

PSYCHOLOGICAL DISTRESS AMONG UNIVERSITY STUDENTS

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PSYCHOLOGICAL DISTRESS AMONG UNIVERSITY STUDENTS

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Editorial: Psychological Distress Among University Students

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Editorial on the Research Topic

Psychological Distress Among University Students

Emerging adulthood (Arnett, 2000, Arnett et al., 2014) is a developmental phase between adolescence and adulthood characterized by many transitions and challenging tasks, such as financial self-sufficiency, choices about career and intimate relationships, and preparing the ground for adult lives (Furnham, 2004; Miller, 2017; Schechter et al., 2018).

For some emerging adults, this phase coincides years of higher education, which implies further tasks: performance demands, changes in living conditions, dealing with a new social and educational context (Settersten and Ray, 2010; Schulenberg and Schoon, 2012). Starting higher education seems to constitute a crucial transition for mental health (Molina et al., 2012; Pedrelli et al., 2015; Auerbach et al., 2016; Harris, 2019), since students consistently report higher levels of distress compared to the general population (James et al., 2017; Tariku et al., 2017; Mboya et al., 2020). In particular, university students seem characterized by high levels of depression, anxiety and suicide risk (see among others Beiter et al., 2015; Auerbach et al., 2016; Larcombe et al., 2016; Rotenstein et al., 2016; Oyekcin et al., 2017; Poorolajal et al., 2017; Tran et al., 2017; Villatte et al., 2017; Tang et al., 2018). Besides, trauma (e.g., childhood abuse, accident, or assault) is a common occurrence, with a percentage ranging from 52 to 85%, of whom 9 to 59% of students might risk developing posttraumatic stress disorder.

University students' distress seems to be particularly influenced by the peer context to which students are exposed on a daily basis (Collins and Laursen, 2004). In particular, peer support seems to protect students' mental health (Alsubaie et al., 2019): indeed, those who report higher levels of perceived social support, also report lower levels of all types of loneliness (Bernardon et al., 2011). Besides, university students' well-being can be also influenced by peer pressure (Alsubaie et al., 2019), that seems to have a role in increasing alcohol and drug consumption (Knee and Neighbors, 2002; Monaci et al., 2013; Abikoye et al., 2014), body image concerns (Webb and Zimmer-Gembeck, 2014), and internet addiction (Esen and Gündogdu, 2010). At the same time, family emotional support seems to have a great importance on happiness and life satisfaction (North et al., 2008; Delle Fave et al., 2010; Hsu, 2010). However, recent literature evidenced that with the transition to university, the importance of peer support becomes more influential and critical than family support (Alsubaie et al., 2019; Kim, 2020), probably because university students have more interactions and similar experiences to their peers than their family (Bernardon et al., 2011).

In these times, we have also to consider the impact of the novel coronavirus disease of 2019 (Covid-19) pandemic, that aroused fears and anxiety globally, leading to an upsurge in the incidence and severity of mental health problems (Granieri et al., 2020; Serafini et al., 2020; Xiong et al., 2020). Indeed, covid-19 pandemic caused a massive interruption in the lives and education of university students worldwide, entailing prolonged school closure, transition to internet-based

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learning, and social isolation from peers during state-enforced quarantine (Bourion-Bédès et al., 2021; Sun et al., 2021). In particular, worries, isolation from social networks, a lack of interaction and emotional support from friends, as well as physical isolation were associated with negative mental health trajectories among university students (Husky et al., 2020; Meda et al., 2021). Lukács (2021) evidenced that university students experienced significant negative changes after the first month of isolation regarding physical activity, relationship with family and friends, financial situation, perceived health, and perspective for the future. Moreover, age, housing conditions, previous history of mental issues, anxiety, and fear significantly predicted psychological distress (Saravanan et al., 2020). Moreover, stress related to academics (e.g., personal uncertainties about academic program, distance teaching), health, and lack of social support predicted more negative mental health impacts (Lai et al., 2020).

These data are matters of particular interest for mental health and educational systems worldwide. Indeed, students experiencing higher psychological distress are at a higher risk of academic failures and dropout (Jaisoorya et al., 2017; Ishii et al., 2018), with important implications for campus health services and mental health policymaking (Viñas Poch et al., 2004).

These considerations are supported by the 13 articles which were included in the Research Topic “Psychological Distress among University Students.”

Focusing on instrument development and evaluation, May, Terman et al. reported on the initial development and validation of the eight-item Burnout Stigma Instrument (BSI-8). First, they described the construction and initial evaluation of scale items, and they replicated in a second study the factor structure determined in the initial study. Results of earlier exploratory and confirmatory factor analyses were replicated using item response theory. Moreover, they found out that burnout stigma predicted mental health indicators 6 weeks later. In another paper, May, Rivera et al. reported both latent profile and item response theory analyses of the School Burnout Inventory in US undergraduate students. Latent profile analysis identified four mutually exclusive subgroups based on patterns of school burnout responses, that were linked to meaningful indicators of academic success and health. Longitudinal analysis suggested that these profiles followed a relatively stable trajectory over time. Moreover, the item response theory analysis identified a more concise four-item scale.

Focusing on distress, Hernández-Torrano et al. used bibliometric procedures to describe literature on mental health and well-being in university students, using metadata extracted from articles dated 1975–2020. They found out that research has grown over the last decades, was disseminated in a wide range of journals, mainly psychology, psychiatry, and education research ones, was published by researchers with diverse geographical background, and by a number of research groups scarcely in contact between them. They also found out that published papers were relatively interdisciplinary, tended to emphasize pathogenic approaches to mental health, and mainly focused on positive mental health, mental disorders, substance abuse, counseling, stigma, stress, and mental health measurement. Furthermore, Karyotaki et al. investigated perceived stress across major life

areas in college students from 24 universities in nine countries. They found out that 93.7% of students reported at least some stress in at least one area. Besides, Franzoi et al. found out concerning levels of distress in students at an Italian University. 44.1% of students showed state anxiety, 61.6% showed trait anxiety, while they showed moderate to severe depression in 20.4% of cases. Moreover, Backhaus et al. conducted a cross-sectional study among students at their first year at university in Europe, Asia, the Western Pacific, and Latin and North America. 48% of students presented clinically relevant depressive symptoms, with considerably high rates among students from Brazil (86%). Focusing on impostor feelings, Fassl et al. found out a highly prevalence of these feelings in a sample of Austrian university students: more specifically, 8.6% experienced few, 40.3% moderate, 38.5% frequent, and 12.6% intense impostor feelings. They also showed that the impostor phenomenon had a moderate and negative relationship with positive masculinity, and a strong and positive correlation with negative aspects of femininity. Moreover, the relationship between impostor feelings and negative femininity was partially mediated by social comparison orientation. Finally, Wang and Zhao investigated anxiety in a sample of Chinese university students after the outbreak of Covid-19 right before the start of new spring term. 15.43% of students screened positive for anxiety. Interestingly, no significant correlation was found between students' anxiety and affected cases of Covid-19 in their cities or provinces.

For what concerns studies investigating associations between distress and other variables, Karyotaki et al. found out associations between stress in all areas except for health and well-being of loved ones and mental disorders, as well as a significant dose-response association between extent of stress in each life area and increased odds of at least one mental disorder. Moreover, the multivariable models that included all stress measures were significant for all disorders. Moeller et al. found out that stress management techniques were related both to students' maladaptation and adaptation in a sample of US undergraduate students. Moreover, Franzoi et al. found a significant positive effect of negative affectivity on alexithymia, and that alexithymia was a mediator between negative affectivity and both state and trait anxiety, while controlling for age and gender. However, their results did not confirm the impact of students' housing conditions on anxiety. Besides, Moeller et al. (2020) found out that belongingness partially mediated the association between emotional intelligence and adaptation in a sample of US undergraduate students. Students with stronger emotional intelligence showed higher levels of belongingness which, in turn, was associated with better overall mental health. Conversely, students with lower emotional intelligence showed higher levels of rejection which was linked to higher depression, anxiety, and distress. Emotional intelligence was considered also by Navarro-Mateu et al. Emotional clarity and self-efficacy were negatively related to stress and positively related to emotional attention, while none of the variables was a necessary condition for inducing stress, even if the interaction between high levels of emotional attention and low levels of self-efficacy was significant for high levels of stress, and low levels of perceived stress seemed connected to the interaction between

low levels of self-efficacy and low levels of emotional attention. Besides, Backhaus et al. found out that lower levels of individual and macrolevel social capital were significantly associated with clinically relevant depressive symptoms among university students. The likelihood of showing depressive symptoms was also significantly higher among students living in regions with lower levels of social capital.

These results underline that it is of fundamental importance to adopt an integrated approach toward university students' psychological distress. Franzoi et al. suggested the need to develop preventative and therapeutic interventions tailored to students' clinical characteristics, Moeller et al. (2020) suggested to target interventions to students experiencing greater feelings of rejection or isolation, while Navarro-Mateu et al. suggested the promotion of measures and intervention programs aimed at improving students' quality of life, and Backhaus et al. suggested the implementation of on-campus mental health counseling services and interventions focused on enhancing social capital. Moreover, Karyotaki et al. suggested that up to 46.9–80.0% of 12-month disorder prevalence might be eliminated if stress prevention interventions were developed. Besides, Binder et al. found out that even a short intervention might be sufficient to facilitate positive change in non-clinical student samples. Their results showed that students started treating themselves better in their everyday life. They became more supportive and friendlier toward themselves, as well as more aware of how harshly they treated themselves in difficult situations. Moreover, they experienced painful emotions in different ways,

finding relief in considering suffering as part of the human condition, and accepting uncomfortable feelings. Consequently, they started feeling more stable and peaceful, and capable to face pressures and challenges connected to their academic and personal lives. Finally, Frewen et al. evaluated an unguided “safe-place” imagery task, a narrative episodic recall task, and a guided wilderness imagery task comparing a virtual reality condition, a 2-D condition, or an eyes-closed mental imagery condition. The virtual reality condition showed the greater participants' perceived satisfaction and credibility, and the greatest positive affect in response to the intervention.

These results underline that it is crucial that more comprehensive services are provided to support students with mental health concerns. Currently, though, mental health services give priority to first-level interventions (Conley et al., 2015). However, it would be of great importance to increase the provision of psychotherapy and psychiatric intervention, thereby addressing a significant public health problem among emerging adults (Cleary et al., 2011).

AUTHOR CONTRIBUTIONS

All authors equally contributed to the manuscript and approve the final version of the paper to be published and agree 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 are appropriately investigated and resolved.

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Becoming Aware of Inner Self-Critique and Kinder Toward Self: A Qualitative Study of Experiences of Outcome After a Brief Self-Compassion Intervention for University Level Students

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This qualitative study investigated ways in which student participants in a three-session self-compassion course became more compassionate toward themselves and challenges related to this change. Ninety-four participants completed an online survey and 12 participants were interviewed face-to-face. First, a thematic analysis of the responses from the online survey was conducted, and then sorted by frequency, indicating their representativeness in the written responses. The following themes were identified: (1) being more supportive and friendlier toward self, (2) being more aware of being too hard on oneself, (3) feeling less alone when having painful feelings, (4) having more acceptance of painful feelings, and (5) feeling more stable and peaceful. These five most frequent themes served as a basis for a structured phenomenological analysis in the next analytic stage. They were used as a template for a content analysis of the interview material. Subsequently, a phenomenological analysis was conducted on the interview transcripts covering the five thematic areas.

Keywords: university students, self-compassion, qualitative study, intervention, stress

INTRODUCTION

Student life is associated with a multitude of pressures. Students often alternate between academic ambition and fear of failure. They must often cope with challenges connected to identity development, establish new relationships and find a healthy balance between work and leisure time. In a historical period with increased market-orientation and neoliberal values, perfectionistic demands seem to increase (Curran and Hill, 2019). Existing research indicates that the prevalence of stress is increasing among students in higher education (Robotham and Julian, 2006). Many students have coping strategies and lifestyle habits that put them at risk for low stress tolerance (Bland et al., 2012). Moreover, a growing body of research indicates a high prevalence of mental health problems among students in higher education, and indicates that these problems may be growing both in number and severity (Zivin et al., 2009; Hunt and Eisenberg, 2010; Twenge et al., 2010;

Evans et al., 2018). Studies have reported that a sizable minority of students experience light to moderate mental health problems, and that their prevalence is much higher than in a non-student population within the same age group (e.g., Stallman, 2010; Shot-study, 2018).

Self-compassion is described as a healthy way of responding to failure and distress, and refers to the disposition to meet distress with self-directed kindness (self-kindness vs. self-judgment), to understand that one is not alone in experiencing difficulties (common humanity vs. isolation), and to notice distressing feelings without getting lost in them (mindfulness vs. over-identification) (Neff, 2003a). Learning to be compassionate toward oneself might help individuals develop their ability to recognize needs, and motivate themselves toward changes that are meaningful to them. Moreover, a self-compassionate stance may help in coping with challenging emotions with a greater degree of understanding and acceptance. Leary et al. (2007) suggest that self-compassion may buffer people against negative self-directed feelings during distressing social events, and also make them more able to evaluate themselves and their possible shortcomings without being overwhelmed by negative emotions. In a meta-analysis, Zessin et al. (2015) found a positive relationship between self-compassion and psychological well-being, and found that this association was somewhat stronger for cognitive and psychological well-being than for affective well-being.

Given this context, this qualitative study explores the issue of how university and university college students experience self-compassion interventions. Knowledge about students' lived experience with both challenges and positive outcomes when working with self-compassion in everyday life can offer clinicians and researchers valuable hypotheses about effective change processes, which may in turn guide future practice. To date, only a few studies have examined the effect of self-compassion interventions for university students. Among them are studies that suggest that a mindful self-compassion (MSC) course can increase self-efficacy and optimism (Smeets et al., 2014) and reduce negative thoughts and emotions (Arimitsu, 2016).

This study is concerned with possible effects of trying to help students to become more self-compassionate, using a three session self-compassion intervention. In a multi-method project, including a quantitative multi-baseline randomized controlled trial (RCT), we reported the effects of a three-session self-compassion course on healthy and unhealthy self-regulation and symptoms of anxiety and depression in university students. In the quantitative study, we found gains in personal growth self-efficacy and healthy impulse-control and reductions in self-judgment and habitual negative self-directed thinking, as well as increases in self-compassion and reductions in anxiety and depression. Changes remained at 6-month follow-up for personal growth self-efficacy, self-judgment and habitual negative self-directed thinking, as well as for self-compassion, anxiety, and depression (Dundas et al., 2017).

Very few studies have explored how young adults experience the process of establishing a more compassionate way of

treating themselves in difficult situations. In a mixed methods study of young women athletes, Ferguson et al. (2014) found that self-compassion was experienced as useful in difficult sport-specific situations, both strengthening perseverance and decreasing rumination. Participants experienced that motivating themselves in a friendly way improved their performance more than aggressive forms of self-criticism. In a phenomenological study of adolescents who had gone through a variety of life difficulties, participants indicated that self-compassion helped them to maintain a positive outlook, self-acceptance, and emotional balance (Klingbe and Van Vliet, 2017).

The aim of this qualitative part of our multi-methods project was to investigate the lived experiences of the students who participated in the brief group-based self-compassion intervention (Dundas et al., 2017). Here, we explore the following research questions: what do the students describe, in their own words, as the most important outcome after participating in a brief group-based self-compassion intervention? In what ways did the students become more compassionate toward themselves? What was it about the intervention that contributed to such an outcome?

MATERIALS AND METHODS

Setting

The findings reported in this qualitative study were collected as part of the larger multi methods clinical study conducted on-campus at University of Bergen (Dundas et al., 2017).

Participants

Initially, 158 participants (85% women, mean age 25 years, standard deviation [SD] = 4.9) were recruited to a study on 'self-compassion for students' via information on student websites hosted by a local university and two university colleges during spring 2016. A clear majority of participants were Caucasian and of Norwegian nationality.

Ninety-seven students completed the intervention in one of four identical courses. A *t*-test comparing students who completed vs. dropped out showed that they were similar with respect to gender, age, and baseline values of the variables of interest (Dundas et al., 2017). The 97 completers (80 women, 17 men) represent the full participant sample contributing to the initial qualitative survey in the project. Twelve of these participants contributed to individual interviews in addition to the qualitative survey responses. The 12 participants contributing to in-depth interviews were one man and 11 women with a mean age of 23.

Intervention

The intervention was based on components of the MSC course developed by Neff and Germer (2013), and elements of Compassionate Mind Training (CMT, Gilbert and Procter, 2006), as well as Mindfulness-Based Stress Reduction (MBSR, Santorelli and Kabat-Zinn, 2009). Three 90-min sessions were delivered over a period of 2 weeks. Sessions were led by the first author;

the second author was available in the room during the course to help if any participant needed one-on-one attention.

In the first session, the participants were introduced to mindfulness and self-compassion through a 15-min lecture, followed by short mindfulness and self-compassion exercises, group discussions, and experiential practices. In the experiential practices the task is to immerse themselves in experiences (for instance, to consider how they treat themselves and how they treat others in difficult situations), and then reflect upon these practices. The second session dealt with mindfulness, common physical stress reactions, shame reactions, how to cope with destructive self-criticism, how self-compassionate behavior might influence the body and mind, and activating and soothing affective systems within an evolutionary and attachment based framework (Gilbert and Procter, 2006). The final session comprised discussions on positive feelings, reflections on how one wants to live, and further discussions about compassion for oneself and others, adapted from Germer and Neff (2016).

Participants were provided with a link to an audiofile with guided mindfulness and self-compassion exercises for daily use between sessions, as well as copies of the presentations given in each session. Between the first and second sessions, we encouraged participants to use the 15-min audio guides to practice 'affectionate breathing' and 'loving kindness for ourselves' on a daily basis. These exercises were adapted from the MSC program (Neff and Germer, 2013). Between the second and third sessions, participants were expected to use the audio guides to practice two new 15-min exercises: 'mindfulness of breathing, body, and emotions,' adapted from the MBSR program (Santorelli and Kabat-Zinn, 2009), and 'giving and receiving compassion,' adapted from the MSC program (Neff and Germer, 2013).

Design and Data Collection Method

Questionnaire

Shortly after the courses, all participants who completed the four self-compassion courses ($N = 97$) filled out an online questionnaire. They were asked to rate the usefulness of the course on a four-point scale from not at all useful to very useful. Those who rated the course as "a little," ($n = 14$) "somewhat," ($n = 37$) or "very" ($n = 47$) useful, in sum, all but three respondents (missing = 2, not at all = 1), were provided with an open-ended follow-up question: what was the most important thing you got out of the course?

Interviews

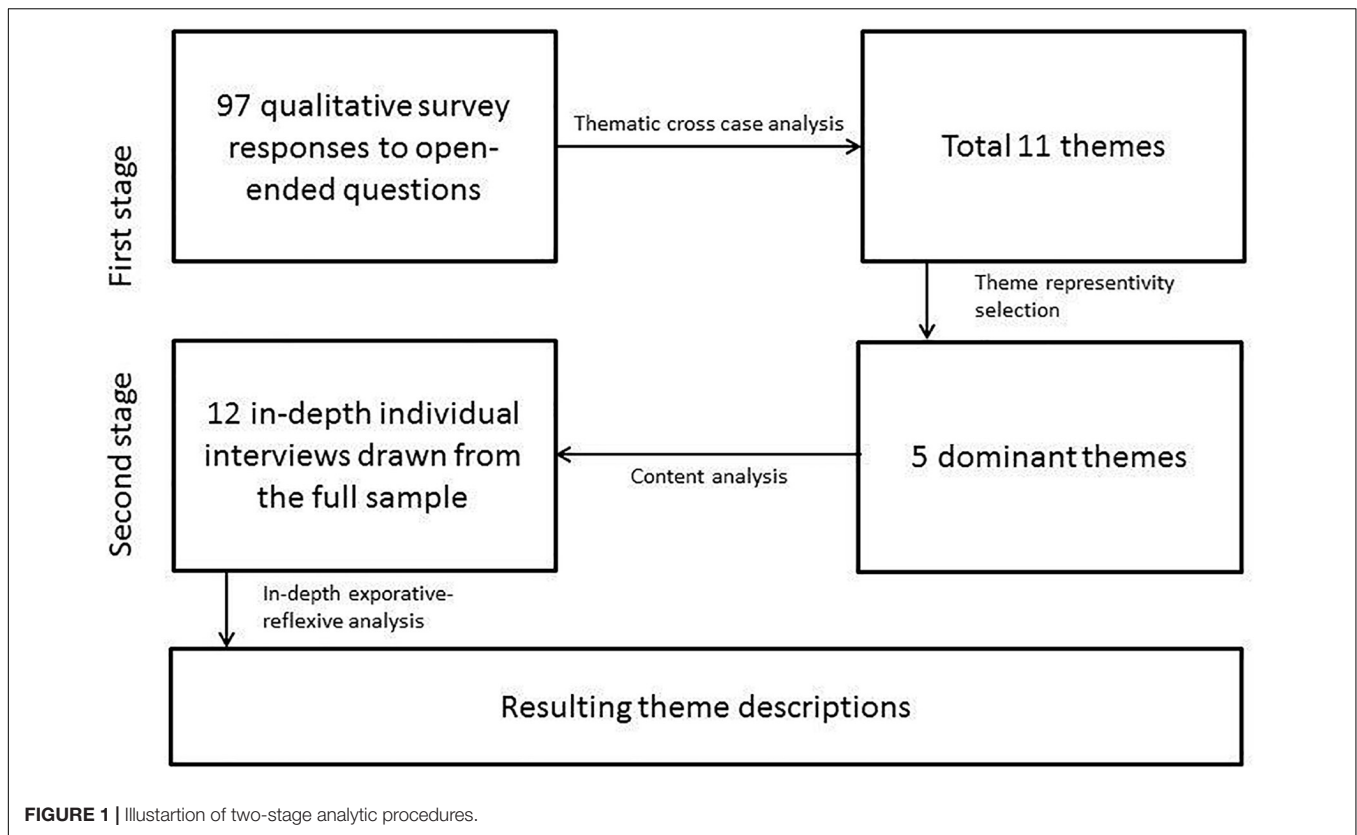
When they signed up for the course the participants were informed that they might be contacted for an interview. Following this procedure for the full completer sample, a sub-sample of 12 of the 97 participants was randomly selected and contacted by phone, and asked to participate in a one-on-one in-depth interview. The interviews were conducted face-to-face, 2 to 4 weeks after the course, in the interviewers' offices, and lasted 30–45 min. All participants who were invited agreed to be interviewed. Interviews were semi-structured and conducted by the third and fourth author, who had not participated in facilitating the course. The interview guide was not based on any specific theoretical approach, although

it was informed by Neff's (2003b) conceptualization of self-compassion. It aimed at an open-ended phenomenological exploration of the participants experiences. The interview started with an open question about what was the most important thing they got out of the course. If the participants described that they treated themselves in other ways than before the course, or motivated themselves in new ways, they were asked specifically to describe situations in which they did so. The interview also explored whether the participant believed that the course had influenced how they handled exams and evaluations, and possible changes in relationships. The last part of the interview focused on the participant's experience of the course and its different components, and also on possible negative experiences or negative outcomes. The interview guide is included as **Appendix**.

