buying tendency among adolescents in China and Thailand: a consumer socialization perspective. *African J. Bus. Manag.* 5, 10198–10209. doi: 10.5897/AJBM11.1808
- Havighurst, R. J. (1972). *Developmental Tasks and Education*, 3rd Edn. New York, NY: D. McKay.
- He, H., Kukar-Kinney, M., and Ridgway, N. M. (2018). Compulsive buying in China: measurement, prevalence, and online drivers. *J. Bus. Res.* 91, 28–39.
- He, H., Zhu, M., and Lam, S. C. (2021). The relationship between compulsive buying and hoarding in China: a multicenter study. *Front. Psychol.* 12:721633. doi: 10.3389/fpsyg.2021.721633
- Iervolino, A. C., Perroud, N., Fullana, M. A., Guipponi, M., Cherkas, L., Collier, D. A., et al. (2009). Prevalence and heritability of compulsive hoarding: a twin study. *Am. J. Psychiatry* 166, 1156–1161. doi: 10.1176/appi.ajp.2009.08121789
- Jiang, Z., and Shi, M. (2016). Prevalence and co-occurrence of compulsive buying, problematic internet and mobile phone use in college students in Yantai, China: relevance of self-traits. *BMC Public Health* 16:1211. doi: 10.1186/s12889-016-3884-1
- Koran, L. M., Faber, R. J., Aboujaoude, E., Large, M. D., and Serpe, R. T. (2006). Estimated prevalence of compulsive buying behavior in the United States. *Am. J. Psychiatry* 163, 1806–1812. doi: 10.1176/ajp.2006.163.10.1806
- Kyrios, M., Fassnacht, D. B., Ali, K., Maclean, B., and Moulding, R. (2020). Predicting the severity of excessive buying using the excessive buying rating scale and compulsive buying scale. *J. Obsessive-Compulsive Related Disord.* 25:100509. doi: 10.1016/j.jocrd.2020.100509
- Kyrios, M., Frost, R. O., and Steketee, G. (2004). Cognitions in compulsive buying and acquisition. *Cogn. Therapy Res.* 28, 241–258. doi: 10.1023/B:COTR.0000021543.62799.32
- Lam, S. C., Chan, Z. S. L., Chong, A. C. Y., Wong, W. W. C., and Ye, J. (2018). Adaptation and validation of richmond compulsive buying scale in Chinese population. *J. Behav. Add.* 7, 760–769. doi: 10.1556/2006.7.2018.94
- Lee, S. H., and Workman, J. E. (2018). Consumer tendency to regret, compulsive buying, gender, and fashion time-of-adoption groups. *Int. J. Fashion Des. Technol. Educ.* 11, 265–276. doi: 10.1080/17543266.2017.1423518
- Li, S., Unger, A., and Bi, C. (2014). Different facets of compulsive buying among Chinese students. *J. Behav. Add.* 3, 238–245. doi: 10.1556/JBA.3.2014.4.5
- Liu, T. W., Lam, S. C., Chung, M. H., and Ho, K. (2020). Adaptation and psychometric testing of the hoarding rating scale (HRS): a self-administered screening scale for epidemiological study in Chinese population. *BMC Psychiatry* 20:159. doi: 10.1186/s12888-020-02539-7
- Lo, H. Y., and Harvey, N. (2014). Compulsive buying: obsessive acquisition, collecting or hoarding? *Int. J. Mental Health Add.* 12, 453–469. doi: 10.1007/s11469-014-9477-2
- Lwanga, S. K., and Lemeshow, S. (1991). *Sample Size Determination in Health Studies: A Practical Manual*. World Health Organization.
- Maraz, A., Griffiths, M. D., and Demetrovics, Z. (2016). The prevalence of compulsive buying: a meta-analysis. *Addiction* 111, 408–419. doi: 10.1111/add.13223
- Moulding, R., Kings, C., and Knight, T. (2021). The things that make us: self and object attachment in hoarding and compulsive buying-shopping disorder. *Curr. Opin. Psychol.* 39, 100–104. doi: 10.1016/j.copsyc.2020.08.016
- Mueller, A., Claes, L., Mitchell, J. E., Faber, R. J., Fischer, J., and Zwaan, M. D. (2011). Does compulsive buying differ between male and female students? *Personal. Individual Diff.* 50, 1309–1312. doi: 10.1016/j.paid.2011.02.026
- Mueller, A., Mitchell, J. E., Crosby, R. D., Gefeller, O., Faber, R. J., Martin, A., et al. (2010). Estimated prevalence of compulsive buying in Germany and its association with sociodemographic characteristics and depressive symptoms. *Psychiatry Res.* 180, 137–142. doi: 10.1016/j.psychres.2009.12.001
- Mueller, A., Mitchell, J. E., Crosby, R. D., Glaesmer, H., and Zwaan, M. D. (2009). The prevalence of compulsive hoarding and its association with compulsive buying in a German population-based sample. *Behav. Res. Ther.* 47, 705–709. doi: 10.1016/j.brat.2009.04.005