Methodological Approach and Data Analysis

We chose a qualitative method that retains the thematic content of the interviews to be able to trace subtle nuances of client perceptions (Braun and Clarke, 2006). This explorative-reflexive thematic analysis was conducted with hermeneutical-phenomenology as an epistemological premise (Laverty, 2003; Binder et al., 2012). The commitment to, and preparation for, exploring experience on a concrete level is the basis of the phenomenological element in our approach (Van Manen, 2014). In line with reflexive methodology, we used our dialog with the participants' narratives and descriptions to explore and reflect upon the interpretive lenses our professional and theoretical backgrounds bring in. Our goal was to establish a reflexive stance, and as much as possible become aware of how our preunderstanding and preconceptions might affect the way the interviews were conducted as well as our analysis of the transcribed material (Alvesson and Skoldberg, 2000; Finlay, 2003). In line with usual practice in reflexive methodology, we present information about our professional background in the "researcher"-section, that might be relevant for how the focus of the study formed and for how data is interpreted. The rationale for the focus on the researchers as well as the participants, is that research is regarded as an interactional enterprise in which the findings are products of the interplay between researchers and participants. We aim to make our collaborative work as a team and our reflexive processes transparent in this article to enhance the quality and trustworthiness to our study.

In order to explore both a large qualitative dataset whilst still maintaining the ability to follow up these themes in-depth we chose to pair a content analysis with a thematic analysis of 12 detailed individuals' accounts. Using a template of themes derived from the large dataset allowed us to identify how representative overarching themes were for the larger group, whilst exploring in-depth the unique lived experiences of these themes in a smaller sample of individuals. By pairing these methods, we could cross-validate the themes, whether they were still salient in the more in-depth accounts and whether more detailed follow-up interviews identified more central identifying themes.



The analysis followed a two-stage process. The first stage was to analyze the written responses to the open-ended question in the electronic survey (“What was the most important thing you got out of the course?”), which was completed by 94 of the 97 participants. All researchers read these 94 short responses (approximately 100 words per participant). By comparing individual accounts, we wanted to identify both patterns of commonalities and differences in what participants experienced as the most important outcome of the course. The first author identified separable content units that represented different experiences of what the most important outcome of the course was. Second, he edited the text in accordance with those codes into coded groups of text. Then he interpreted and summarized the meaning within each of the coded groups of text fragments into conceptions and overall descriptions of 11 themes. All authors then turned back to the overall text to check whether voices and points of view in the students’ responses should be added, and if there were any themes which could be added or developed further. This resulted in some minor reformulations. The five most frequently mentioned themes were chosen for further in-depth analysis.

In the second stage of analysis, we analyzed the in-depth interviews of 12 participants by applying an explorative-reflexive thematic approach. See **Figure 1** for a visual overview of the analytic procedures.

The analysis of the 12 interviews proceeded through six steps. First, all researchers read all the transcribed material to obtain

a basic sense of the participants’ experience. Second, the first author conducted a content analysis, coding the interview-text with the five themes from the stage one analyses as templates. Third, all the other researchers read through the text to check whether they agreed with the first author’s coding, and whether the themes that the templates build upon were representative of the content of the text. After critical examination, the researchers reached consensus on which parts of the text were to be included in the thematic templates. The researcher team agreed that that these templates covered sufficiently large and central parts of the interviews that they could be used for in-depth exploration of the participants’ experience within the thematic areas. Fourth, the first author interpreted and summarized the meaning within each of the coded groups of text fragments into detailed descriptions of experiences, reflecting those which emerged as the most important aspects of the participants’ experience. Fifth, all authors reread the text to check whether voices and points of view should be added, conceptions and descriptions could be developed further, or correctives made to the preliminary line of interpretation. Sixth, the phenomenological descriptions were finally formulated and agreed upon by all six authors.

Researchers

The study was conducted within the Research Group for Clinical Psychology at the University of Bergen. The first author is a professor of clinical psychology with 24 years of clinical experience with adults, adolescents, children, and families.

His clinical approach is integrative, and he has training in mindfulness- and self-compassion approaches, in addition to Emotion Focused Therapy, and interpersonal/relational psychoanalytic therapy. The second author is an associate professor of clinical psychology with over 30 years of experience working part-time as a clinical psychologist in family and individual settings. Her clinical approach is integrative, and she has training in mindfulness- and self-compassion based approaches, and interpersonal/relational psychoanalytic therapy. The third author is an associate professor in clinical psychology with 11 years of clinical experience with adults, adolescents, and children. She has a special interest in treatment of complex trauma and has training in phase-oriented trauma treatment. Her general clinical orientation is integrative, drawing on humanistic, cognitive, relational, and systemic approaches. The fourth author is an associate professor of clinical psychology with 8 years of clinical experience, and has training in MBSR, Emotion-Focused Therapy, and Cognitive/Systemic Therapy. His general interest is integrative, with an emphasis on humanistic, relational, and existential approaches to psychotherapy. The fifth author is a research fellow and psychologist with 6 years of clinical experience with training in self-compassion and mindfulness-based approaches. The sixth author is a specialist in clinical psychology with 12 years of clinical experience. He holds an adjunct position as professor of clinical psychology, and has training in humanistic and emotion focused approaches to clinical practice. All researchers have previous experience with qualitative research.

Ethics Statement

The study was approved by the Regional Committee for Medical and Health Research Ethics (Region West) situated at the medical faculty of the University of Bergen, and by the Norwegian Centre for Research Data. Pseudonyms are used for participant quotes in the following to secure their anonymity.

RESULTS

First Stage Analysis: Thematic Analysis Across Open Ended Survey Responses

As described as the first stage of the analysis in the methods section, we first conducted a thematic analysis of the 97 written responses to the open ended survey question “What was the most important thing you got out of the course?” We identified 11 themes with varying coverage across participants. Some participants reported one important outcome, whereas others reported several. **Table 1** provides an overview of the 11 themes and how broadly they were represented in the material.

As can be read from the table, the five most common themes on the open ended survey-question addressed phenomena of supportiveness and friendliness toward self, awareness of harshness toward self, feeling more connected to other people, being more accepting of emotions, and feeling more stable and peaceful in mastering stress. These were carried on as templates

TABLE 1 | Common answers from participants who completed the intervention.

After the course:

“I am more supportive and friendly toward myself when things are difficult or feel painful” (<i>n</i> = 37)
“I am more aware that I am too hard upon myself or treat myself badly” (<i>n</i> = 32)
“I feel less alone in the world when experiencing painful feelings and difficulties” (<i>n</i> = 23)
“I am more accepting of painful or uncomfortable feelings, and more easily allow the feelings to be there” (<i>n</i> = 22)
“I feel more stable and peaceful, and have learned new ways to cope with stress” (<i>n</i> = 19)
“I became more self-reflective” (<i>n</i> = 10)
“I become more aware of joyful feelings” (<i>n</i> = 10)
“I acquired more knowledge about self-compassion and self-criticism” (<i>n</i> = 8)
“I have learned useful tools and techniques that I can use in everyday life” (<i>n</i> = 8)
“I became more accepting of my needs” (<i>n</i> = 7)
“I am more aware of my feelings and bodily reactions” (<i>n</i> = 6)

for the first step of the analysis of the in-depth interviews. In the following, we present results from the second stage of this analysis in more detail, providing phenomenological nuance through details and quotes.

Second Stage Analysis: In-Depth Exploration of Identified Themes Through Analysis of Interviews

Original themes from stage one are further analyzed in the second stage, expressing new core meanings arising from in-depth exploration in dialog with the 12 participants.

I Am More Supportive and Friendlier Toward Myself When Things Are Difficult or Feel Painful

Participants described having begun a process of treating themselves better in everyday life. They described this as a gradual process of change, where they took one step at a time, often through trying—and sometimes failing—when encountering difficult situations. For example, one participant, Maria, said:

I have really noticed it now during this exam period, that I have been a part of now. With—in a way—not being so hard on myself with thoughts like, ‘I can’t do this.’ But instead trying to turn around and think: ‘Yes, this has been a difficult year.’ And, now—like—I’ve come to think: ‘you’ve done well.’ And try to think a little more positively, and basically be self-compassionate for the situation I’m in. (...)

S: Sometimes it hasn’t worked so well, but other times it has. In a way, I’ve taken a little breather/“Think about your breath—let it be in focus” and thought: ‘You’ve done well.’ Yes. Considering what I have experienced this spring, [I tell myself] ‘it’s okay to be satisfied with what you’ve accomplished.’

This quote indicates that Maria understands her academic struggle in a wider perspective, as an understandable result of difficulties in an important interpersonal relationship this

spring. Compassionate breathing is part of the course, and she uses this practice during painful events in her daily life, combining an awareness of the breath with friendly self-talk. Maria experiences herself to still be in the process of moving toward a more accepting and friendly way of treating herself, something she has in common with all the participants that were selected for interviews.

Participants described what they learned as something quite simple, at other times also as something that they were already familiar with. But, paradoxically, they also described it as something new that represented a very important change in the way they treated themselves. On the one hand, being self-compassionate was simple; on the other hand, when it came to actually doing it, it was far from easy. Some participants also highlighted the use of practices and exercises that facilitated a friendly attitude toward oneself. They described it as a form of skill training, and one of them drew parallels to first aid training. The student discussed above, Maria, formulated it this way:

It's probably the same as with other things, that you practice first aid, right. Then you know that you're better prepared when a situation occurs. It actually helps to practice being kind toward yourself, so you can use it when it becomes necessary.

I Am More Aware That I Am Too Hard on Myself or Treat Myself Badly

Many participants were surprised to find how powerful it felt to become more aware of how harshly they actually treated themselves in difficult situations. They were also surprised at how quickly this awareness made a crucial difference in their lives. The exercise from the first session—how would you treat a friend in a difficult situation, and how would you treat yourself?—was described as a very important experience for many of them. One participant, Inga, described it as a 'wake-up call':

We were presented with a situation (. . .), and then we were supposed to write down how we thought we would react to it, and how we would've reacted if a friend were in the same situation. And then I noticed a huge difference in the way I treat myself and how I would treat a friend. In a way, that was the first wake-up call that I had during the course.

I: How did that affect you?

S: It got me to realize that I am really hard on myself, and he talked about the inner critic, and I realized that for me, it's really mean (. . .) It got me to really think about, for the rest of the day, to think about all the times I've probably been a little hard on myself, but in a way, not really realized it.

In the short run, this insight was a source of worry for her. The night after she experienced this 'wake-up call' she felt restless, and repeatedly asked herself why she treated herself so badly. It seemed she balanced on a thin line between rumination and constructive self-reflection. After some days, she landed on the self-reflective side, and made plans for how she could treat herself better in difficult situations. This led her to experience more mastery and positive feelings. It was also described as useful by

many participants to externalize and personify their own self-criticism as 'an inner critic.' They spontaneously used this term to describe a harsh part of themselves that became active in difficult situations and made them feel more stressed, ashamed or anxious. Inga explained:

I feel like I've become more aware, especially of the inner critic they talk about. That I am a little more aware of when it starts to talk, and pay attention when: 'Oh, no, now I started to think a little negatively.'

The times when she became aware of this, she consciously provided herself with support. Another participant, Karen, described her inner critic in even more personalized terms:

The biggest relief was giving the inner critic a pat and saying, yeah, yeah, now, you can just sit here and complain, I'll get back to you.

I: So that you, in a way, put it on hold. . .

S: Yes, I get to put it on hold for a little bit or get a little distance to the constant train of talk, and yes. . . When I am aware of it, it's not so intense.

For her, as for several other participants, becoming aware of destructive self-criticism in itself seemed to soften it, something that seemed to create a space for more self-accepting attitudes:

I actually feel like I'm a little more accepting when things go wrong, or things don't go as well as I had hoped. Then instead of putting myself down, I can, in a way, be a little more accepting, and instead focus on what I can do here and now to improve it.

I Feel Less Alone in the World When I Have Painful Feelings and Difficulties

Participants expressed that the way the course highlighted suffering as a natural part of the human condition, as something that everyone had to cope with, albeit in different forms, was experienced as a relief. This topic was both a part of the psychoeducational curriculum of the course and something that was addressed in discussions, inquiry and in the exercises. One participant, Thea, described how insight into the commonality of her difficulties itself made a huge difference:

It was that feeling of: Yes! I'm not alone—in a way. Kind of like, I became a little calmer. And kind of relieved that it's okay. (. . .) A reminder that it's okay that you can't do it all the time. But it was interesting to experience that when I went through kind of bad things too (. . .) I could feel that I was in it then.

Thea seemed to feel less lonely and this helped her mobilize resources to deal with difficult experiences. She did not have to fight painful feelings as much; she could more easily accept them. Her experience of being part of a group with ordinary young adults who also faced challenging emotional situations even evoked positive feelings, and made it possible for her to be more present.

Another participant, Elisabeth, explained that she applied the insight that suffering was something she had in common

with others as a way to comfort herself. She could remind herself that 'Yes, that's human.' Other participants said that this experience of sharing a common humanity made them feel less lonely, safer, and less ashamed. The recognition that others also face painful feelings and difficult life situations also became evident to participants in more implicit ways, through sharing in the group, structured exercises, and dialogs between participants.

However, some of the participants also felt ambivalent about sharing, and described it as somewhat anxiety-provoking to suddenly have to share experiences from the exercises with the stranger sitting next to them. For instance, Helga stated:

That was probably the part of the course that I feel like didn't quite work. It was really dependent on who you were talking to and your chemistry. And I feel like, of the people I ended up with, there weren't that many who were as extroverted. Plus it's like... you have to let your guard down really fast. So I don't think I got so much out of that [part]. I didn't learn that much from pairing into groups of two and talking with my neighbor.

Despite the fact that it was anxiety-provoking for some, many participants described talking with others as a very important and useful part—perhaps even the most important part—of the course. For example, Olga described sharing as a way to discover something about herself:

So it wasn't just sharing with her, but it felt like I was sharing it with myself for the first time too. But because she responded so well, that nervous feeling went away really fast, and I got a lot out of it. I was left with the feeling of, yes... yes, that was a little scary, but also... I'm so glad I was brave enough to do it. Yes.

The 'self-compassion pause,' which is taught during the first part of the course, consists of three parts—recognizing painful emotions, reminding oneself of how suffering is part of the human condition, and then turning to needs—'what do I need when I feel pain like this.' The notion that distress is a common human feeling was described as useful and thought provoking. However at least one participant expressed ambivalence regarding being reminded that suffering is part of the human condition. In some social situations the notion that suffering is part of the human condition and that 'all people have problems' can be used defensively, for instance by health personnel treating suffering individuals, which can be experienced as a rejection by the patient. Instead of hearing: 'you're not alone,' participants may hear 'you're not so special and I don't care about you.' One participant had recently experienced a situation like that, and this made the topic problematic to her. For this participant, Andrea, step two of the self-compassion pause became difficult to handle:

S: That step number two, where you acknowledge that others experience the same thing.

I: Yes?

S: There I like got a little, pissed—because that's exactly what I've heard from the doctor and the nurse after the operation.

I: What did they say to you?

S: Well, (...) it was like: —Yes, the operation didn't go well, but there are a lot of other people who've experienced that, there are lots of people who have had to quit the sport—that's just how it is.

After a while, she managed to differentiate between this very frustrating communication at the hospital and the way the topic of common humanity was addressed in the course. Andrea explained that '(I) think it was a little better to hear it during the course [rather than at the hospital] because then it had a [different] context instead of just being an isolated message.' Step three in the exercise became very important to Andrea, she felt relieved when she turned her attention to her own needs: 'So I got pretty mad, but then it continued to the third step where it was: what do I need now? And it was actually for me just to continue to see if I can get it [to work in a different way]. And then I felt a little better again.'

I Am More Accepting of Painful or Uncomfortable Feelings, and More Easily Allow the Feelings to Just Be There and Not to Escalate

Many participants expressed that participation in the course made it easier for them to accept painful and uncomfortable feelings, and even to provide themselves 'with some help' rather than letting difficult feelings escalate, as one participant said. This, in turn, made them feel more safe and secure. They had more faith in their own inner resources and ability to handle difficult emotions, as Anna described:

Like, if I feel uncomfortable for whatever reason, then I think like, I can help myself then in a way. I don't know if it makes sense, but it's like I don't just need to wait for it to pass (...) I think more about what I feel and such. Kind of like what the instructor talked about actually, that you let the feeling be there, but at the same time there's a kind of security at the other end (...).

I: So there's a kind of safety, it's totally okay, to feel that emotion, that it can be there without getting pulled in a sort of downward spiral.

S: Yes. Actually that. I think I've avoided a lot of uncomfortable feelings before, because I'm probably prone to thinking negatively. And now I experience them more, but with a kind of security.

In this way, Anna felt able to support herself when difficult emotions awoke. She seemed more able to differentiate between the painful feeling in itself and the cascades of negative thoughts that also arose in these situations. Accepting the feeling and treating herself in a friendly manner seemed to make her more able to decouple from her former thought patterns. In this way, she could step out of rumination before negative thoughts made her feel worse. We also see from this example that she seemed to feel more autonomy when she felt that she had resources to master a difficult situation on her own.

Another participant, Emma, described how she became more aware of what she needed in situations that made her

angry, which increased her ability to handle her needs in an autonomous way:

If I get like that, I can get really mad for example, and instead of thinking: Oh, I'm so mad and I'm so dumb, and just becoming angrier and angrier... I think that: Yeah, yeah, it's not that strange(...) For example, if I get in a fight with my boyfriend, I often want his validation that I am good, even if I am so angry, but he doesn't want to give me that because he's really mad at me. Now I've started to think, or understood, after that course, that I can give it to myself then. I don't need him to give it to me, in a way, a validation that I am actually a good person even if I'm mad and act stupid. That there are—like—reasons for that. So that's really helped. Then, I don't get as mad either.

Some of the basic assumptions in the curriculum of the course were already familiar to some of the participants, especially when it came to the value of allowing and accepting negative emotions. Some of them were psychology students while others were familiar with the ideas due to the popularization of mindfulness in the media and on the internet. The experiential nature of the course, and the weight given to exercises and practical tools, were described as providing a direct experience that had a distinct impact compared to a more theoretical understanding:

It [the course] was actually a tool for how to practice something I've understood purely theoretically. Let feelings be there, as they are, accept them as they are, make space for them, give them room. And I've tried that, but not really understood how to do it, so I felt that the methods and techniques we learned were a really good way of practicing what I've tried to do.

This participant, Else, said that participation in the course gave her useful tools to deal with difficult situations, and changed the more abstract idea of acceptance into something practical and real that she could use in her own life. Acceptance of painful feelings seemed to lead to an experience of robustness and increased autonomy when handling everyday life challenges. Participants seemed to feel more confident that they could handle challenges, both when it came to academic demands, and in relation to difficulties in their relationships with others.

I Feel More Stable and Peaceful, and Have Learned New Ways to Cope With Stress

Stress management was not defined as part of the curriculum of the course *per se*, but several participants described stress-management as the most important outcome. Friendliness toward oneself, especially physically, was often an implicit or explicit part of their new ways of handling stress, as Emma describes when asked about changes after the course:

That I am much better at listening to my body when I should take a break and relax. And then tell myself that that 'It's okay, it's okay to do that.' Yeah... Those are the biggest changes.

Emma described a more caring attitude toward herself when it came to basic physical needs, such as the need for rest when she

was tired. Following this, she became more accepting toward the emotional body, and gained trust in the ways that emotions can physically be contained and processed:

I choose to like, go into it, (...) yesterday, for example, I got really stressed for a lot of reasons, and in addition, I was really exhausted. And I started to rile myself up and started thinking; 'Oh my God, it's going to go wrong and everything is going to go badly,' and really like worst case scenario thoughts and catastrophizing, and then I started to like, cry and then instead of just laying down and continuing to think and not going out, I laid down on the bed for a little bit and just tried to listen to my body and let all the thoughts go on, or try to not force them away, just let them be there. And then I calmed down a lot. I was still pretty sad, but I wasn't. after that I could still go out and continue. (...)

Meditative practices were a core part of the curriculum, and several participants described that they experimented with the techniques in similar ways to this participant. The meditation exercises and techniques in themselves were described as an important source of inner peace and useful tools to establish more stability in their emotional life. Some participants described it as challenging for them to practice meditation in the class, especially the parts that involved attention toward the heart and breath. But even some of those who initially felt these exercises were challenging described these practices as quite powerful, sometimes to an extent that surprised them, especially when it came to their stabilizing potential. Helga described it this way:

And there was also a time, I thought I was going to be late so I was pretty stressed and had just managed to sit down, and I could feel my heart racing, and then we were supposed to start an exercise, and I could tell 'Oh, now I am anxious, wow,' and I got really stressed. And then we were supposed to feel our heartbeat. And then I could tell, okay, now it's starting to help, now it's beginning to... When I started the exercise my heart was racing, and I thought it was really uncomfortable and I thought everybody would be able to see that it's uncomfortable, and [I started to] imagine that someone is sitting with their eyes open and watching me. [However] When the exercise was over I was totally calm. So I think it had a really good effect on me.

Another participant who presented herself as a person unable to meditate because her 'attention was all over the place' experienced that the practices gave her more inner peace over time. So increased inner stability was an important topic when it came to what the participants described as the most important outcome of the course. It was also possible to see this as an implicit thematic pattern in the other themes the analysis brought up.

DISCUSSION

In analyzing the responses to the open-ended survey question and the interviews, we found that most of the answers

revolved around finding new, less harsh ways of relating to oneself. This is in concordance with the findings from the quantitative part of the study, which showed a decrease in self-judgment and habitual negative self-directed thinking following the intervention (Dundas et al., 2017). In the present study, it became evident that all the informants we interviewed had experienced important changes in the way they related to themselves. Participants were more aware of how they treated themselves and managed to stay more supportive and friendlier toward themselves, particularly in the face of challenges. Even though awareness and self-support are presented as two separate subthemes in our results, these themes are clearly interrelated, as evident from the first quote from Maria (see p. 13). Maria describes how she now immediately notices when she starts to become highly self-critical, and is able to use this awareness as an opportunity to apply resources acquired from the course (such as attend to the breath) and be self-supporting in a difficult situation. While the students' written responses to the open questions in the survey had pointed to the importance of becoming aware that one treated oneself too harshly, the interviews painted a more nuanced picture. There seemed to be a bi-directionality of awareness and self-support: while distress-awareness was necessary for responding supportively to inner distress, treating oneself kindly and with support seemed to open students up to greater awareness of distress and vulnerability.

Although the way awareness is facilitated differs between therapeutic approaches, awareness of thoughts and feelings as a premise of change resonates with thinking across different theoretical approaches, including cognitive therapy (Furlong and Oei, 2002), mindfulness-based cognitive therapy (Teasdale et al., 2000), and the tradition of mindfulness and self-compassion (Neff, 2003a; Frewen et al., 2008; Birnie et al., 2010). The interrelation between awareness and new actions reported by the participants in the present study points toward two interesting aspects of our findings: first, the participants' stories showed the potential transformative power in increased awareness—but also how difficult this transformation of awareness into behavioral change can be. The participants described in various ways the paradoxical experience of finding the focus on being aware of distress and being kind to oneself familiar, almost simple, and at the same time really important in driving change, and difficult to live by. The psychoeducation and the practices during the course were experienced as important resources to make this transition from theoretical knowledge to actual experience and practical changes in everyday life. It seems that the repetition of exercises both in the meetings and between sessions facilitated an acceptance that practice is necessary. One participant even drew parallels to practicing first aid. This might carry significance, as being friendly toward oneself is easy as long as everything runs smoothly. It is when things become difficult that self-support becomes necessary (i.e., definition of self-compassion, Neff, 2003b).

Second, participants expressed surprise regarding how quickly things started to change once they adopted a slightly new focus. This was a very brief intervention—three meetings over

the course of 2 weeks. Still, participants reported significant and meaningful psychological changes over this short period of time, an experiential result that we find validated through the RCT (Dundas et al., 2017) in this multi-method project. The participants' stories show how they adopted the resources provided during the course and applied them as support in the context of their own life situations.

The findings imply that attending to distress over time might reduce distress. This is in contrast to the common belief that attending closely to distressing thoughts and emotions might increase the frequency of those very thoughts and emotions. Self-compassion training combines the awareness of distress with responses that might counteract the tendency for distress to escalate via rumination, shame, or other distressing emotions. The interviews indicated that participants had understood that being self-compassionate meant not adding insult to injury.

The interviews indicated that even a short intervention might be sufficient to facilitate positive change in non-clinical student samples, thus potentially serving a preventive effect for student mental health problems. Participants' descriptions of new ways of relating to painful emotion resonate well with the increase in self-compassion, and decrease in anxiety and depression found in the quantitative data.

The way the participants experience increased agency and resilience is also in line with the findings from our quantitative study, which showed an increase in personal growth self-efficacy (Dundas et al., 2017). Several studies have shown that mindfulness training is associated with increased perceived agency and sense of control (e.g., Monshat, 2012; Moore and Martin, 2015). The present interviews show that not only mindfulness, but also self-compassion, may increase a feeling of agency and provide a useful tool when facing distressing situations and emotions.

Not all aspects of the course were experienced as positive to all participants. Difficulties with finding time to practice between sessions is a familiar problem for most people when learning a new skill, and students have a busy schedule with frequent lectures and deadlines associated with assignments, tests, and exams during the semester. The audio recorded guided meditations were, for this reason, kept short (15 min).

The finding that discussions between participants could be difficult for some might be explained in several ways. It could represent a cultural phenomenon, since 'letting down one's wall' in dialog with a non-familiar peer is not as common in Scandinavia as in, for example, American culture. Also, conducting courses in a group of students who are unfamiliar with each other and the instructor, and who do not have enough time to get to know each other, may pose some challenges with regard to issues of perceived safety. In the current courses this challenge may have been exacerbated by some students knowing the instructor and being familiar with mindfulness and psychology in general, whilst others were not. On the other hand, other participants expressed satisfaction with the discussions and inquiry during the course, stating that this made them realize how common some of their own concerns were. As in any form of psychological interventions, the relationship

between the instructor and the individual participants, as well as among the participants themselves, may be critical in deciding outcomes.

Reflexivity, Scope, and Limitations

Reflexivity involves 'an attitude of attending systematically to the context of knowledge construction, especially to the effect of the researcher, at every step of the research process' (Malterud, 2001, p. 484). All the researchers were also clinicians with a relational, emotion-oriented, and experiential orientation to their clinical work, and most of them also to mindfulness based approaches. On the one hand, this probably sensitized the group to the exploration of issues related to emotional processes, self-self and self-other relations, and the therapeutic potentials of acceptance. On the other hand, it brings the possibility of a bias of overemphasizing emotional outcomes at the expense of cognitive aspects that are also documented to be of high importance in other studies (see for example Zessin et al., 2015). In the analysis, we have taken care to listen and to highlight positive experiences that also have to do with cognitive insights.

The first, second and fifth author also have training in self-compassion based approaches, and this also might be a source of bias. The dominant themes in the findings are easy to relate to theoretical approaches to self-compassion within psychology, e.g., Kristin Neff's model. Neff's concept of self-compassion is a central part of the curriculum of the course, and we hope that our findings reflect how the participants made use of this psychoeducational elements of the course, in addition to the practices that were taught. We invited the authors that were less invested in compassion-based approaches to take a critical role and examine elements of theoretical 'impregnation' in the analysis. However, in a qualitative study our reconceptualization of psychological phenomena will unavoidably play a role in the way we understand participants and their utterances, even when we are aware of our orientations—they also function as lenses. In our opinion, qualitative studies of outcome need to be supplemented by quantitative studies that offer stronger possibilities for disconfirmation of hypotheses.

The interview situation is a relationship between members of the academic staff and students from different fields of study, and the participants are also aware that the interviewers are mental health professionals. It is possible that conversations with peers could bring up other aspects, as happens in a focus group format. On the other hand, the individual interview format ensured confidentiality and opened up the possibility of in-depth exploration of the specific narratives of the participants. As found in the interviews, reflection and exploration together with peers can be experienced as challenging.

The themes selected for in-depth analysis in the 12 interviews are based upon written answers from the survey completed by the larger group of 94 participants. To a certain extent, this can secure representativeness of the themes that are chosen for further exploration. On the other hand, a content analysis based on templates achieved from analysis of a larger sample brings limitations to possible interpretations of the interviews, and exploration into experiences that are specific for the interviewed participants rather than those occurring frequently

in the larger sample. Here, we chose to prioritize themes that were representative in the larger sample of participants.

There were limitations also connected to the intervention as such. Three sessions is a very short course. Many participants experienced the course as a little too short—they thought that one more session would have been useful. Participants experienced the assignment to listen to specific audio-recorded guided meditations between sessions as challenging. Many stated that it was hard to find time for them in a busy week schedule. Some of them also expressed feeling sleepy when they used them.

CONCLUSION

A three-step qualitative analysis of participants experiences after a brief self-compassion course was conducted, consisting of a thematic analysis of finding from our online survey, content analysis of interviews with participants, and phenomenological exploration of these thematic content areas. The most central finding was that the participants experienced that they were more supportive and friendlier toward themselves when things were difficult or felt painful, having begun a process of treating themselves better in everyday life. As part of this process, they became more aware of how harshly they used to treat themselves in difficult situations. Many participants also described that their experience of painful emotions changed, both finding more relief in the fact that suffering is part of the human condition, and becoming more accepting to uncomfortable feelings. As a result of this, many participants also felt more stable and peaceful, and better able to cope with the everyday pressures and challenges in their student and personal lives.

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 Regional Committee for Medical and Health Research Ethics – West. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

P-EB wrote the first draft of the manuscript. P-EB, ID, and SS contributed to the conception and design of the study. P-EB led the analysis of the data. P-EB, ID, AH, SS, and VW contributed to the analysis of the data. CM contributed with critical auditing of the analysis. P-EB, ID, SS, AH, VW, and CM wrote the sections of the manuscript. All authors contributed to the manuscript revision, and read and approved the submitted version.

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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.

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APPENDIX

Interview Guide: Participants' Experiences After a Self-Compassion Course.

First: read the participant's code and today's date

(1) What do you experience is the most important thing you got out of participating in the course?

(A) If the participant experiences that they treated themselves differently than before:

- Can you tell me about a situation in which you noticed that you treated yourself in a different way than before?

If the participant does **not** describe a situation which consists of motivating themselves, you can ask:

- Have you experienced situations in which you motivate yourself differently than before?

If the participant does **not** describe situations in which they failed, or were confronted with their own limitations:

- Have you experienced situations in which you treat yourself differently when you fail, are unable to do something or somehow fall short?

If the participant has **not** described a situation in which they treated themselves with kindness or care when they experienced painful/uncomfortable situations in relation to others, you can ask:

- Have you experienced situations in which you noticed that you treat yourself in a different way than before when something has been painful or uncomfortable in relation to others?
- Do you experience that participating in the course has affected your relationship to your performance* in situations in which your performance will be assessed? In which case, how so?
- Do you experience that participating in the course has affected your relationship to other people in any way? In which case, how so?

(2) What was it that sparked your interest in participating in the course?

(3) What did you expect to get out of the course? How did your expectations compare to what you got out of the course?

(4) After you signed up for the course and before it started, did you start to read about self-compassion or work with the topic on your own?

(5) What was your experience of participating in the course sessions?

If the participant does not mention the small group discussions

- What was your experience of talking to your neighbor (in the sessions)

If the participant does **not** mention the exercises

- What was your experience of doing the exercises

(6) What was your experience of doing the homework?

(7) Was there anything in regards to the course that made you feel uncomfortable? Was there anything that you would describe as a downside to participating?

(8) What do you think about offering the course to all students who want to take it?

Is there anything else that is important to you? Anything we forgot to ask? Anything you have not mentioned?

*Word translated reflects, i.e., work, school type performance.



Emotional Intelligence, Belongingness, and Mental Health in College Students

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Mental health problems are prevalent amongst today's college students and psychosocial stress has been identified as a strong contributing factor. Conversely, research has documented that emotional intelligence (EQ) is a protective factor for depression, anxiety and stress (mental health problems). However, the underlying mechanism whereby EQ may support stronger mental health is currently not well understood. This study used regression analyses to examine the hypothesis that belongingness (inclusion, rejection) partially mediates the effects of EQ (attention, clarity, repair) on psychological well-being in a large sample ($N = 2,094$) of undergraduate students. Results supported the mediation hypotheses for all three EQ components and highlighted that the effects of rejection on psychological well-being were particularly strong. In line with prior research, our results indicate that prevention and intervention efforts with college students could explicitly target EQ skills in an effort to reduce perceived rejection and promote student well-being.

Keywords: mental health, college students, emotional intelligence, belonging, depression, anxiety, stress, rejection

INTRODUCTION

Mental Health Problems

High rates of mental health problems have been documented amongst college students (for a discussion see Auerbach et al., 2016; Xiao et al., 2017). For example, one study reported that 17% of surveyed students met diagnostic criteria for major depressive disorder (Selkie et al., 2015). Using the Depression, Anxiety, Stress Scale (DASS-21) Mahmoud et al. (2012) found 29% of college students had elevated levels of depression, while 27% had elevated anxiety and 24% elevated stress. The elevated rates of depression, anxiety and stress (mental health problems) are also noted in national data such as those from the American College Health Association's National College Health Assessment (ACHA-NCHA; American College Health Association, 2019). In their survey of undergraduate students, ACHA reports 26% of students reported feeling so depressed in the past 30 days that it was difficult to function, while 43% of students reported feeling overwhelmed by anxiety in the same period of time (American College Health Association, 2019). While recognizing that many factors contribute to the high rates of psychopathology of college students, past research indicates that psychosocial stress is associated with mental health problems (e.g., Dusselier et al., 2005; Drum et al., 2009). The transition to college is associated with the developmental challenge of changes to existing relationships (Hurst et al., 2013) while college students also experience increased

exploration in the context of declining social support systems (Conley et al., 2014). Given the close link between psychosocial stress and student mental health, applied work has explicitly targeted psychosocial functioning of college students (e.g., Pratt et al., 2000; Conley et al., 2013).

Emotional Intelligence

In light of the increasing mental health problems and the influence of psychosocial factors for college students, it has become increasingly important to understand the role of emotional intelligence of college students as researchers and practitioners begin exploring opportunities for interventions. Emotional intelligence (EQ) includes “the abilities to accurately perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge, and to reflectively regulate emotions” (Mayer et al., 2004, p. 197). The variability in EQ suggests that some individuals are better able to perceive, correctly identify, and regulate emotions than others (Mayer and Salovey, 1997). Various strands of research suggest that higher levels of EQ are associated with various aspects of psychological well-being, including greater levels of subjective well-being (Sánchez-Álvarez et al., 2015), life satisfaction (Extremera and Fernández-Berrocal, 2005), and better mental health (Martins et al., 2010; Ruiz-Aranda et al., 2012). Further, research has also shown that different aspects of EQ are related to an individual’s ability to perform certain tasks, including academic (Parker et al., 2004; Costa and Faria, 2015) and athletic achievement (Perlini and Halverson, 2006). Focusing specifically on undergraduate students, higher levels of interpersonal and intrapersonal intelligence have been linked to greater college retention (Parker et al., 2006) and end-of-year GPA among first-year students (Schutte et al., 1998; Parker et al., 2004).

Moving beyond emotional adaptation and individual competence, EQ also appears to be involved in the shaping of social functioning. In a study of undergraduate students, researchers found that participants’ EQ was related to their satisfaction with social relationships (Lopes et al., 2003). Specifically, participants who reported having higher levels of emotion regulation abilities were more likely to also report having positive relationships with others, perceiving support from parents, and were less likely to have negative interactions with a friend (Lopes et al., 2003). These results were largely supported by a second study in which an individual’s self-reported emotion regulation abilities were significantly correlated with self-reported positive interactions with friends (Lopes et al., 2004). A noteworthy strength of this study is that the individual’s self-reported emotion regulation abilities were also significantly correlated with friends’ reports of interpersonal functioning (Lopes et al., 2004). Research has demonstrated that higher scores of EQ are associated with more social acceptance and fewer experiences of rejection (Kokkinos and Kipritsi, 2012), as well as larger and more fulfilling social support networks (Ciarrochi et al., 2001). Taken together, these results support the view that the multiple aspects of EQ are associated with better social functioning. Stated differently, individuals who are better able to recognize and regulate their own emotions appear

better able to establish and maintain healthy social relationships with peers and parents.

Sense of Belonging

An important aspect of social functioning is a sense of belonging. The role of perceived belongingness in psychological well-being has also been explored. The seminal work of Baumeister and Leary (1995) provides a valuable theoretical background for this notion. According to the Need to Belong Theory (NBT; Baumeister and Leary, 1995), human beings are motivated to establish a certain amount of stable and positive interpersonal relationships (Baumeister and Leary, 1995). There is extensive evidence to support the NBT. There is a strong positive relation between an individual’s sense of interpersonal belonging and their ratings of happiness and subjective well-being (McAdams and Bryant, 1987). While a lack of social bonds, or explicit feelings of social exclusion, contribute to feelings of anxiety (Baumeister and Tice, 1990; Leary, 1990; Williamson et al., 2018), other mental health outcomes, including depression, loneliness, and social anxiety, are greatly reduced when college students experience a sense of belonging (O’Keeffe, 2013; Stebleton et al., 2014; Raymond and Sheppard, 2018). The need to belong may be particularly pronounced in college students and appears to serve a protective function when satisfied. Yet, despite evidence that EQ is associated with higher quality social interactions with peers (Brackett et al., 2004; Lopes et al., 2004), the relation between EQ and belongingness among college students is not well understood.

The Current Study

High rates of mental health problems are well documented in today’s college population. In an effort to support the well-being of undergraduate students, predictors of mental health problems need to be identified and fostered. In recognizing that psychosocial stressors are contributing to some of the psychological distress reported by college students, aspects of EQ and belongingness have emerged as correlates of mental health problems. To our knowledge, no study to date has examined the association between the different aspects of EQ, belongingness, and mental health in college students. Additionally, elucidating the effects of the EQ subscales (attention, clarity, repair) on mental health in college students could provide an opportunity to direct interventions that target specific emotional skills. Given that greater levels of each of the aspects of EQ have been associated with better interpersonal relationships, this study tested the hypothesis that belongingness (whether measured as level of acceptance, rejection, or both) mediates the effects of the EQ subscales (attention, clarity, repair) on psychological well-being.

MATERIALS AND METHODS

Procedure

The Middlebury Institutional Review Board (IRB) approved all study procedures. An ongoing longitudinal study, the College Student Mental Health Pathways study, is a study exploring

TABLE 1 | Participant characteristics.

Participant characteristics	<i>n</i>	%	Age	
			<i>M</i>	<i>SD</i>
All participants	2,071	100	19.94	1.33
Gender				
Female	1,221	58.31	19.94	1.34
Male	811	38.73	19.91	20.62
Other	62	2.96	20.62	1.57
Sexual Orientation				
Heterosexual	1,655	79.04	19.93	1.31
Gay/Lesbian	85	4.06	19.96	1.43
Bisexual	173	8.26	19.9	1.36
Other	181	8.64	20.05	1.44
Race/Ethnicity				
White	1,519	72.54	19.99	1.33
Asian	195	9.31	19.80	1.29
Black/African American	91	4.35	19.79	1.43
Latinx	189	9.03	19.69	1.36
Other	100	4.78	20.00	1.28
SES				
Lower	239	11.55	19.92	1.40
Middle	1,060	51.21	19.85	1.32
High	771	37.25	20.06	1.31

social/emotional development and mental health outcomes among undergraduate college students. The present analysis utilizes data from wave two, collected in 2019. All students at two liberal arts colleges in the United States received an email inviting them to participate in a study about student stress and mental health. Students who clicked on the link in the email were directed to an informed consent page, approved by the primary author's IRB. Students were able to consent after reading the consent form by selecting one of two radio buttons, 'I consent to participate' or 'I do not

consent to participate'. A total of 2,094 students completed wave two of the study, which resulted in a participation rate of 45.86%. At the completion of the survey, students could enter their contact information into a separate survey to participate in a raffle to win a gift card (values ranged from \$25–100).