- Mueller, A., Mueller, U., Albert, P., Mertens, C., Silbermann, A., Mitchell, J. E., et al. (2007). Hoarding in a compulsive buying sample. *Behav. Res. Ther.* 45, 2754–2763. doi: 10.1016/j.brat.2007.07.012
- Otero-López, J. M., and Villardefrancos, E. (2014). Prevalence, sociodemographic factors, psychological distress, and coping strategies related to compulsive buying: a cross sectional study in Galicia, Spain. *BMC Psychiatry* 14:101. doi: 10.1186/1471-244X-14-101
- Raab, G., Neuner, M., Reisch, L. A., and Scherhorn, G. (2005). *SKSK-Screeningverfahren zur Erhebung von Kompensatorischem und Süchtigem Kaufverhalten [Screening procedure for the measurement of compensatory and compulsive buying behavior]*. Göttingen: Hogrefe.
- Ridgway, N. M., Kukar-Kinney, M., and Monroe, K. B. (2008). An expanded conceptualization and a new measure of compulsive buying. *J. Consumer Res.* 35, 622–639. doi: 10.1016/j.psychres.2014.11.080
- Roberts, J. A., and Tanner, J. F. (2000). Compulsive buying and risky behavior among adolescents. *Psychol. Rep.* 86, 763–770. doi: 10.2466/pr0.2000.86.3.763
- Scherhorn, G., Reisch, L. A., and Raab, L. A. (1990). Compulsive buying in West Germany: an empirical investigation. *J. Consumer Policy* 13, 155–189.
- Sun, C. T.-L. (2013). *Themes in Chinese Psychology*. Singapore: Cengage Learning Asia Pte Ltd.
- Tarka, P., Kukar-Kinney, M., and Harnish, R. J. (2022). Consumers' personality and compulsive buying behavior: the role of hedonistic shopping experiences and gender in mediating-moderating relationships. *J. Retailing Consumer Services* 64:102802.
- Timpano, K. R., Çek, D., Fu, Z. F., Tang, T., Wang, J. P., and Chasson, G. S. (2015). A consideration of hoarding disorder symptoms in China. *Compr. Psychiatry* 57, 36–45. doi: 10.1016/j.comppsy.2014.11.006
- Timpano, K. R., Exner, C., Glaesmer, H., Rief, W., Keshaviah, A., Brähler, E., et al. (2011). The epidemiology of the proposed DSM-5 hoarding disorder: exploration of the acquisition specifier, associated features, and distress. *J. Clin. Psychiatry* 72, 780–789. doi: 10.4088/JCP.10m06380
- Tolin, D. F., Frost, R. O., and Steketee, G. (2010). A brief interview for assessing compulsive hoarding: the hoarding rating scale-interview. *Psychiatry Res.* 178, 147–152. doi: 10.1016/j.psychres.2009.05.001
- Varveri, L., Novara, C., Petralia, V., Romano, F., and Lavanco, G. (2014). "Compulsive buying and elderly men: depression, coping strategies and social support," in *Proceedings of the European Scientific Journal, 1st Mediterranean Interdisciplinary Forum on Social Sciences and Humanities MIFS 2014* (Beirut).
- Weinstein, A., Maraz, A., Griffiths, M. D., Lejoyeux, M., and Demetrovics, Z. (2016). "Compulsive buying—features and characteristics of addiction," in *Neuropathology of Drug Addictions and Substance Misuse* 993–1007. doi: 10.1016/b978-0-12-800634-4.00098-6
- World Health Organization (1992). *International Classification of Mental and Behavioural Disorders. (ICD-10)*. Geneva: World Health Organization.
- Xu, W., Fu, Z., Wang, J., and Zhang, Y. (2015). Relationship between autistic traits and hoarding in a large non-clinical Chinese sample: mediating effect of anxiety and depression. *Psychol. Rep.* 116, 23–32. doi: 10.2466/15.PR0.116k17w0
- Yi, S. (2013). Heterogeneity of compulsive buyers based on impulsivity and compulsivity dimensions: a latent profile analytic approach. *Psychiatry Res.* 208, 174–182. doi: 10.1016/j.psychres.2012.09.058
- Zheng, Y., Yang, X., Liu, Q., Chu, X., Huang, Q., and Zhou, Z. (2020). Perceived stress and online compulsive buying among women: a moderated mediation model. *Comp. Hum. Behav.* 103, 13–20. doi: 10.1016/j.chb.2019.09.012

Conflict of Interest: The authors declare that this study received funding from three parties, including The Open University of Hong Kong, Wofoo Social Enterprises, Hong Kong, and National Natural Science Foundation of China. The funder was not involved in the study design, collection, analysis, interpretation of data, the writing of this article or the decision to submit it for publication.

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 Ye, Lam and He. 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.

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