Measures

Demographics

Participants reported demographic information including gender, race/ethnicity, perceived socioeconomic status (SES), and sexual orientation. A majority of the sample identified as female (58.31%, $n = 1,221$), 38.73% ($n = 811$) identified as male and 2.96% ($n = 62$) non-binary. The majority of respondents identified as heterosexual, 79.04% ($n = 1,655$), while 4.06% ($n = 85$) identified as gay/lesbian, and 8.26% ($n = 173$) identified as bisexual. Seventy-three percent ($n = 1,519$) of the sample identified as White, followed by Asian 9.31% ($n = 195$), Latinx 9.03% ($n = 189$), and those identifying as mixed race or other 4.78% ($n = 100$). Perceived SES status included 51.21% ($n = 1,060$) of participants identifying as middle SES, 37.25% ($n = 771$) as high SES, and 11.5% ($n = 239$) as lower SES. The average age of the students was 19.94 ($SD = 1.33$). Demographics are presented in **Table 1**.

Depression, Anxiety, and Stress

The DASS-21 scale (Henry and Crawford, 2005) was used to assess depression, anxiety, and stress. The scale can be utilized as a sum score or as three individual scales (i.e., depression, anxiety, stress). Participants were asked to respond to statements indicating how frequently in the past week they experienced any of the symptoms. Response sets and associated values for scoring were as follow: (0) did not apply to me at all, (1) applied to me to some degree, or some of the time, (2) applied to me a considerable degree or a good part of time, (3) applied to me very much or most of the time. Each scale

TABLE 2 | Correlations and descriptive statistics for variables of interest.

Measures	1	2	3	4	5	6	7	8	9
DASS									
1. Anxiety		0.64***	0.74***	0.88***	−0.36***	0.44***	−0.05*	−0.32***	−0.34***
2. Depression			0.67***	0.88***	−0.51***	0.60***	−0.10***	−0.38***	−0.57***
3. Stress				0.91***	−0.33***	0.44***	0.02	−0.34***	−0.40***
4. Total					−0.45***	0.56***	−0.05*	−0.39***	−0.50***
GBS									
5. Inclusion						−0.72***	0.20***	0.33***	0.48***
6. Rejection							−0.16***	−0.39***	−0.53***
TMMS									
7. Attention								0.26***	0.22***
8. Clarity									0.37***
9. Repair									
<i>M</i>	7.17	8.72	10.87	26.76	33.50	16.19	67.11	45.20	29.92
<i>SD</i>	7.64	9.00	8.56	22.42	6.36	15.00	10.92	9.53	6.48

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

contained seven items, with associated scores ranging from 0 to 21. Items in the measure include: “I found it difficult to work up the initiative to do things” (depression), “I felt I was close to panic” (anxiety) and “I found it hard to wind down” (stress). Due to the strong intercorrelations between depression, anxiety and stress (see **Table 2**), the composite DASS score was used to better capture the totality of the mental health experience. Cronbach’s alpha for the full scale was 0.93.

Belongingness

The General Belongingness Scale (GBS; Malone et al., 2012) was used to measure experiences of belongingness. The GBS contains two subscales: Inclusion and Rejection. Each subscale contains six items and participants responded to each item using a 7-point Likert scale ranging from strongly disagree to strongly agree. Sample items include: “I feel accepted by others” (Inclusion) and “When I am with other people, I feel like a stranger” (Rejection). Inclusion and Rejection are potentially orthogonal; it is possible for a respondent to be high (or low) on both, reflecting the simultaneous experience of being included in some circumstances and rejected in others. Cronbach’s alphas were 0.92 for the Inclusion subscale and .89 for the Rejection subscale.

Emotional Intelligence

The Trait Meta Mood Scale (TMMS; Salovey et al., 1995) was used to measure three forms of emotional intelligence: attention to emotions (Attention), emotional clarity (Clarity) and repair of emotions (Repair). The TMMS includes 30 items, 13 for Attention, 11 for Clarity, and 6 for Repair. Participants were asked to use a five-point Likert scale (strongly disagree to strongly agree) to indicate their agreement with each item. Example items include: “I pay a lot of attention to how I feel” (Attention), “Sometimes I can’t tell what my feelings are” (Clarity), and “I try to think good thoughts no matter how badly I feel” (Repair). Cronbach’s alphas for the subscales were: 0.87 for Attention, 0.86 for Clarity, and 0.81 for Repair.

Statistical Procedures

Three parallel mediation models were independently estimated using the PROCESS macro (Hayes, 2017), using pre-defined Model 4. Consistent with the original conceptualization of the TMMS as consisting of independent subscales (Attention, Clarity, and Repair), and with more recent factor analyses that found low levels of cross-loading amongst empirically observed factors (Palmer et al., 2003), the models were estimated separately in order to illustrate the independent contributions of each subscale. Models were estimated both with and without demographic covariates. Covariates tested were gender identification, socioeconomic status, sexual orientation, and race/ethnicity, all dummy coded to allow for their inclusion in ordinary least squares regression modeling. The resulting models including covariates did not differ in significance, sign, or approximate coefficient value from the models that did not include covariates. For ease of interpretation the models represented do not show the covariates.

RESULTS

Bivariate correlations were estimated for variables of interest and are shown in **Table 2**. Note that statistically significant (and meaningfully large) correlations were observed amongst most of the variables, with only the relationships between Attention and Stress having a $p > 0.05$, and only the relationships between Stress and Anxiety and the DASS Full Scale having an estimated $p > 0.01$. The correlations between the DASS Full Scale and the DASS subscales are presented for completeness, but should be interpreted with caution, since the full scale consists of the sum of the subscales, and thus the measures are not independent.

Tables 3–6 show differences in the variables of interest by gender (**Table 3**), socioeconomic status (**Table 4**), sexual

TABLE 3 | Gender differences in Depression Anxiety Stress Scale (DASS), Trait Meta Mood Scale (TMMS) and General Belongingness Scale (GBS).

	Man		Woman		Other	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
DASS						
Full scale	23.51a	21.58	28.52b	22.36	40.88c	26.41
Anxiety	6.21a	7.17	7.72b	7.80	10.81c	8.88
Depression	8.24a	8.77	8.86a	8.95	14.44b	11.36
Stress	9.05a	8.08	11.94b	8.56	15.62c	9.84
TMMS						
Attention	64.08a	11.10	68.82b	10.53	67.71a,b	11.96
Clarity	45.91a	9.50	44.76b	9.54	43.58a,b	9.78
Repair	30.00a	6.20	29.88a	6.62	26.12b	6.66
GBS						
Inclusion	33.33a	6.41	33.66a	6.36	30.22b	7.08
Rejection	16.18a	7.47	16.08a	7.47	20.72b	8.54

Values in the same row with a different subscript are significantly different at $p < 0.05$.

TABLE 4 | Socioeconomic differences in Depression Anxiety Stress Scale (DASS), Trait Meta Mood Scale (TMMS), and General Belongingness Scale (GBS).

	Lower		Middle		Upper	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
DASS						
Full scale	31.20a	24.76	26.54b	22.38	25.71b	21.34
Anxiety	8.60a	8.63	7.16b	7.67	6.78b	7.20
Depression	10.76a	9.77	8.79b	9.04	7.99b	8.49
Stress	11.85a	9.20	10.60b	8.35	10.94a,b	8.56
TMMS						
Attention	65.09a	11.69	66.85b	10.94	67.64b	10.87
Clarity	43.38a	10.19	45.14b	9.42	45.82b	9.44
Repair	28.58a	6.84	29.74b	6.35	30.41c	6.49
GBS						
Inclusion	31.16a	7.15	33.19b	6.45	34.59c	5.85
Rejection	19.67a	7.84	16.37b	7.4	14.87c	7.17

Values in the same row with a different subscript are significantly different at $p < 0.05$.

orientation (Table 5), and race/ethnicity (Table 6). Significance was calculated using ANOVAs, and is marked with subscripts on all three tables at the $p < 0.05$ level.

Tables 7–9 show the results of a series of parallel mediation models conducted with PROCESS (Hayes, 2017). These models tested whether the relationship between each of the three TMMS subscales (Attention, Clarity, and Repair) and the DASS Full Scale measure of mental health symptoms was mediated by either or both of the GBS scales (Inclusion and Rejection). Thus, Model 1 (see Figure 1 for an illustration and Table 7 for details) tests whether the relationship between Attention and the DASS Full Scale is mediated by Inclusion, Rejection or both; Table 8 and Figure 2 show the same model, but with Clarity; and Table 9 and Figure 3 show the same model, but with Repair. Both the unstandardized and fully standardized coefficients are presented for the total effect of each indirect path, for each model. As per Hayes (2017), the fully standardized

coefficients are reasonable measures of effect size, although some debate persists about how best to present effect sizes for more complex mediation models. The standardized coefficients for each indirect path represent the predicted change in DASS Full Scale (as measured in standard deviations) associated with a one standard deviation change in TMMS Attention, Clarity, or Repair (respectively).

All three models accounted for a significant portion of the variance in the outcome measure; see Tables 7–9 and Figures 1–3 for coefficients and model fit information. The 95% CI for the indirect path between TMMS Repair and DASS Full Scale through GBS Inclusion included zero, which suggests that the strength of that pathway is not of meaningful or statistically significant size. Note that all models reflect partial mediation, and that a protective indirect effect of Attention (through Inclusion and Rejection) is partially suppressed by a deleterious direct effect of Attention of

TABLE 5 | Sexual orientation differences in Depression Anxiety Stress Scale (DASS), Trait Meta Mood Scale (TMMS), and General Belongingness Scale (GBS).

	Heterosexual		Gay/lesbian		Bisexual		Other	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
DASS								
Full scale	24.78a	21.45	35.92b	25.98	36.44b	25.29	32.07b	21.13
Anxiety	6.65a	7.32	10.05b,c	9.86	9.96b	8.51	8.19c	7.41
Depression	8.05a	8.55	11.85b	10.39	11.93b	11.05	10.41b	8.54
Stress	10.08a	8.30	14.03b	9.77	14.55b	8.42	13.47b	8.52
TMMS								
Attention	66.34a	10.82	66.81a	13.27	69.91b	11.31	70.25b	10.46
Clarity	45.53a	9.43	44.04a,b	9.44	43.40b	10.45	44.30a,b	9.52
Repair	30.31a	6.31	27.85b	7.51	28.16b	7.42	28.12b	5.67
GBS								
Inclusion	33.88a	6.24	31.66b	6.66	31.96b	7.36	31.80b	6.22
Rejection	15.50a	7.25	19.80b	8.2	19.02b	8.27	18.39b	7.26

Values in the same row with a different subscript are significantly different at $p < 0.05$.

TABLE 6 | Racial/ethnic differences in Depression Anxiety Stress Scale (DASS), Trait Meta Mood Scale (TMMS), and General Belongingness Scale (GBS).

	Asian		Black		Hispanic		White	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
DASS								
Full scale	28.67a,b	22.44	26.35a,b	23.11	30.40a	24.82	25.93b	21.76
Anxiety	7.63a,b	7.36	7.58a,b	7.88	8.61a	8.49	6.90b	7.47
Depression	10.31a	9.40	8.82a,b	8.93	10.20a	10.02	8.26b	8.68
Stress	10.74a	8.22	9.95a	8.65	11.60a	9.06	10.77a	8.44
TMMS								
Attention	63.48a	11.40	65.38a,c	10.09	64.75a,c	12.33	67.77b	10.69
Clarity	44.04a	9.11	45.70a	9.43	44.48a	10.55	45.38a	9.51
Repair	28.53a	7.02	29.71a,b	6.66	29.20a,b	6.60	30.20b	6.37
GBS								
Inclusion	31.79a	6.54	32.50a	6.23	32.02a	6.83	34.01b	6.26
Rejection	18.68a	7.80	18.09a	7.30	17.25a	7.41	15.55b	7.37

Values in the same row with a different subscript are significantly different at $p < 0.05$.

TABLE 7 | Parallel mediation model of TMMS Attention predicting DASS Full scale, mediated by GBS Inclusion and Rejection.

Outcome variable	Predictor variable	Coefficient	SE	p	95% CI
Direct Effects					
GBS Inclusion	$F(1, 1914) = 73.70, p < 0.001; r^2 = 0.04$				
	Constant	26.06	0.88		
	TMSS Attention	0.11	0.01	<0.001	[0.09, 0.14]
GBS Rejection	$F(1, 1914) = 50.27, p < 0.001; r^2 = 0.03$				
	Constant	23.52	1.04		
	TMMS Attention	-0.11	0.02	<0.001	[-0.14, -0.08]
DASS Full scale	$F(3, 1912) = 296.29, p < 0.001; r^2 = 0.32$				
	Constant	10.63	4.85		
	TMMS Attention	0.11	0.04	<0.001	[0.03, 0.18]
	GBS Inclusion	-0.41	0.10	<0.001	[-0.60, -0.22]
	GBS Rejection	1.43	0.08	<0.001	[1.27, 1.59]
Total Effect Model					
DASS Full scale	$F(1, 1914) = 4.60, p = 0.03; r^2 = 0.002$				
	Constant	33.43	3.15		
	TMMS Attention	-0.10	0.05	0.03	[-0.19, -0.01]
Total effect of TMMS Attention on DASS Full scale		-0.10	0.05	0.03	[-0.19, -0.01]
Direct effect of TMMS Attention on DASS Full scale		0.11	0.04	0.009	[0.03, 0.18]
Indirect effects of TMMS Attention on DASS Full scale					
Total indirect effect [standardized coefficient]		-0.20 [-0.10]	0.03		[-0.26, -0.15]
Through GBS Inclusion [standardized coefficient]		-0.05 [-0.02]	0.01		[-0.08, -0.02]
Through GBS Rejection [standardized coefficient]		-0.16 [-0.08]	0.02		[-0.20, -0.11]

TABLE 8 | Parallel mediation model of TMMS Clarity predicting DASS Full scale, mediated by GBS Inclusion and Rejection.

Outcome variable	Predictor variable	Coefficient	SE	p	95% CI
Direct Effects					
GBS Inclusion	$F(1, 1904) = 233.49, p < 0.001; r^2 = 0.11$				
	Constant	23.50	0.67		
	TMSS Clarity	0.22	0.01	<0.001	[0.19, 0.25]
GBS Rejection	$F(1, 1904) = 341.72, p < 0.001; r^2 = 0.15$				
	Constant	30.07	0.77		
	TMSS Clarity	-0.31	0.02	<0.001	[-0.34, -0.27]
DASS Full scale	$F(3, 1902) = 341.01, p < 0.001; r^2 = 0.35$				
	Constant	39.09	4.74		
	TMSS Clarity	-0.48	0.05	<0.001	[-0.57, -0.38]
	GBS Inclusion	-0.32	0.09	<0.001	[-0.50, -0.13]
	GBS Rejection	1.23	0.08	<0.001	[1.07, 1.39]
Total Effect Model					
DASS Full scale	$F(1, 1904) = 349.28, p < 0.001; r^2 = 0.16$				
	Constant	68.59	2.29		
	TMMS Clarity	-0.92	0.05	<0.001	[-1.02, -0.83]
Total effect of TMMS Clarity on DASS Full scale		-0.92	0.05	<0.001	[-1.02, -0.83]
Direct effect of TMMS Clarity on DASS Full scale		-0.48	0.47	<0.001	[-0.57, -0.38]
Indirect effects of TMMS Clarity on DASS Full scale					
Total indirect effect [standardized coefficient]		-0.45 [-0.19]	0.03		[-0.51, -0.39]
Through GBS Inclusion [standardized coefficient]		-0.07 [-0.03]	0.03		[-0.12, -0.02]
Through GBS Rejection [standardized coefficient]		-0.38 [-0.16]	0.04		[-0.45, -0.31]

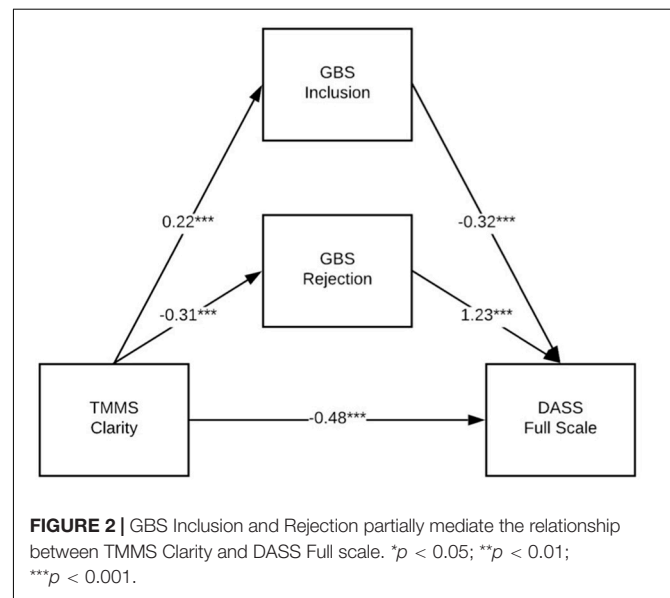
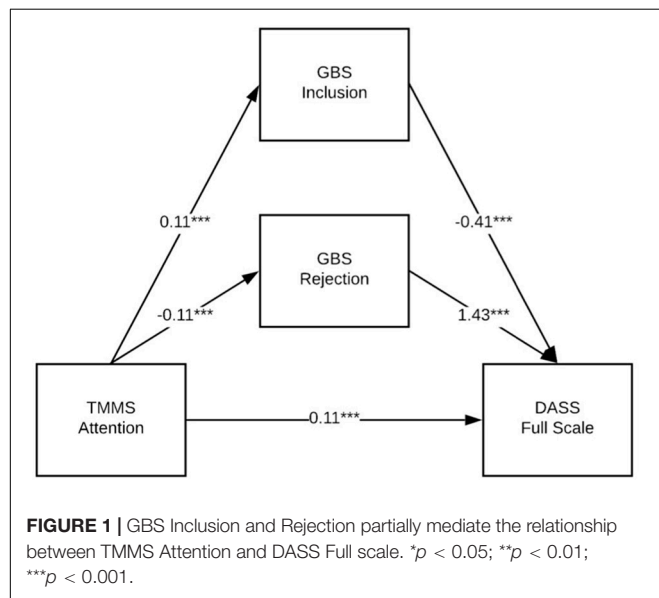
mental health burden. Note that the size of this sample may reduce the interpretability of NHST measures of significance, and that the size and sign of the coefficients are more meaningful.

DISCUSSION

This study sought to elucidate the association between EQ and adaptive functioning in college students. Specifically, the

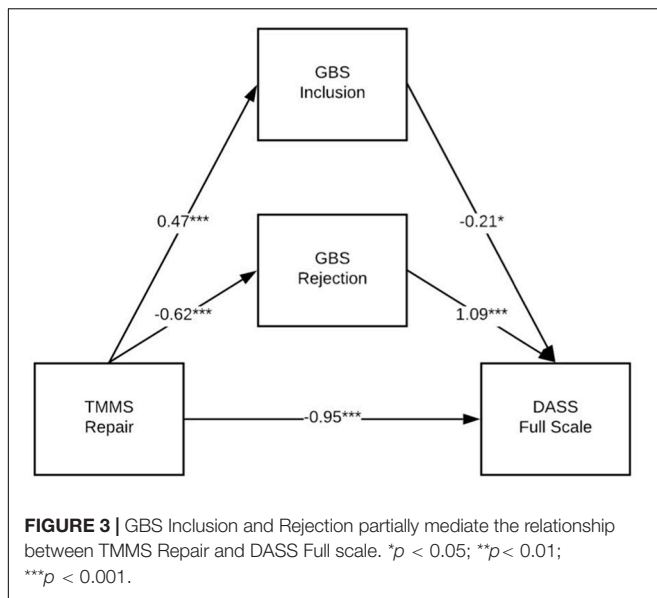
TABLE 9 | Parallel mediation model of TMMS Repair predicting DASS Full scale, mediated by GBS Inclusion and Rejection.

Outcome variable	Predictor variable	Coefficient	SE	<i>p</i>	95% CI
Direct Effects					
GBS Inclusion	$F(1, 1922) = 581.69, p < 0.001; r^2 = 0.23$				
	Constant	19.30	0.60		
	TMMS Repair	0.47	0.02	<0.001	[0.44, 0.51]
GBS Rejection	$F(1, 1922) = 756.73, p < 0.001; r^2 = 0.29$				
	Constant	34.61	0.68		
	TMMS Repair	-0.62	0.02	<0.001	[-0.66, -0.57]
DASS Full scale	$F(3, 1920) = 370.50, p < 0.001; r^2 = 0.37$				
	Constant	44.27	4.62		
	TMSS Repair	-0.95	0.08	<0.001	[-1.09, -0.80]
	GBS Inclusion	-0.21	0.09	0.03	[-0.39, -0.02]
	GBS Rejection	1.09	0.08	<0.001	[0.93, 1.25]
Total Effect Model					
DASS Full scale	$F(1, 1922) = 631.20, p < 0.001; r^2 = 0.25$				
	Constant	78.08	2.09		
	TMMS Repair	-1.72	0.07	<0.001	[-1.85, -1.58]
Total effect of TMMS Repair on DASS Full scale		-1.72	0.07	<0.001	[-1.85, -1.58]
Direct effect of TMMS Repair on DASS Full scale		-0.95	0.08	<0.001	[-1.09, -0.80]
Indirect effects of TMMS Repair on DASS Full scale					
Total indirect effect [standardized coefficient]		-0.77 [-0.22]	0.05		[-0.88, -0.66]
Through GBS Inclusion [standardized coefficient]		-0.10 [-0.03]	0.05		[-0.21, 0.004]
Through GBS Rejection [standardized coefficient]		-0.67 [-0.19]	0.06		[-0.80, -0.55]



models tested whether sense of belongingness mediates the association between EQ and adaptation. We hypothesized that students with stronger EQ abilities would report higher levels of belongingness which, in turn, would be associated with better mental health. Conversely, we also expected that students with lower levels of EQ would be more likely to experience rejection which, in turn, would be linked to higher levels of depression, anxiety, and stress.

These results broadly supported our hypothesis: students with more EQ (as evidenced by higher scores on any or all of the subscales) experienced higher levels of belongingness (more inclusion and less rejection) which, in turn, was associated with lower overall mental health problems. The exception was the indirect pathway between TMMS Repair and DASS Full Scale through GBS Inclusion, which was not of meaningful size. While inclusion was found to be meaningful in predicting mental health, it was the experience of rejection



that was the stronger predictor of mental health outcomes. Specifically, students with lower levels of EQ are experiencing higher levels of rejection, and it is rejection which has the most significant impact on the DASS full scale mental health outcome. These results implicitly support the modeling of inclusion and rejection as orthogonal scales, as per the GBS (Malone et al., 2012). The effects of rejection on depression in adolescent populations is well established (for a review see Platt et al., 2013). Our findings extend the existing research by demonstrating that among emerging adults, the experience of rejection is associated with higher levels of mental health problems. The experience of being included does have a protective effect, but, since high levels of inclusion and rejection can be experienced by the same person, working to improve inclusion is unlikely to be sufficient to reduce mental health burdens: the reduction of experience of rejection is likely to have a larger impact.

Implications

These findings have implications for applied work. Results from our mediation analyses suggested a strong link between perceived rejection and mental health problems. Such results tentatively suggest that intervention efforts could target students who are experiencing feelings of rejection or isolation within their college community. Once identified, these students could be targeted with additional supports, such as short-term counseling, to support well-being. Taking a preventative approach, campus initiatives that support regular and healthy student interactions should continue to receive funding such that they can be maximally effective. A focus on increasing students' sense of belonging should also seek to lower experiences of rejection. Given that each of the scales of EQ was independently related to sense of belongingness, targeting and strengthening emotional intelligence would also be a potential avenue for prevention and intervention efforts. However, further research

is needed to further elucidate the association between EQ, belongingness, and mental health in college samples. Such research should address both the differences in impact between the EQ subscales and explore the extent to which Attention, Clarity, and Repair may vary in their malleability. If, as these results suggest, they are each independently linked to important mental health outcomes, then a targeted intervention would be most effective if it targeted the aspect of EQ most susceptible to intentional change.

Limitations

Our results should be interpreted in the context of the study's limitations. First, the study was based on student self-report, which has inherent and well-documented limitations. A second weakness relates to the representativeness of our sample; participants were recruited from two small, competitive liberal arts colleges thereby potentially limiting generalizability of study findings. Similarly, there might be systematic differences between those students who decided to complete the survey and those who chose not to participate. Lastly, data was collected at one timepoint, which limits our ability to make strong inferences about causality. Future research should recruit samples that are more representative of the overall college student population and consider using multi-informant assessments (e.g., friends, parents) to corroborate the self-report data. Longitudinal data collection could also help establish the causal relationship between the three study variables. These limitations notwithstanding, our findings expand what is known about college student well-being by suggesting that EQ and a sense of belongingness are related to mental health symptoms of college students.

DATA AVAILABILITY STATEMENT

The datasets generated for this study will not be made publicly available in order to maintain confidentiality of the study participants. Requests to access the datasets should be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Middlebury College Institutional Review Board. The patients/participants provided their electronic informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RM and MS contributed conception, design, and database organization. RM, MS, and VP contributed equally to analyses, draft of the manuscript as well as revisions, and approved the submitted version.

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School Burnout Inventory: Latent Profile and Item Response Theory Analyses in Undergraduate Samples

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The current research reports both latent profile (person-oriented) and item response theory (IRT) analyses of the School Burnout Inventory (SBI) in United States undergraduate samples. Study 1 ($n = 1,007$) comprises a latent profile analysis (LPA) that identified four mutually exclusive subgroups based on patterns of school burnout responses. Covariate analyses of grade point average and negative affect suggested that school burnout profiles function similarly to variable-oriented approaches. Study 2 ($n = 544$) explored longitudinal patterns of school burnout among college students via use of a repeated measures LPA. Findings suggested that the profiles identified reflect a relatively stable school burnout trajectory over time. Covariate analysis of sleep quality and academic engagement demonstrated differences across profiles, but the patterns were similar to variable-oriented statistical approaches. Study 3 ($n = 2,364$) utilized an IRT analysis of the SBI to identify a short, efficient measure. Item information curves and graded response model item discrimination parameters identified a 4-item SBI scale (SBI-4) that offered reasonably high levels of information for assessing school burnout in comparison to the original nine-item SBI. Implications and future research are identified.

Keywords: item response theory, latent profile analysis, person-oriented approach, repeated measures latent profile analysis, School Burnout Inventory

INTRODUCTION

The attainment of a baccalaureate degree offers a considerable advantage in job placement over those who have not acquired an undergraduate education (U.S. Department of Commerce, 2016). Not surprisingly, approximately 69.2% of high school graduates go on to enroll in college programs (U.S. Department of Commerce, 2016). Undergraduate enrollment is disproportionately female, with about 11.5 million females enrolled in the fall of 2017 as compared to 8.9 million males (U.S. Department of Education, 2017). Reflecting the importance of higher education, the number of American undergraduate students is increasing. Enrollment of traditional college-aged students (18- to 24-year-olds) is up more than 5.1 million in 2017 (20.4 million) from that of 2000 (U.S. Department of Education, 2017). Given the prevalence of college education and its resulting employment advantages, investigations into factors that may jeopardize retention in United States colleges are warranted. One such emerging factor is school burnout.

Burnout is a well-researched, multidimensional, affective response to occupational stress. Although burnout has traditionally been investigated within the workplace, it is becoming more

common to extend burnout investigations into academic populations (Salmela-Aro et al., 2008, 2009; Parker and Salmela-Aro, 2011). Within an educational context, *school* burnout has been characterized by chronic exhaustion from school-related work, cynicism toward the meaning of school, and feelings of inadequacy toward school-related accomplishments (Salmela-Aro et al., 2008, 2009). A host of negative conditions have been associated with school burnout, including suboptimal physiological functioning (May et al., 2014a,b, 2016) and diminished cognitive and academic performance (Salmela-Aro et al., 2008, 2009; May et al., 2015).

Although school burnout is typically studied using a variable-oriented approach, valuable contributions stemming from a person-oriented approach have improved the school burnout literature. Contrary to research treating school burnout symptoms as the unit of analysis, person-oriented analyses focus on groups of individuals as the unit of analysis. As thoroughly discussed in Mäkikangas and Kinnunen (2016), person- and variable-oriented statistical approaches diverge both theoretically and methodologically. These approaches differ statistically in that person-oriented analyses examine intra-individual variation in school burnout symptomology (e.g., class or cluster analyses), whereas variable-oriented analyses examine inter-individual variation (e.g., linear association between variables through either correlational or mean level analyses). Person-oriented statistical analyses assume that there is heterogeneity in burnout symptoms in the population (Laursen and Hoff, 2006).

Typically, person-oriented analyses begin with an unknown number of classes or clusters and proceed with the development of different class solutions. Class solutions are then compared and evaluated on the basis of statistical and theoretical criteria (Bergman et al., 2003; Mäkikangas and Kinnunen, 2016). The advantage of a person-oriented approach is its ability to identify types or classes of symptomology and the trajectory of development and change in symptomology. Types or classes are not identified by any predefined scores or cutoff values and, in the context of school burnout, may help to provide a unique perspective on how individuals are similar (or different) from each other in burnout symptomology. Thus, person-oriented statistical approaches help identify how many groups of individuals are needed to largely describe between-person differences (either longitudinally or cross-sectionally), assuming that they are drawn from several subpopulations with between-person variability.

The systematic review conducted by Mäkikangas and Kinnunen (2016) identified only 24 publications (out of 470) that reported findings pertaining to person-oriented approaches to modeling burnout between the years 2004 and 2015. Their findings reveal that person-oriented analyses of burnout types and trajectories largely parallel burnout findings from variable-oriented approaches: burnout typically develops with the appearance of exhaustion and cynicism occurring simultaneously and then the development of reduced professional efficacy followed by symptoms that are largely stable over time. However, person-oriented analyses provided unique information regarding the identification of atypical burnout types and developmental

trajectories (e.g., cynicism occurring alone or together with reduced professional efficacy).

Importantly, only 4 of the 24 studies identified by Mäkikangas and Kinnunen (2016) pertained to school burnout (the remainder focused on occupational burnout). Furthermore, none of the four publications utilized American samples (one publication utilized Korean students, one utilized Chinese students, and two utilized Finnish students; Lee et al., 2010; Zhang et al., 2013; Salmela-Aro and Upadaya, 2014; Tuominen-Soini and Salmela-Aro, 2014, respectively). In addition, only one of those publications reported on a collegiate sample (see Tuominen-Soini and Salmela-Aro, 2014, modeling burnout and engagement profiles, although see the more recent work of Salmela-Aro and Read, 2017). Differences in tuition price, enrollment rates, university degree curriculum structure, and typical class size are just a few of many factors (for additional factors, see Taylor, 2012; Chang and Wang, 2017; Chatlani, 2018) that may lead to differential student stress across various countries and across different educational settings within countries (e.g., university, technical college, community college).

Person-oriented analyses provide a worthwhile supplement to variable-oriented approaches to examining school burnout. However, given their limited use in the school burnout literature and the lack of representation of American collegiate samples in the person-oriented literature, the current research reports findings of latent profile analyses (LPA) of school burnout in American collegiate samples. Study 1 reports on a LPA examining school burnout in United States undergraduates. Study 2 then explores longitudinal patterns of school burnout among United States college students using repeated measures LPA (RMLPA). Finally, supplementing the person-oriented approaches of Studies 1–3 utilizes an item response theory (IRT) analysis to identify an efficient, psychometrically optimized 4-item School Burnout Inventory (SBI) scale (SBI-4). All three studies focus on the measurement of school burnout using the SBI (Salmela-Aro et al., 2009).

STUDY 1

Person-oriented approaches to burnout complement traditional variable-oriented approaches by helping to reveal intra-individual heterogeneity within the burnout syndrome. This allows for the identification of types or patterns of burnout symptomology within individuals. Study 1 explores school burnout via a person-oriented approach, specifically LPA, using the SBI (Salmela-Aro et al., 2009). LPA is a latent variable modeling technique that classifies individuals into mutually exclusive subgroups based on patterns of responses to either continuous or a combination of categorical and continuous observations (Roesch et al., 2010). Extending LPA, this study also examines the associations between school burnout profile membership, related negative affect symptomology (depression and anxiety symptoms), and an indicator of academic achievement (grade point average, GPA). Prior variable-oriented research has documented relationships between the aforementioned constructs indicating that even

when controlling for affective symptoms, increased school burnout predicts lower GPA (May et al., 2015).

Analytical Approach

To explore heterogeneity within school burnout among United States college students, a LPA was conducted using Mplus (Version 7.4). The LPA focused on participants' responses to the nine items from the SBI (Salmela-Aro et al., 2009). Independent models were estimated in an iterative manner that began with a one-profile solution, and profiles were added until the best-fitting model was identified. For each model estimated, random parameter start values were used to verify the replication of the log-likelihood value and to ensure that model convergence was due to a global rather than local maximum (Hipp and Bauer, 2006). Any missing data were handled using full-information-maximum-likelihood.

The final model was chosen based on a number of statistical indicators, model parameters, and interpretative meaning of the final solution. Specifically, absolute model fit was assessed by the following fit criterion: Akaike information criterion (AIC), Bayesian information criterion (BIC), and sample size adjusted BIC (A-BIC). Lower AIC, BIC, and A-BIC indicate better model data fit (Roesch et al., 2010). Bootstrap likelihood ratio tests (BLRTs) also informed this process, and provided a p -value that, when significant, indicated a model with k number of profiles to be preferred over a model with $k - 1$ profiles. Two parameters estimated in latent profile models also informed the selection of the final model: latent class probabilities (i.e., likelihood of belonging to a particular class) and conditional response means (i.e., mean of an item within a particular profile). Higher latent class probabilities and distinguished conditional response means are preferred. Entropy was considered in this process, which is an indicator of profile enumeration and ranges from 0 to 1, where closer to 1 indicates how well profiles have been distinguished (Roesch et al., 2010). Models that contained profiles with less than 5% of the sample were considered to be less parsimonious and less likely to replicate in future samples, and were therefore considered undesirable solutions independent of the other fit indices.

A three-step approach was used to examine the associations between profile membership and GPA and depressive and anxiety symptomatology. This approach is preferred to the commonly used classify-analyze approach when determining latent profile differences on auxiliary variables because it makes use of the latent measurement model by accounting for measurement error and because of its advanced performance in examining associations between latent classes and external variables (Bolck et al., 2004; Vermunt, 2010; Asparouhov and Muthén, 2014). Following identification of the best-fitting latent profile model, the next steps involved using the posterior distribution to create an indicator of most likely latent class membership before estimating the final model with auxiliary variables (i.e., indicators of emerging adult GPA, anxiety, and depression), while accounting for the measurement error associated with latent profile classification (Asparouhov and Muthén, 2014). This process utilized Wald chi-square

significance tests to determine mean differences for each outcome across identified profiles.

Method

Participants

Participants were 1,007 undergraduate students (67% females, $M_{age} = 20.06$ years, $SD = 1.26$). Students who completed at least one full academic semester were eligible for study participation. Sample demographics include: 66% Caucasian, 16% African American, 1.5% Asian, 8% Hispanic, and 8.5% endorsing either biracial or non-disclosed ethnicity, with 14% freshmen, 26% sophomores, 35% juniors, and 25% seniors.

Measures

School burnout

School burnout was measured using the SBI (Salmela-Aro et al., 2009). The SBI consists of nine items measuring three first-order factors of school burnout: (a) exhaustion at school (four items), (b) cynicism toward the meaning of school (three items), and (c) sense of inadequacy at school (two items). Summed scores from the first-order factors comprise a second-order overall school burnout score. Higher composite scores indicate higher burnout. Participants responded to items (e.g., "I feel overwhelmed by my schoolwork" as an example exhaustion item, "I feel a lack motivation in schoolwork and often think of giving up" as an example cynicism item, and "I often have feelings of inadequacy in my schoolwork" as an example inadequacy item) on a scale from 1 (*completely disagree*) to 6 (*completely agree*). Internal consistency for the present sample was $\alpha = 0.89$.

Depressive symptoms

Depressive symptomatology was assessed via the 10-item Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977; Santor and Coyne, 1997). The CES-D has been widely used as a measure of depressive symptoms in non-clinical samples. It asks participants to respond to a list of ways they may have felt or behaved during the previous week. Sample items include "I could not 'get going'" and "I felt hopeful about the future." Participants responded 0 (*rarely*) to 3 (*most/all of the time*) on items, such as feelings of loneliness, hopelessness, and restless sleep. Some items were reverse-coded, such that higher responses indicate more depressive symptoms. Internal consistency for the present sample was $\alpha = 0.89$.

Anxiety symptoms

Anxiety was measured using the 20-item State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970). Participants were asked to respond to anxiety items such as "upset," "calm," "secure," "at ease," and "nervous." Responses were scored on a four-point Likert scale from 1 (*not at all*) to 4 (*very much so*). Half of the items were reverse-coded so that higher scores indicated greater anxiety. Items were summed to create a composite anxiety score with a possible range of 20–80. Internal consistency for the sample was $\alpha = 0.90$.

Academic achievement

Academic achievement was assessed through self-reported cumulative GPA ranging from 1.50 to 4.00.

Procedure

Data from all eligible participants was collected via online survey questionnaires. Questionnaires contained demographic questions and the measurement scales described. All participants were recruited from undergraduate classrooms at a large southern university in the United States as an option for voluntary class credit. Extra credit was generally less than 1% of the final grade. Data were collected in the middle (weeks 3–9) of the spring academic semester. All participants gave their written consent prior to study participation, and approval was obtained from the institutional review board before any data were collected.

Results and Discussion

Selection of Optimal Latent Profile Solution

Statistical indicators used to determine the final profile solution are presented in **Table 1**. The analysis of the nine school burnout items suggested that a four-profile solution fit the data best. AIC, BIC, and A-BIC all decreased for every solution over one, while BLRT indicated that a five-profile solution was preferred over a four-profile solution. When comparing four- and five-profile models, however, entropy was stronger for a four-profile solution, and latent class probabilities were consistently higher for a four-profile solution. Moreover, the latent class probabilities of subgroup membership assignment were strong for the four-class solution: 91% for profile 1, 87% for profile 2, 93% for profile 3, and 93% for profile 4. For these reasons, we considered the four-profile solution to be the best-fitting model.

Description of Identified Profiles

The conditional response means for each indicator of school burnout were used to interpret each subgroup and are presented in **Figure 1**. Profile 1 participants (approximately 13% of the overall sample) reported the lowest levels of school burnout across all indicators and were labeled *low burnout*. Participants in profile 2 (approximately 25% of the overall sample) reported higher levels of burnout than their counterparts in profile 1 but lower-than-average responses overall. As such, this profile was labeled *below-average burnout*, reflecting their close yet lower-than-average responses across all indicators. Profile 3 was the largest profile, including close to half of the overall sample (48%). These participants reported above-average scores of school burnout across all nine indicators; therefore, profile 3 was labeled *above-average burnout*. Lastly, profile 4 (approximately 14% of the overall sample) was labeled *high burnout* because it comprised those with the highest reported levels of school burnout across all indicators.

Differences in GPA as a Function of Profile Membership

Results from Wald chi-square significance tests determining whether differences existed across profile mean scores of GPA are presented in **Figure 2**, with **Table 2** showing all *post hoc* comparisons. Findings showed that levels of GPA varied across profiles. As expected, participants comprising the *low burnout* profile reported the second highest GPA ($M = 3.38$), which was significantly higher than that of those classified into

the *high burnout* profile. Those in the *below-average burnout* profile recorded the highest GPA ($M = 3.45$), which was significantly higher than that of those in the *above-average burnout* ($M = 3.30$) and *high burnout* ($M = 3.17$) profiles. Notably, participants in the *high burnout* profile reported the lowest GPA, which was statistically significantly different from each of the other profiles.

Differences in Depressive Symptomology as a Function of Profile Membership

Findings determining profile differences in depressive symptomology are reported in **Figure 2**, with *post hoc* comparisons in **Table 2**. Participants comprising the *low burnout* profile reported the lowest levels of depressive symptomology ($M = 4.75$), followed by those in the *below-average burnout* profile ($M = 6.98$) and *above-average burnout* profile ($M = 8.90$), with individuals in the *high burnout* profile reporting the highest levels of depressive symptomology ($M = 14.00$). All profile comparisons yielded statistically significant differences except for that between participants in the *below-average burnout* and *above-average burnout* profiles.

Differences in Anxiety Symptomology as a Function of Profile Membership

Figure 2 also shows results from the Wald chi-square significance tests for profile differences on reported levels of anxiety symptomology, with *post hoc* comparisons in **Table 2**. Levels of anxiety symptomology significantly varied across all profiles. Participants in the *low burnout* profile reported the lowest levels of anxiety symptomology ($M = 28.32$), followed by those in the *below-average burnout* profile ($M = 34.96$) and then the *above-average burnout* profile ($M = 39.13$), with individuals in the *high burnout* profile reporting the highest levels of anxiety symptomology ($M = 46.39$).

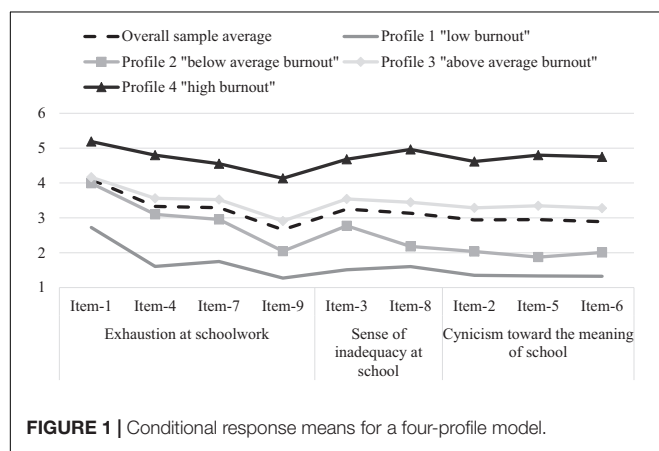
These findings are novel as they reflect the first person-oriented approach to understanding intra-individual heterogeneity in burnout symptomology in a United States collegiate sample. Four unique categories of school burnout symptomology were established with a four-class profile solution: categories labeled *low burnout* (13% of the overall sample), *below-average burnout* (25% of the overall sample), *above-average burnout* (48% of the overall sample), and *high burnout* (14% of the overall sample). Similarly, Ahola et al. (2014), albeit in an older sample of employed individuals, identified a similar clustering of burnout and depressive symptoms, identifying a three-factor solution of “low level of symptoms” (low level of burnout and depressive symptoms), “intermediate level of symptoms” (intermediate levels of burnout and depressive symptoms), and “high level of symptoms” (high levels of burnout and depressive symptoms).

Interestingly, covariate analyses suggest that profiles function similarly to a variable-oriented approach. This is evidenced by a reduction in GPA and increase in affective symptoms corresponding to the increase in burnout symptomology found within the established profiles. However, as this is the first LPA using the SBI in an American collegiate sample, supplemental profile analyses would be advantageous. Toward this objective,

TABLE 1 | Comparison of latent profile models ($N = 1,007$).

Model	AIC	BIC	A-BIC	Entropy	BLRT	Profile: <i>n</i>	LCP
1 profile	31,039.12	31,127.59	31,070.42	n/a	n/a	1. 1,007	
2 profiles	28,688.57	28,826.19	28,737.26	0.83	$p < 0.001$	1. 446	0.94
						2. 561	0.95
3 profiles	27,776.51	27,963.27	27,842.58	0.87	$p < 0.001$	1. 311	0.95
						2. 157	0.93
						3. 539	0.94
4 profiles	27,524.96	27,760.86	27,608.41	0.84	$p < 0.01$	1. 128	0.91
						2. 254	0.87
						3. 487	0.93
						4. 138	0.93
5 profiles	27,352.23	27,637.28	27,453.07	0.79	$p < 0.001$	1. 157	0.91
						2. 163	0.85
						3. 320	0.84
						4. 275	0.84
						5. 92	0.93

AIC, Akaike information criterion; BIC, Bayesian information criterion; A-BIC, sample size adjusted BIC; BLRT, bootstrap likelihood ratio test; n/a, not available; *n*, number of participants; LCP, latent class probability. Bold font indicates selected model.



Study 2 provides an investigation of developmental trajectories of school burnout profiles.

STUDY 2

To date, consensus regarding a school burnout trajectory remains elusive. Earlier work regarding development change in burnout in European students seemed to suggest that school burnout is surprisingly consistent over time (Parker and Salmela-Aro, 2011; Salmela-Aro and Upadaya, 2014). More recent work in latent profiles, however, has suggested that while a stable, zero-slope burnout trajectory may be found within a majority of students sampled (Salmela-Aro and Upadaya, 2014), substantial trajectory heterogeneity can be identified within subclasses (see Salmela-Aro and Read, 2017). Although informative, such school burnout trajectory analyses have not yet been examined within any United States student population. Thus, to improve upon the cross-sectional limitation of Study 1 and begin to develop an idea of the developmental trajectory of school burnout over time in the

United States, this study explores longitudinal patterns in school burnout profiles across three academic semesters.

Additionally, associations between school burnout profiles and student levels of sleep quality and academic engagement were examined. Both diminished sleep quality and poor job engagement are well-documented correlates of increased occupational burnout (for a review of sleep and occupational burnout findings, see Akerstedt et al., 2017; for a review of job engagement and occupational burnout findings, see Leon et al., 2015 or Taris et al., 2017). However, considerably less is known of these relationships in regard to school burnout, and then even less in non-European academic populations, demonstrating a need for research regarding sleep and engagement relationships with school burnout in American collegiate samples.

Sleep is a vital component of health and has been shown to be important in occupational burnout (Alvarez and Ayas, 2007; Akerstedt et al., 2017). However, research linking sleep and school burnout is largely absent in primary to post-secondary student populations. What little research there is primarily focuses on sleep–burnout relationships in medical students (for a review, see Dyrbye et al., 2006). As an example of a typical finding, a survey study of medical students in India found that poorer sleep as measured with the Pittsburgh Sleep Quality Index (PSQI) corresponded to increased subscale school burnout scores (e.g., burnout and disengagement) using the Oldenburg Burnout Inventory (Shad et al., 2015).

Engagement is important within the burnout literature as it represents motivational, cognitive, and behavioral components that may prevent burnout's occurrence and continued development (although the uniqueness of burnout and engagement as constructs is admittedly controversial; see Taris et al., 2017). In higher education, academic engagement is conceptualized as a three-dimensional construct, comprising energy for, dedication toward, and absorption in schoolwork. Specifically, academic engagement is thought of as a positive approach to schoolwork (energy), dedication to a positive

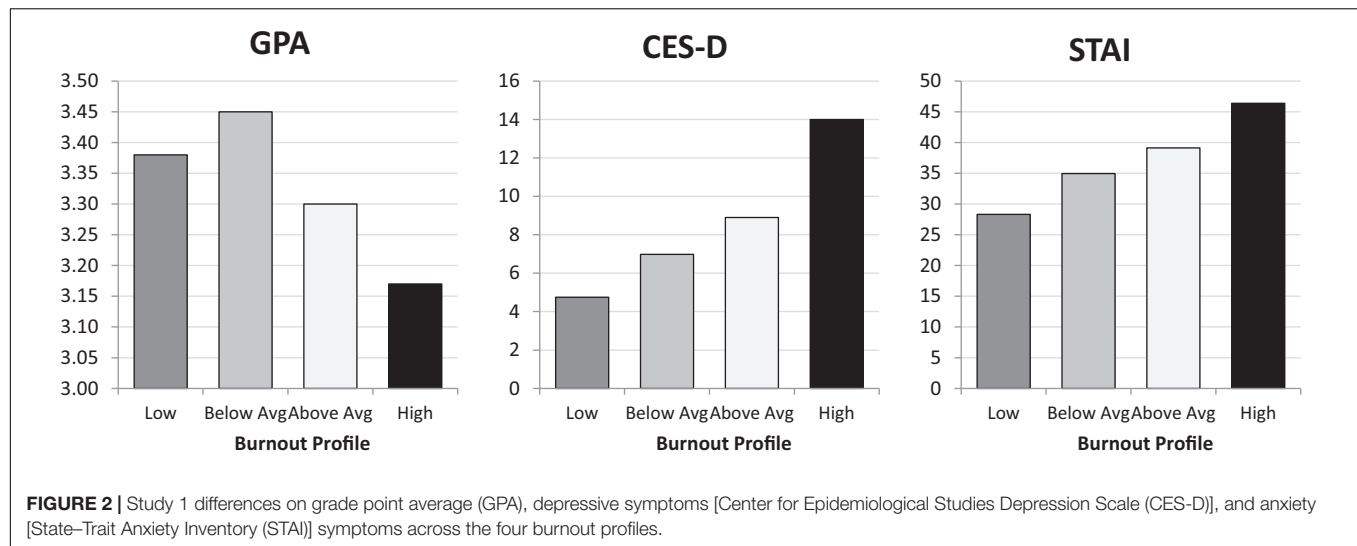


TABLE 2 | Profile differences in grade point average, depression, and anxiety ($N = 1,007$).

Outcome <i>M</i> (<i>SE</i>)	Profile 1: “low burnout”	Profile 2: “below-average burnout”	Profile 3: “above-average burnout”	Profile 4: “high burnout”
GPA	3.38 (0.04) ^a	3.45 (0.03) ^{b,c}	3.30 (0.02) ^{b,d}	3.17 (0.04) ^{a,c,d}
Depressive symptoms	4.75 (0.28) ^{a,b,c}	6.98 (0.68) ^{a,d}	8.90 (0.45) ^{b,e}	14.00 (0.53) ^{c,d,e}
Anxiety symptoms	28.32 (0.79) ^{a,b,c}	34.96(0.73) ^{a,d,e}	39.13 (0.52) ^{b,d,f}	46.39(1.00) ^{c,e,f}

M, mean; *SE*, standard error; GPA, grade point average. ^{a, b, c, d}, matching subscripts denote significant post hoc differences.

attitude while perceiving schoolwork as meaningful (dedication), and absorption in concentration on schoolwork (absorption; Salmela-Aro and Upadaya, 2014, p. 60; see also Schaufeli et al., 2002a). Attempts to link school burnout and school engagement have been limited and have primarily involved European samples, with no findings pertaining to United States students (to the best of our knowledge). However, the research that does exist indicates that decreased school engagement corresponds to a variety of negative outcomes, including increased depression and increased school burnout (Salmela-Aro et al., 2009). Demonstrating similar relationships, a longitudinal profile approach by Salmela-Aro and Read (2017) evaluating school burnout and academic engagement indicated that as academic engagement decreases, school burnout increases over time.

Therefore, given the importance of sleep and engagement and their absence in the school burnout literature, we examined their relationships with profiles of school burnout. As suggested by prior research on medical students, we expect profiles with increased school burnout symptomology to align with poorer sleep quality. Furthermore, as suggested by the findings in Salmela-Aro and Read's (2017) study, we expected school burnout and academic engagement to be inversely related so that increased engagement corresponds to lower school burnout.

Analytical Approach

To explore longitudinal patterns of school burnout among college students, an RMLPA was conducted in Mplus (Version 7.4). RMLPA is an application of LPA to repeated measures that aims to identify a categorical latent variable that underlies the

heterogeneity in a population's responses to questions over time (Collins and Lanza, 2010). We again focused on participants' responses to the nine items from the SBI obtained across three time points. Independent RMLCA models were estimated in the same iterative manner that the latent profile models were estimated in the previous study, and the same statistical indicators (i.e., AIC, BIC, A-BIC, BLRT, and entropy) and model parameters (i.e., latent class probabilities and conditional response means) were used to select the optimal fitting model. Once the final model was identified, a three-step approach as conducted in Study 1 (Asparouhov and Muthén, 2014) was used to examine the associations between profile membership and student' levels of sleep and academic engagement.

Method

Participants

Participants were undergraduate students recruited from undergraduate courses at a large southern university in the United States who had completed at least one full academic semester and were enrolled in classes during the entire duration of the study. Students who completed three consecutive academic semesters (thus providing the three data waves necessary for the repeated measures analysis) were included in analyses. Students who graduated during the course of the study were eliminated from analyses. Studies 1 and 2 samples were independent in that no student was included in both analyses.

An initial sample of 989 students were contacted during the first semester (wave) of data collection. Of those students, 422 students (43% of the initial sample) graduated during the course

of the study and were thus not eligible for study analysis. Of the remaining 585 students, 544 (67% females, $M_{age} = 19.00$ years, $SD = 1.01$) completed three consecutive academic semesters and were included in the analyses, resulting in 7% study attrition of eligible participants. Of study eligible participants, 66% reported as Caucasian, 16% African American, 1.5% Asian, 8% Hispanic, and 8.5% either biracial or non-disclosed ethnicity. At the time of initial data collection, 26% of students reported as freshmen, 38% sophomores, and 36% juniors. Study incentive was provided (as per instructor discretion) in the form of extra credit that did not surpass 1% of the final grade.

Measures

School burnout

School burnout was measured using the SBI as in Study 1. Reliability for the present sample was $\alpha = 0.89$.

Sleep disturbance

Sleep was measured using the PSQI (Buysse et al., 1989). The PSQI contains 19 self-rated items that include seven clinically derived subscales measuring: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction (excludes rating provided by bed partner). Responses range from open-ended format to Likert-type scales. Subscales are comprised of unique algorithms. For example, subjective sleep quality is measured via participants' response to the item, "During the past month, how would you rate your sleep quality overall?" Responses range from 0 (*very good*) to 4 (*very bad*), with higher scores indicating poorer sleep quality. In contrast, sleep efficiency is computed as a percentile ranging from 0 to 100, with higher scores indicating improved sleep efficiency and lower sleep problems. The algorithm for sleep efficiency exists as the value of the item "During the past month, how many hours of actual sleep did you get at night?" divided by the difference in hours between the two items "During the past month, when have you usually gone to bed?" and "During the past month, when have you usually gotten up in the morning?" multiplied by 100. Combined subscale scores are then used to derive the construct of total sleep disturbance. To achieve unilateral direction indicating higher total sleep disturbance, the subscales of sleep efficiency and duration of sleep were reverse-coded to match algorithms for sleep disturbance, sleep latency, day dysfunction due to sleepiness, overall sleep quality, and use of sleep medication. Higher scores in each subscale independently and summed together indicate poorer sleep. All PSQI sample subscale reliabilities were greater than $\alpha = 0.85$.

Academic engagement

A 17-item measure of academic engagement developed by Schaufeli et al. (2002b) was used. The measure reflects the three underlying dimensions of engagement: energy (six items, e.g., "When I get up in the morning, I feel like going to class"); dedication (five items, e.g., "I am enthusiastic about my studies"); and absorption (six items, e.g., "When I am studying, I forget everything else around me"). All items are scored on a seven-point frequency rating scale ranging from 1 (*never*) to 7 (*always*). Items were summed to create a global composite score, with

higher scores indicating greater academic engagement. Reliability for the present sample was $\alpha = 0.88$.

Procedure

Data collection from all eligible participants was completed via online survey questionnaires over three consecutive academic semesters. Questionnaires contained demographic questions and the measurement scales described. All participants were recruited from undergraduate classrooms as an option for voluntary class credit. Extra credit was generally less than 1% of the final grade. Data were collected between weeks 3 and 5 of the academic semesters. All participants gave their consent prior to study participation, and approval was obtained from the institutional review board before any data were collected. Recruitment and data collection procedures were identical across semesters. Sleep and academic engagement measurement responses, however, were only collected during the last wave of assessments.

Results and Discussion

Selection of Optimal Latent Profile Solution

Analyses of the nine school burnout items suggested a six-profile solution as the best-fitting model. As seen in **Table 3**, AIC, BIC, and A-BIC were lowest for a six-profile solution, and BLRT indicated a six-profile over a five-profile solution. It is worth noting that across all models, classification certainty (entropy values >0.90) and latent class probabilities (0.93–0.98) were particularly high. However, due to not having enough participants to represent each profile in the six-profile solution (i.e., profiles smaller than 5% of the overall sample), we decided to retain a five-profile model.

Description of Identified Profiles

The conditional response means for each indicator of school burnout assessed at T1, T2, and T3 are presented in **Figure 3** and were used to interpret each class. Participants in profile 1 (approximately 11% of the overall sample) reported the lowest levels of school burnout across all three time points and were labeled *low burnout*. Those comprising profile 2 (10%) reported significantly lower-than-average levels of sense of inadequacy at school and cynicism toward the meaning of school but mean levels of exhaustion across all three time points, and therefore were labeled *below-average inadequacy and cynicism*. Profile 3 (34%) was labeled *below-nearing-average burnout* because it contained participants with below-average levels of burnout at T1 and T2 that approached average levels of burnout at T3. Participants in profile 4 (30%) reported above-average levels of burnout across all three time points and were labeled *above-average burnout*. Lastly, profile 5 (15%) was labeled *high burnout* because it contained participants who reported the highest levels of burnout across all three time points.

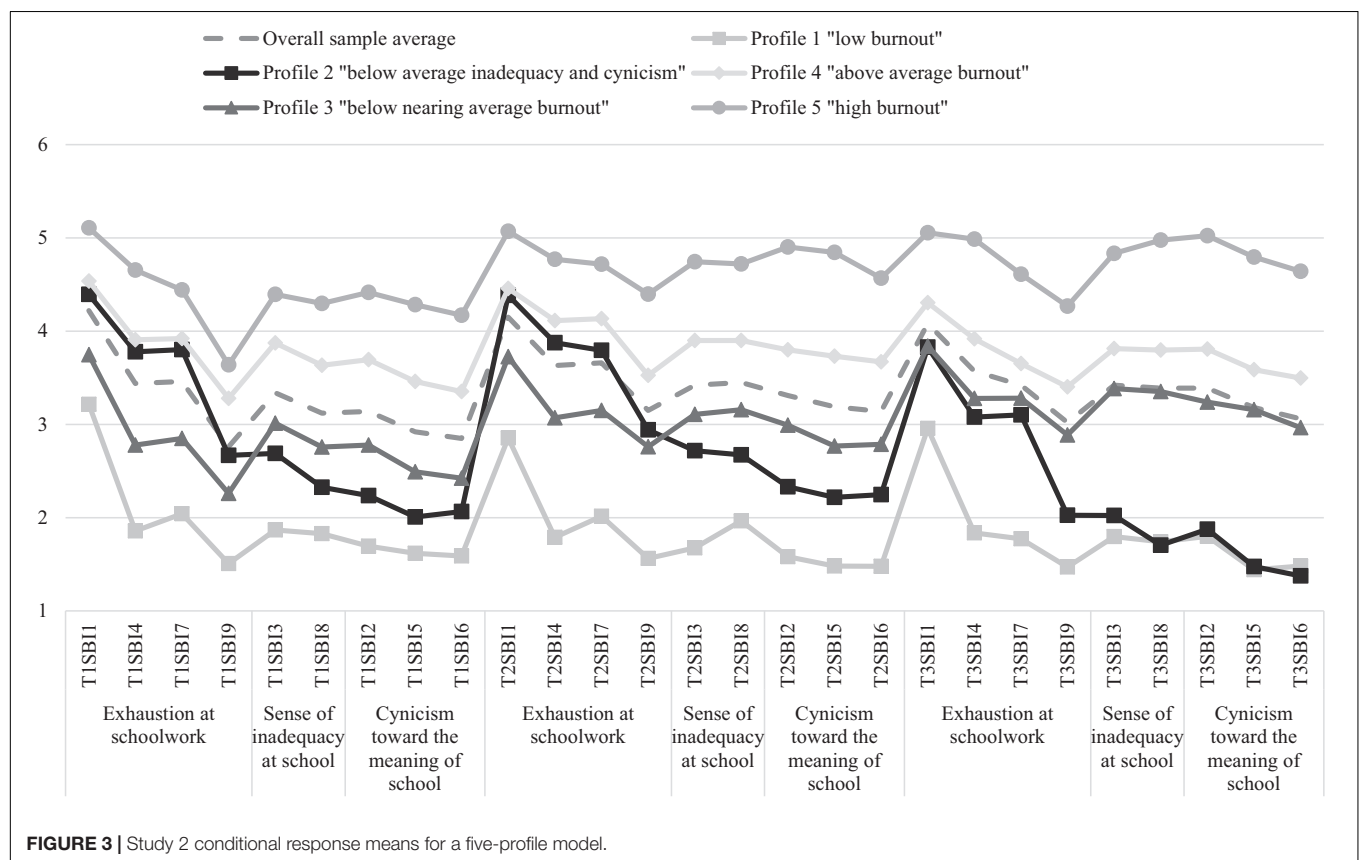
Differences in Sleep Disturbance as a Function of Profile Membership

Results from the Wald chi-square significance tests indicated that levels of sleep significantly varied across profiles (**Figure 4**). **Table 4** shows *post hoc* comparisons in covariates between profiles. Participants in the *low burnout* profile reported the

TABLE 3 | Comparison of latent profile models in study 2 ($N = 544$).

Class solution	AIC	BIC	A-BIC	Entropy	BLRT	Profile: n	LCP
1 profile	46,498.92	46,731.06	46,559.64	n/a	n/a	1. $n = 544$	
2 profiles	43,016.50	43,369.01	43,108.71	0.92	$p < 0.001$	1. $n = 238$	0.97
						2. $n = 306$	0.98
3 profiles	41,741.40	42,214.28	41,865.10	0.93	$p < 0.001$	1. $n = 115$	0.98
						2. $n = 278$	0.97
						3. $n = 151$	0.97
4 profiles	41,358.43	41,951.69	41,513.62	0.90	$p < 0.001$	1. $n = 99$	0.97
						2. $n = 183$	0.93
						3. $n = 182$	0.93
						4. $n = 80$	0.95
5 profiles	41,026.03	41,739.66	41,212.71	0.90	$p < 0.001$	1. $n = 60$	0.94
						2. $n = 58$	0.95
						3. $n = 185$	0.93
						4. $n = 161$	0.94
						5. $n = 80$	0.96
6 profiles	40,741.31	41,575.31	40,959.45	0.92	$p < 0.001$	1. $n = 32$	0.94
						2. $n = 75$	0.96
						3. $n = 159$	0.95
						4. $n = 174$	0.93
						5. $n = 84$	0.94
						6. $n = 20$	0.95

AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; A-BIC = Sample Size Adjusted BIC; BLRT = Bootstrap Likelihood Ratio Test; n/a = not available; n = number of participants; LCP = latent class probability. Bold font indicates selected model.



lowest level of sleep problems ($M = 0.67$), whereas those comprising the *high burnout* profile were significantly higher on this measure and recorded the highest levels of sleep problems during the last data assessment wave ($M = 9.09$). There were no significant differences in sleep scores between the *below-average inadequacy and cynicism* and *above-average burnout* profiles.

Differences in Academic Engagement as a Function of Profile Membership

Results also indicated that levels of academic engagement significantly varied across profiles (**Figure 4**). Those comprising the *low burnout* profile recorded the highest levels of engagement ($M = 80.02$), followed by participants in the *below-average inadequacy and cynicism* profile ($M = 75.20$), *below-nearing-average burnout* ($M = 64.33$), and *above-average burnout* ($M = 61.42$), and those in the *high burnout* profile reported the lowest levels of engagement ($M = 54.57$). There were no significant differences in academic engagement scores between the *below-nearing-average burnout* and *above-average burnout* profiles.

Study findings from the RMLPA suggested a five-profile solution. With the inclusion of profile 2, *below-average inadequacy and cynicism*, this study produced a one-profile class increase from Study 1. However, it should be noted that this was the smallest class produced by the profile analysis as it comprises only 10% of the sample. Interestingly, in regard to trajectory, the analysis demonstrated fairly consistent membership trajectories across time—with approximately 66% of the study sample having a stable trajectory. The finding that the majority of the sample displayed a stable school burnout trajectory over time is consistent with the European school burnout literature (Parker and Salmela-Aro, 2011; Salmela-Aro and Upadaya, 2014). For example, Salmela-Aro and Upadaya (2014) demonstrated in their first study that about 60% of the sample showed a relatively stable burnout trajectory. However, it should be stated that about a third of the students (34%) in the current study showed a slowly increasing trajectory from below-average to near-average burnout. The current profile identification findings are also somewhat consistent with Study 1 in Salmela-Aro and Upadaya (2014), demonstrating a four-latent-group solution (60% of the adolescents showed a low and stable level of school burnout, 29% increasing burnout, 3% strongly increasing burnout, and 8% high-decreasing school burnout), but not Study 2, where only two groups were identified (4% moderate and slightly decreasing and 6% high-increasing).

While this study was designed to provide a description of potential trajectory stability, future research may seek to test factors that help predict stability or change, such as that of experiencing educational stage transitions as examined in Salmela-Aro and Upadaya (2014). For the current data, it may be that the subgroup experiencing a slowly increasing trajectory from below-average to near-average burnout may be nearing or undergoing stressful educational transitions. However, this growth is probably more than an issue of simply transitioning into another year of school, as mean values of school burnout have not been shown to differ by undergraduate year in school (see May et al., 2014a,b).

In relation to covariates, our hypotheses were supported. Both sleep disturbance and academic engagement displayed patterns largely consistent with variable-oriented statistical approaches: the lowest school burnout profile reported the lowest level of sleep problems and greatest amount of academic engagement, whereas the highest school burnout profile reported the highest levels of sleep problems and least amount of academic engagement. However, highlighting the importance of person-oriented analysis, it could be argued that for sleep disturbance, a slightly more interesting pattern appeared, with one group producing an unexpected mean (profile 4: *above-average burnout*). While this pattern needs to be replicated, this finding would have been obscured by traditional correlational analyses. Overall, in addition to reporting novel findings using a United States undergraduate student sample, this study adds to the school burnout literature in that relatively little is known regarding sleep quality and school burnout in any undergraduate student population.

In evaluating the profile findings from Studies 1 and 2, these person-oriented school burnout results parallel those yielded by variable-oriented statistical approaches using the SBI. Furthermore, the additional covariate analyses (GPA, depression, anxiety, sleep, and engagement) largely mirror the school burnout findings of research in European populations. However, given the potential sample and response pattern differences between this American school burnout research and that conducted in other countries, it may be helpful to continue to refine and develop the SBI. Therefore, to supplement the person-oriented SBI analyses of Studies 1 and 2, we now provide an IRT analysis of the SBI.

STUDY 3

Item response theory (Hambleton et al., 1991) refers to a conglomeration of statistical models and techniques (e.g., latent distribution theory, item characteristic curve, item characteristic function, differential item functioning) that have been used to augment the limitations of classical test theory (CTT) approaches to measurement scale development and evaluation. CTT approaches to measurement rely mainly on correlational techniques like Cronbach's alpha coefficients, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA). Although CTT approaches have advantages (e.g., require smaller sample sizes, weaker assumptions) and can be effective at creating internally consistent scales, researchers are using IRT approaches to develop psychometrically optimized scales by increasing precision and minimizing measurement error (Foster et al., 2017; Mahmud, 2017).

Item response theory accomplishes this optimization by evaluating the latent trait that determines how individuals respond to test items. Specifically, IRT estimates latent scores (θ) for each participant on the construct being examined. IRT then evaluates the response curves of each item to determine if participants with higher θ scores select higher response choices and participants with lower θ scores select lower response choices. If this is then true for an item, it is considered effective

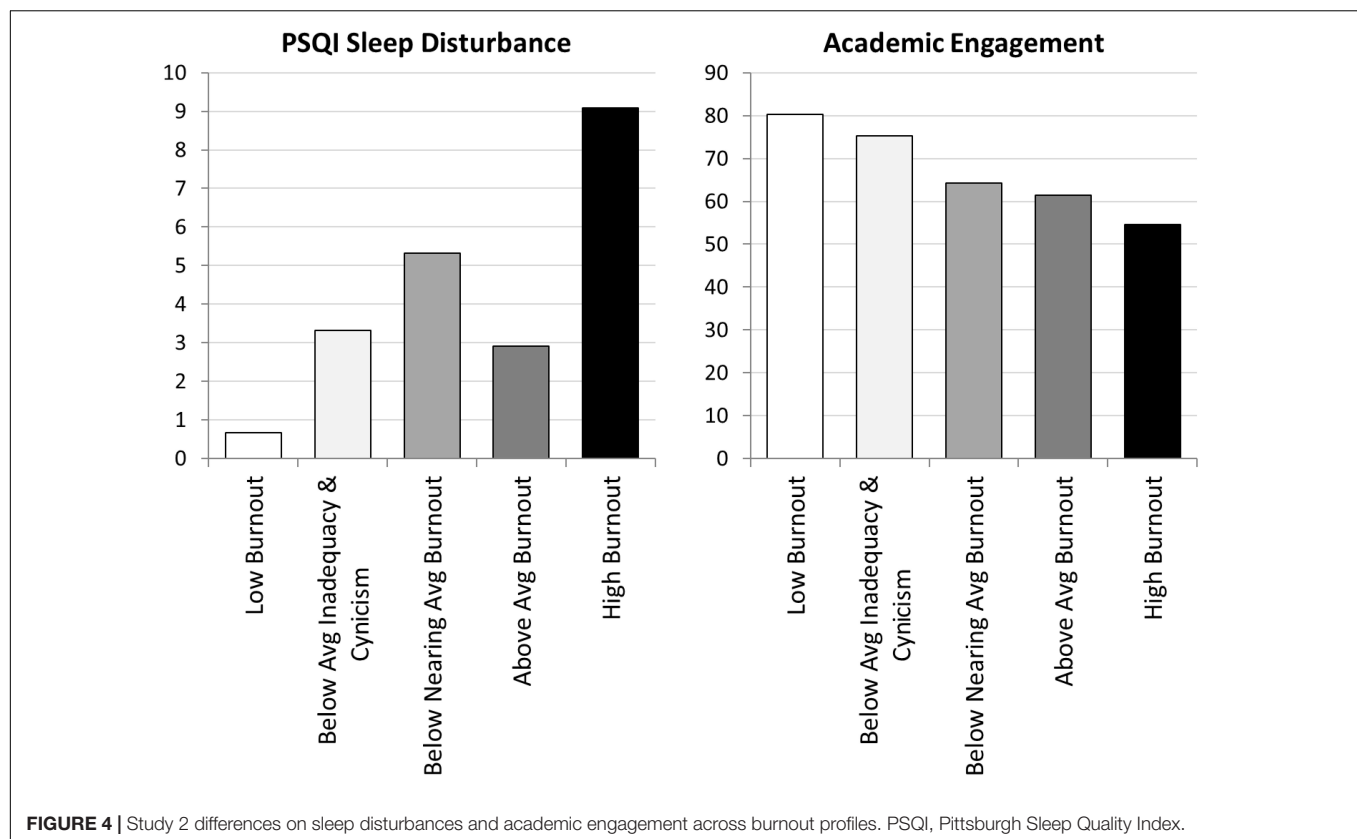


TABLE 4 | Profile differences in sleep and school engagement at time 3 in study 2 ($N = 544$).

Outcome M (SE)	Profile 1: "low burnout"	Profile 2: "below-average inadequacy and cynicism"	Profile 3: "below-nearing-average burnout"	Profile 4: "above-average burnout"	Profile 5: "high burnout"
Sleep disturbances	0.67 (0.58) ^{a,b,c,d}	3.31 (0.42) ^{a,e,f}	5.32 (0.45) ^{b,e,g,i}	2.91 (0.71) ^{c,g,h}	9.09 (0.73) ^{d,f,h,i}
Academic engagement	80.82 (1.58) ^{a,b,c,d}	75.20 (1.66) ^{a,e,f,g}	64.33 (1.20) ^{b,e,h}	61.42 (1.15) ^{c,f,i}	54.57 (1.78) ^{d,g,h,i}

M = Mean; SE = Standard error. a, b, c, d = Matching subscripts denote significant post-hoc difference.

and informative for assessing θ . Through this process, IRT analyses provide estimates of the discriminating information that each item can provide a measurement scale. Although IRT requires stronger assumptions and considerably larger sample sizes, item parameters yielded by IRT analysis are largely subpopulation-invariant, helping to produce test items and measurement scales that can function consistently in a wide range of future samples. Thus, item parameter invariance is a major advantage of IRT over CTT as it allows researchers to generalize how items work across populations.

Use of IRT techniques to supplement traditional measurement analyses of burnout (e.g., EFA, CFA) have been minimal given the large amount of burnout research. Only a few evaluations have been conducted, and these are limited to the Oldenburg Burnout Inventory (see Gustavsson et al., 2010; Reis et al., 2015) and variants of the Maslach Burnout Inventory [see Gonzalez-Roma et al., 2006 analysis of the Maslach Burnout Inventory-General Survey (MBI-GS) and Denton et al., 2013 analysis of the Maslach Burnout Inventory-Educators Survey (MBI-ES)]. Furthermore, there have been no published IRT-based analyses of the SBI and

only limited information regarding its factor structure provided via traditional measurement analyses. Arguably Salmela-Aro et al. (2009) conducted the most comprehensive evaluation of the factor structure of school burnout, concluding via factor analysis that a model where three first-order burnout factors are explained by a second-order factor measuring overall school burnout fit the data the best. Thus, as evaluations of the factor structure of the SBI are limited, this study sought to evaluate the SBI in an American undergraduate sample using factor analysis and IRT.

Methods

Participants

Undergraduate students who completed at least one full academic semester were eligible for study participation ($n = 2,364$, 86% females, $M_{age} = 20.11$ years, $SD = 1.95$). Sample demographics include: 68% Caucasian, 11% African American, 4% Asian, 15% Hispanic, and 2% endorsing either biracial or non-disclosed ethnicity, with 16% freshmen, 35% sophomores, 31% juniors, and 18% seniors. This sampling was conducted independently from Studies 1 and 2; thus, there was no overlap in participant data.

Measures

Anxiety symptoms

As in Study 1, anxiety was measured using the 20-item State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970). Internal consistency for the present sample was $\alpha = 0.91$.

Depressive symptoms

As in Studies 1 and 2, depressive symptomology was assessed via the 10-item CES-D (Radloff, 1977; Santor and Coyne, 1997). Internal consistency for the present sample was $\alpha = 0.92$.

School burnout

As in Studies 1 and 2, school burnout was measured using the nine-item SBI (Salmela-Aro et al., 2009).

Perceived stress

Perception of stress over the past month was assessed using the 10-item Perceived Stress Scale (PSS-10; Cohen et al., 1983). The PSS-10 has respondents rate items (e.g., “In the last month, how often have you been upset because of something that happened unexpectedly?” and “In the last month, how often have you felt that you were unable to control the important things in your life?”) on a scale from 0 (*never*) to 4 (*very often*) or from 1 (*completely disagree*) to 6 (*completely agree*). Internal consistency for the present sample was $\alpha = 0.85$.

Procedure

Data collection from all eligible participants was completed via online survey questionnaires over the course of two academic years (six semesters). Questionnaires contained demographic questions and the measurement instruments described. All participants were recruited from undergraduate classrooms at a large southern university in the United States as an option for voluntary class credit. Extra credit was generally less than 1% of the final grade. Data were collected between weeks 3 and 5 of each academic semester. All participants gave their written consent prior to study participation, and approval was obtained from the institutional review board before any data were collected.

Results and Discussion

Item response theory assumes the items being examined assess a single construct (i.e., that they are unidimensional). An EFA on the nine items of the SBI yielded a dominant first factor with an eigenvalue (4.64) that accounted for 52% of the variance and was over four times larger than the second eigenvalue (1.13), suggesting that the items could reasonably be considered unidimensional. An IRT analysis was therefore performed on the SBI items to identify the items most effective at discriminating burnout between students. To perform this IRT analysis, graded response model (GRM; Samejima, 1997) parameters for the items within each set were estimated with Multilog 7.0 (Thissen et al., 2002) using marginal maximum likelihood estimation. GRMs are well suited for analyzing polytomous data such as Likert-based SBI response items.

As described in the introduction, IRT conceptualizes the information provided by an item as that item's ability to discriminate between individuals on the construct being measured (termed θ in IRT equations). Thus, an item is

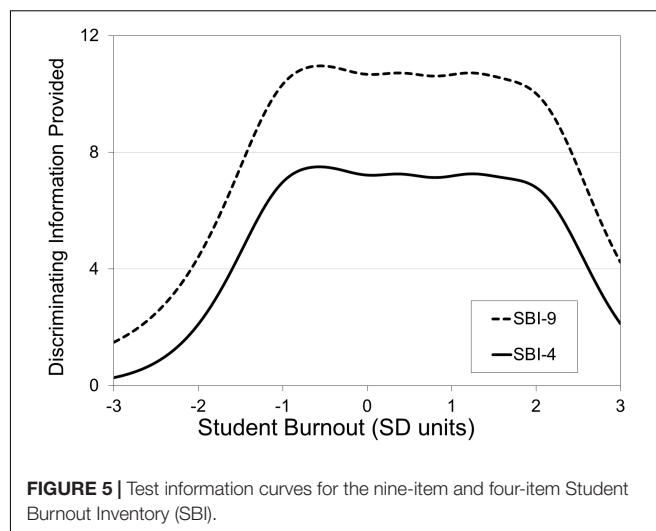
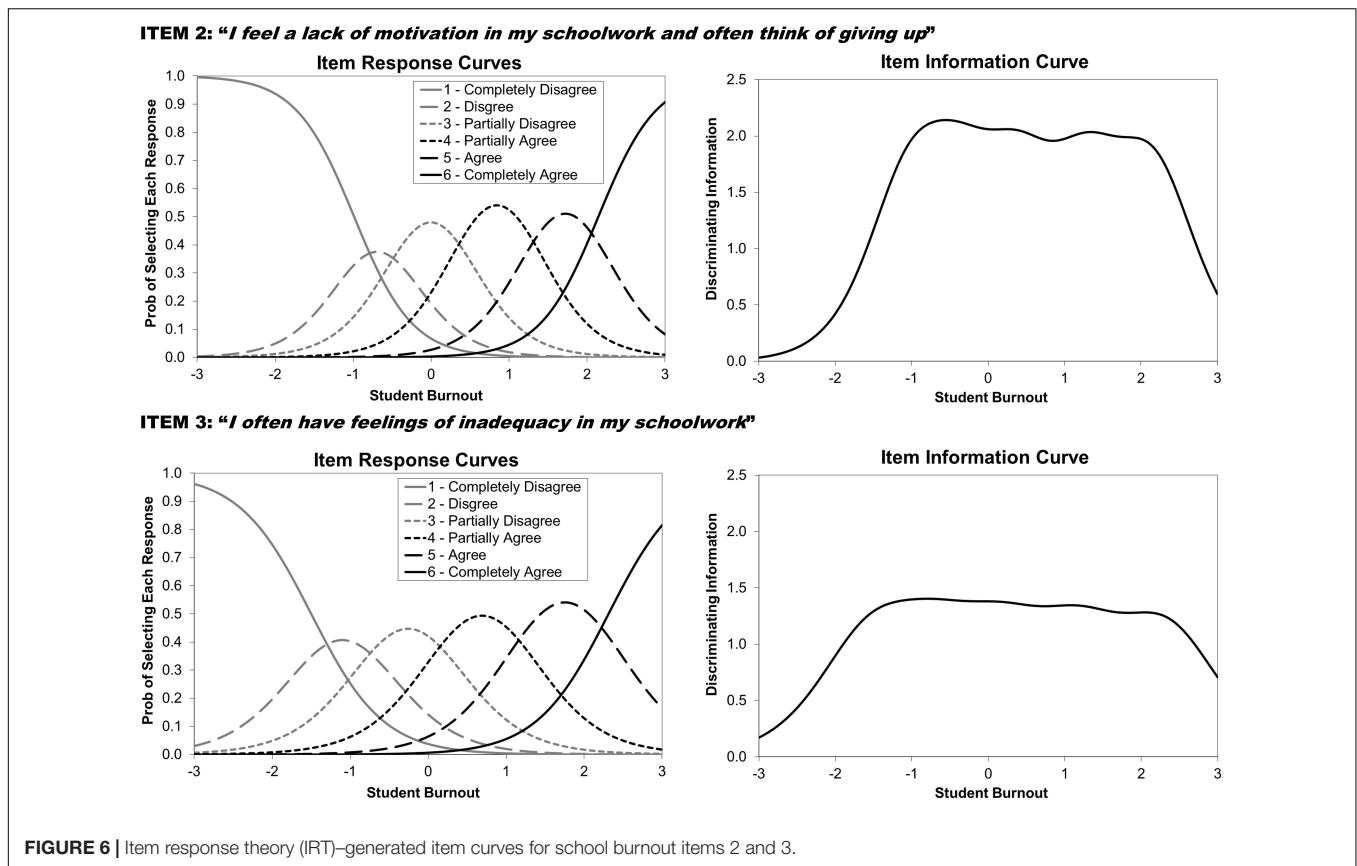


FIGURE 5 | Test information curves for the nine-item and four-item Student Burnout Inventory (SBI).

considered to be more informative if subjects lower on θ select lower answer choices and subjects higher on θ select higher answers. IRT specifically evaluates how the distributions of the responses for each item map onto the latent θ estimates across all subjects (generating item response curves represented by GRM item parameters) to create information profiles (termed item information curves or IICs at the item level and test information curves or TICs at the scale level; see Figure 5). Information curves reveal how much discriminating information items or scales provide at various levels of θ (ranging from 3 standard deviations below the mean to 3 standard deviations above the mean). Information curves therefore synthesize the item parameters estimated by the GRM to provide a graphic method of comparing the relative information provided for items and scales from the same analysis, with curves of greater height (more information) and greater width (spanning a greater range of θ) identifying highly effective items and scales. Put simply, the greater the area under any information curve, the greater the discriminating information offered.

The IICs and the GRM item discrimination parameters were examined and identified four SBI items providing the largest amount of information across the widest range of student burnout, thereby leading to identification of the SBI-4. These four items are items 2, 3, 5, and 6 from Salmela-Aro et al. (2009): “I feel a lack of motivation in my schoolwork and often think of giving up,” “I often have feelings of inadequacy in my schoolwork,” “I feel that I am losing interest in my schoolwork,” and “I’m continually wondering whether my schoolwork has any meaning,” respectively. It is important to note that none of these items are represented in the exhaustion subscale, as items 2, 5, and 6 come from the cynicism subscale and item 3 from the inadequacy subscale.

Figure 5 shows the TICs for the original nine-item SBI as well as the new SBI-4. As revealed by the information curves, although the SBI-4 is less than half the length of the original scale, it offers high levels of information for assessing burnout. Demonstrating the high degree of information the SBI-4 carries



in comparison to the nine-item SBI, the SBI-4 and the nine-item SBI correlated at $r = 0.92$. Furthermore, Pearson correlations between the measurement scales and the SBI-4 and the nine-item SBI produced highly similar patterns: CES-D (SBI-4 $r = 0.49$, SBI-9 $r = 0.52$), STAI (SBI-4 $r = 0.45$, SBI-9 $r = 0.49$), and PSS-10 (SBI-4 $r = 0.51$, SBI-9 $r = 0.60$). IICs for SBI items can be found in **Figure 6** (items 2 and 3) and **Figure 7** (items 5 and 6).

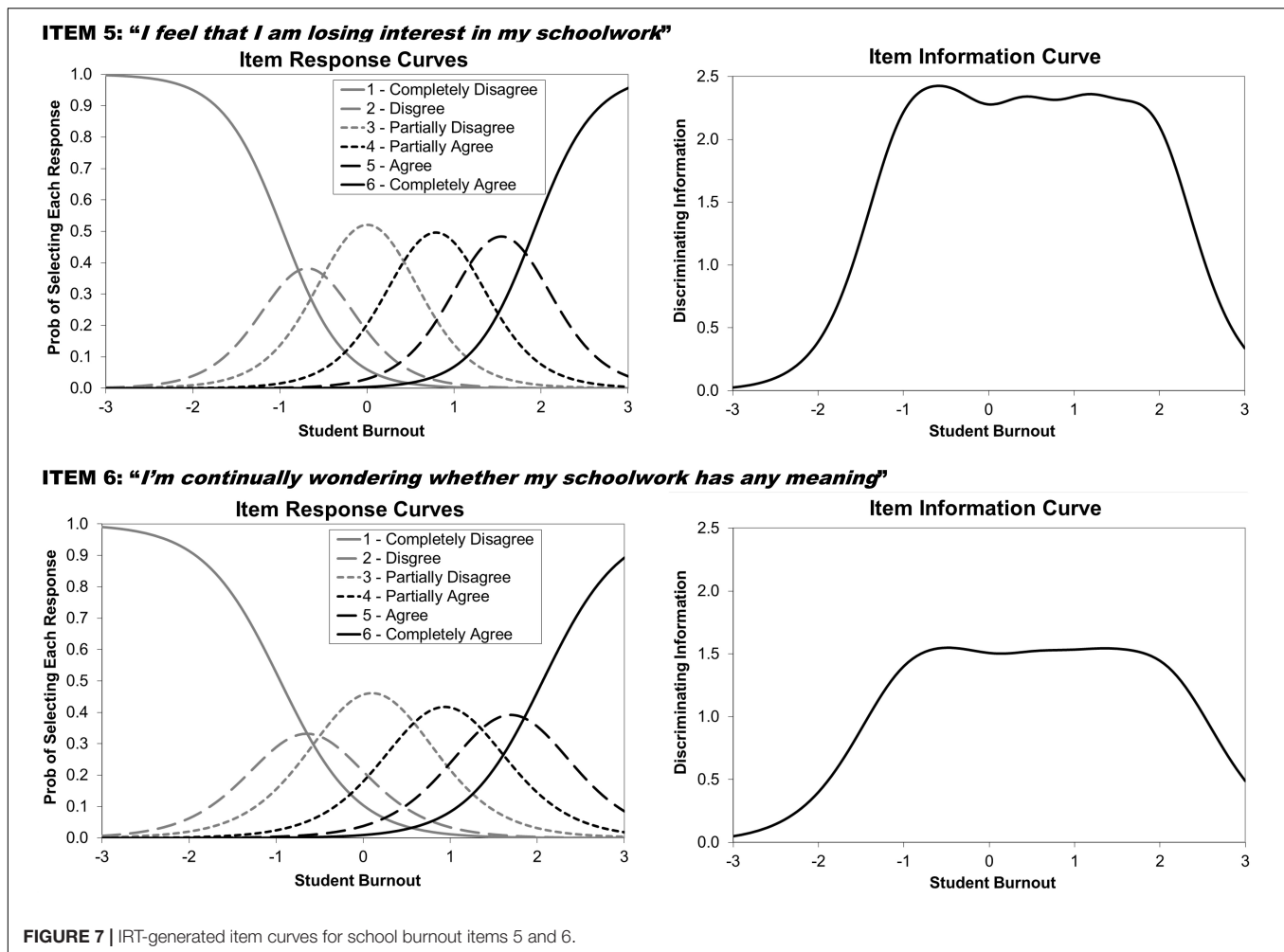
GENERAL DISCUSSION

Over three independent studies, this research evaluated school burnout as measured by the SBI through latent profile (person-oriented) and IRT analyses in American undergraduate students. Studies 1 and 2 identified mutually exclusive school burnout subgroups via LPA. These subgroups were linked to meaningful indicators of both academic success (GPA and academic engagement) and health (depression, anxiety, and sleep quality) and suggested that the information gained from the person-oriented burnout profiles largely parallels that gained from traditional variable-oriented approaches. Thus, latent profile approaches revealed that respondents can be (generally) ordered reliably according to their symptom severity (i.e., the score alone likely provides enough information about between-person differences). Findings also suggest that school burnout follows a stable trajectory over time for the majority of students. Supplementing the profile analyses, IRT analysis provided a

novel, more concise 4-item school burnout measure (SBI-4) that provides reasonably high levels of information for assessing school burnout. This research therefore produces a novel contribution to the school burnout literature by providing the initial evaluation of person-oriented and IRT-based analytic evaluations of burnout in American students.

Supplementing the more commonly found variable-oriented statistical approaches, the person-oriented analyses conducted in this research were able to identify an atypical school burnout typology. Whereas the LPA in Study 1 clustered subscale burnout profiles largely equivocally (mean values of exhaustion, cynicism, and inadequacy were approximately equivalent), the RMLPA in Study 2 identified an atypical school burnout profile where cynicism and inadequacy scores were discrepant from exhaustion scores. While small in prevalence in the sample, future research may find it fruitful to (1) identify covariates predictive of this divergence and (2) identify negative outcomes that may be more closely aligned with this profile than with the other clusters. Also of potential interest to future research may be latent transition analyses (LTAs). LTA has the ability to evaluate whether individuals change or switch their school burnout profile membership over time. The lack of modeling membership transition over time is a limitation of the current analyses.

The development of a shorter, more concise measure of the SBI (SBI-4) was a welcome outcome of the current research. This condensed measure is more time efficient and may be beneficial in time-sensitive data collection studies such as those



conducted in medical-based research, diary-based studies, or larger, national or multi-site research projects. Advantageously, the SBI-4 is not only more time effective, but it does not suffer from information loss in comparison to the full SBI, as demonstrated by the IRT analysis. How the SBI-4 compares to other measures of school burnout such as the Maslach Burnout Inventory—Student Survey or the Oldenburg Burnout Inventory is a task for continued research.

The current IRT analysis may also have produced the added benefit of sparking continued interest in gaining a deeper and richer understating of how individuals respond to items and view the burnout construct, especially in student samples. This is highlighted by the fact that the SBI-4 contains no exhaustion items yet still carries considerable measurement information. Given these findings and noting that the graded response model provides information regarding how well an item differentiates between similar people, it may be that while the “amount” of exhaustion coincides with the construct of burnout (and is a necessary prerequisite of burnout), cynicism and inadequacy items better predict individual differences in burnout-covariate associations. Regardless, debates regarding the conceptualization of burnout (especially with emphasis being placed largely on

the exhaustion dimension) and its measurement are far from concluded and appear more important than ever.

Notwithstanding the strength of this research, important limitations are worth addressing. One limitation is that the samples were predominantly female, thereby limiting the discovery of potential gender differences. Considerable burnout research suggests that females report greater levels of burnout in comparison to their male counterparts; thus, the current findings may be overestimating these psychosocial effect sizes. However, it should be noted that in regard to physiological functioning, prior research indicates that school burnout is associated with cardiovascular risk similarly in both male and female undergraduates (May et al., 2014a,b). Another limitation is the use of self-reported GPA. As an alternative strategy, grades might have been collected from the university registrar, potentially decreasing the influence of self-report bias. However, investigations consistently demonstrate that self-reported grades in undergraduates correlate greatly ($r > 0.80$) with actual grades (Kuncel et al., 2005).

Importantly, it should be emphasized that the current research only focused on undergraduates assessed cross-sectionally or in a relatively short time frame. The three consecutive semesters

used in this research may even be too short of a window to fully capture the developmental profile of burnout. It may be advantageous for future research to evaluate the burnout process over multiple years and in multiple samples, evaluating the same hypotheses tested here in more diverse populations ranging from primary to tertiary school populations (e.g., school-aged children to adults enrolled in medical school programs, Ph.D. graduate programs, and law school programs). Finally, in Study 3, only a subset of possible IRT analyses were conducted. As noted regarding the potential addition of LTAs, additional IRT-based analyses may lead to more confident conclusions regarding subpopulation invariance (for example, contrasting or supplementing IRT differential functioning analyses with IRT likelihood ratio tests).

In summary, the current findings show that school burnout manifests itself in unique clusters of symptoms, which are largely stable over time. Covariate analyses demonstrated differences across profiles, but the patterns were similar to variable-oriented statistical approaches. This research also produced a novel, more concise and time-efficient measure of school burnout, the SBI-4. We believe the current research adds greatly to the understanding of burnout, especially burnout within academic settings (i.e., school burnout). This is especially true given the scarcity of person-oriented and IRT-based approaches in the investigation

of school burnout and the absence of research on these topics in United States undergraduate student samples.

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 Office for Human Subjects Protection – Florida State University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RM contributed to the data collection and manuscript writing. PR conducted the statistical analyses in Studies 1 and 2, and provided interpretation. RR conducted the statistical analysis in Study 3 and provided interpretation. FF contributed to the manuscript writing.

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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.

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Burnout Stigma Inventory: Initial Development and Validation in Industry and Academia

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Although burnout is a risk factor for various negative mental and physical outcomes, its prevention is hampered by the stigma associated with burnout. The current research therefore reports on the initial development and validation of a novel measure of perceived burnout stigma. Study 1 ($n = 318$) describes the construction and initial evaluation of scale items derived from established mental health stigma and burnout scales. Study 2 ($n = 705$) then replicated the burnout stigma factor structure established in the initial study. Additionally, it evaluates relationships between occupational and school burnout stigma and indicators of mental health. Hierarchical multiple regressions showed that burnout stigma accounted for variance in depression, anxiety, and stress over and beyond that of burnout. Study 3 ($n = 682$) extended these findings via cross-lagged and bidirectional models, demonstrating that burnout stigma predicted mental health indicators 6 weeks later. Study 4 ($n = 717$) supplemented earlier exploratory and confirmatory factor analyses using item response theory to further demonstrate that perceived burnout stigma is a unidimensional construct potentially applicable to both work and school settings. Overall, the current research resulted in an eight-item burnout stigma instrument (BSI-8) with excellent psychometric properties that predicts indicators of mental health.

Keywords: burnout, instrument development, item response theory, mental health, stigma

INTRODUCTION

Although conceptualizations vary, burnout is widely considered to comprise three factors (emotional exhaustion, cynicism toward one's work, and doubt in professional efficacy) resulting from prolonged exposure to work-related stress (Maslach et al., 2001; Schaufeli et al., 2009; Maslach, 2017). Highlighting its growing importance in relation to wellness, the World Health Organization (WHO) recently announced that the upcoming 11th Revision of the International Classification of Diseases (ICD-11) will provide a more detailed description of burnout, emphasizing burnout as a syndrome resulting from "chronic workplace stress that has not been successfully managed" (World Health Organization, 2019). Initially identified in human service occupations (Freudenberger, 1974), research has since documented burnout in other occupations (Maslach et al., 2001), and in academic (school) populations (Walburg, 2014). The application of burnout to students suggests

that both employment and school obligations entail achievement pressures and that burnout manifests from difficulties in coping with those pressures (for a detailed commentary see Schaufeli and Taris, 2005; Salmela-Aro et al., 2009; Parker and Salmela-Aro, 2011). Indeed, data suggests that burnout levels are comparable in occupational and school settings (Reis et al., 2015) with both lay and research audiences noting concern about its “epidemic” prevalence (Milken Institute Center for the Future of Aging, 2018; Ranjbar and Ricker, 2018).

The fact that burnout is linked to numerous negative outcomes emphasizes its importance. Psychologically, for example, individuals experiencing burnout display cognitive impairments (Deligkaris et al., 2014), difficulty with emotional response suppression (Golkar et al., 2014), and increased levels of clinical depression (Bianchi et al., 2013). In regards to physiology, burnout has been associated with differential brain structure (Savic, 2015), hypothalamic-pituitary-adrenal (HPA) axis dysregulation (Oosterholt et al., 2015), suboptimal cardiovascular functioning (May et al., 2014a,b, 2016, 2018) and increased risk of heart disease and mortality (Toker et al., 2012). In sum, burnout is a ubiquitous phenomenon of interest to a diverse audience including physiologists, mental and behavioral health professionals, and policy makers.

Even though ample evidence indicates that burnout is an independent risk factor for numerous deleterious mental and physical health outcomes, there are barriers to its prevention. One notable barrier is the stigma associated with burnout (Bianchi et al., 2016). The importance of stigma is emphasized in research on mental health where it has been shown to result in feeling insecure, inadequate, inferior, and weak; it also encourages avoidance, prejudice, and rejection of people with mental health conditions (Lannin et al., 2016). Thus, individuals with mental health challenges often face social consequences in addition to their health challenges. Some research suggests that stigma may even be more harmful to people with a mental health condition than the condition itself (Cechnicki et al., 2011).

The World Health Organization (WHO) considers stigma to be one of the greatest barriers to the treatment of mental health challenges (Orel, 2007). People presenting with symptoms are likely to perceive higher stigma than those without current symptoms (Busby Grant et al., 2016). This is problematic as stigma increases the risk of developing depression and anxiety (Pyle et al., 2015) and serves as a barrier for help-seeking behaviors (Bianchi et al., 2016). Several types of stigma affect those with mental health challenges, including perceived stigma. Perceived stigma refers to an individual's beliefs about others' attitudes toward mental health challenges (Busby Grant et al., 2016).

Applied to burnout, perceived stigma may reflect the belief that most people view burnt out individuals as less competent than those who are not burnt out. Perceived stigma is often internalized in the form of self-stigma, which in turn, predicts help-seeking attitudes and behaviors (Chronister et al., 2013; Jennings et al., 2015). Therefore, stigma is a powerful social force that has the potential to prevent treatment seeking and exacerbate the stigmatized challenges

(Jennings et al., 2015; Pyle et al., 2015). This study explores burnout stigma conceptualized as the perceived stigma of individuals who experience burnout.

Like indicators of mental health, burnout carries stigma while also being socially contagious (see the overview provided in Bakker et al., 2005). As burnout manifests in both behavioral and social symptoms, symptoms can be noticed by others and incorporated into emotional contagion processes (i.e., mimicry). This may then result in a double-edged problem: burnout prevalence grows (as the likelihood of self-labeling increases), while the likelihood of help-seeking behaviors decreases (thus preventing appropriate treatment). Unfortunately, even though burnout stigmatization has attracted increasing interest from researchers in Europe (Bianchi et al., 2016, 2019), almost nothing is known about burnout stigma in the U.S in either employed or student populations. Establishing a thorough understanding of burnout stigma and its correlates is imperative in order to increase awareness and provide a platform for advocacy and policy change.

Therefore, to expand understanding of burnout stigma in the U.S. we investigated perceived burnout stigma in four studies using American samples. Study 1 first reports beliefs about the potential stigmatization of school burnout. Study 1 presents a new burnout stigma measure that can be adapted for use in academic and work settings. Study 2 confirms the factor structure identified in Study 1 and then documents mental health correlates in both academic and occupational samples. Study 3 then provides data on the temporal ordering of perceived burnout stigma and mental health indicators. Finally, Study 4 provides an item response theory analysis of the new eight-item burnout stigma instrument (BSI-8). This research emphasizes the importance of burnout stigma, describes the development and validation of a novel perceived burnout stigma measure that can be used in both occupational and academic settings, and highlights the potential influence of perceived burnout stigma on mental health indicators. Given recent attention aimed at increasing awareness of burnout symptomology, the development of a validated burnout stigma measure would provide an important contribution to burnout prevention and early identification efforts.

STUDY 1

Burnout appears to be a serious problem worldwide (Sablik et al., 2013) that is linked to a variety of mental health challenges, including anxiety, depression, stress, and borderline personality traits (Mohammadi, 2006; Bianchi et al., 2013, 2018). However, research examining burnout stigmatization has only recently emerged (Dyrbye et al., 2015; Bianchi et al., 2016; Mullen and Crowe, 2017). Bianchi and colleagues were the first to study burnout-specific stigma (Bianchi et al., 2016). To measure burnout stigma, the authors replaced the term “depression” with “burnout” in a 7-item depression instrument derived by the authors (Crisp et al., 2005; Beck et al., 2009; Schwenk et al., 2010). Findings indicated that burnout was stigmatized at only a slightly

lower level than depression (Bianchi et al., 2016), although other findings indicate that burnout may not be less stigmatized than depression (Mendel et al., 2015).

In any event, stigma related to burnout may be different from that related to depression (for further commentary contrasting burnout and depression, see Koutsimani et al., 2019). Burnout is less publicized than depression and is usually conceptualized within the specific context of work or school (Maslach et al., 2001; Schaufeli et al., 2009), whereas depression is viewed as context independent. Additionally, as each label (burnout and depression) potentially carries a unique social stigma, burnout and depression stigma may lead to differing outcomes. Thus, it may be worthwhile to examine burnout stigma as separate from depression stigma (Bianchi et al., 2016).

As burnout stigma in the U.S. has been underexplored, Study 1 sought to provide some content validation to the construct of burnout stigma. In order to better understand the stigma of a specific group, one must first ask those in the group for their thoughts about the group identity and stigma (Corrigan, 2018). Consequently, we first evaluated the awareness of burnout amongst students and their thoughts about burnout stigma. Although some research has studied stigma as it relates to burnout, this research has not explored student attitudes toward the construct of school burnout and burnout stigma (Dyrbye et al., 2015; Mullen and Crowe, 2017; Bianchi et al., 2018). The authors posit that individuals might negatively judge those who experience burnout (as happens with those suffering from numerous illnesses including depression and anxiety, see Bharadwaj et al., 2017).

This study also sought to construct a burnout stigma measure applicable to U.S. populations. The measure was constructed from items and themes modified from established stigma and burnout scales (see description in section Materials and Methods). Sampling and evaluation of these new items was completed in both academic and occupational samples. Based on prior findings, burnout stigma was expected to be of appreciative magnitude in both populations. In sum, Study 1 evaluated support for the content validity of burnout stigma and provided initial data on a novel perceived burnout stigma scale that can be used in both occupational and school settings.

Materials and Methods

Participants

For the occupational sample, 144 employed adults ($M_{\text{age}} = 34.50$, $SD = 9.85$ years, Males = 65.2%) completed the measure using Amazon Mechanical Turk. Eligibility criteria included at least 30 h of weekly work/130 h monthly work. Work sample demographics include: 74% Caucasian, 8% African American, 11% Asian, 5% Hispanic, and 2% endorsed either biracial or non-disclosed ethnicity. For the student sample, 174 undergraduate students completed the measure in an online survey ($M_{\text{age}} = 19.21$, $SD = 1.12$ years, Females = 93%). Eligibility criteria include completing a full semester of college. Student demographics include: 70% Caucasian, 15% African American,

2% Asian, 9% Hispanic, and 4% endorsed biracial/non-disclosed ethnicity with 20% Freshmen, 33% Sophomore, 25% Junior, and 22% Senior.

Measures

Burnout and burnout stigma beliefs

Several items were used to assess student beliefs about burnout and burnout stigma. One question was: “Have you heard of the term ‘school burnout?’” with three response options (1 = No, never, 2 = Maybe but unsure, 3 = Yes). Subsequent questions were, “Do you think you suffer negative outcomes because of school burnout?” “Do you think school burnout is dangerous to one’s health?” “Do you think the university should provide support for students suffering from school burnout?” and “Do you think those suffering from school burnout may be stigmatized?” These questions were answered on a 4-point scale (1 = No, not at all, 2 = A little, 3 = Moderately so, 4 = Yes, definitely).

Burnout stigma

The burnout stigma measure was constructed with items that used phrasing and themes from previously established mental health stigma and burnout scales. These included the Stigma Scale for Receiving Psychological Help, the Self-Stigma of Mental Illness Scale, the Maslach Burnout Inventory-General Survey, and the Maslach Burnout Inventory-Student Survey (Schaufeli et al., 1996, 2002; Komiya et al., 2000; Tucker et al., 2013). Relevant themes were extracted from existing descriptions of burnout and of mental health stigma and then items were created with combinations of burnout and stigma descriptors. Item stems referencing the themes of emotional exhaustion, cynicism toward one’s work, and doubt in professional efficacy were combined with references to negative or less desirable traits/behaviors/outcomes (e.g., lazy, lack of worth, poor performance, unintelligent, character flaws) to represent perceived burnout stigma items. Scale items appear in **Table 1**. Phrasing was adapted to fit occupational and school settings, for instance “work” was replaced with “schoolwork” where appropriate.

Participants were asked, “Please rate the degree to which most other people would agree with the following statements. Your responses should reflect your impression of others’ beliefs and not necessarily your own. Most people believe that.” which was then followed by the stigma items and response scale. Ten items were included as short survey lengths yield higher response rates (Deutschens et al., 2004). Responses were given on a 7-point scale (1 = Strongly Disagree, Moderately Disagree, Slightly Disagree, Neither Agree Nor Disagree, Slightly Agree, Moderately Agree, 7 = Strongly Agree).

Procedure

Data collection from all eligible participants was completed via an online survey which contained demographics and the burnout stigma scale. The occupational sample was collected via Amazon Mechanical Turk and paid \$2 (USD). The student sample was recruited from undergraduate classrooms as an option for voluntary class credit. Extra credit was generally less than 1% of the final grade. Student data were collected in the middle (weeks

TABLE 1 | Means and standard deviations for items of the burnout stigma instrument (BSI) for the student and occupational samples.

Item	Students <i>M</i> (<i>SD</i>)	Workers <i>M</i> (<i>SD</i>)
People who are burnt out are lazy.*	3.15 (1.71)	2.52 (1.57)
People who claim to be burnt out should work harder.	3.14 (1.64)	2.66 (1.90)
Those who feel overwhelmed by schoolwork are weak.	2.77 (1.69)	2.62 (1.62)
Those who don't have energy for schoolwork aren't pushing themselves enough.	3.11 (1.77)	2.92 (1.76)
People who are too emotionally exhausted to do well at school don't deserve achievement or praise.	2.63 (1.64)	2.92 (1.81)
Those who lose interest in their schoolwork are incapable of performing well.	2.91 (1.64)	3.09 (1.76)
People who question why their schoolwork is important are not worth the investment of time and resources.	2.83 (1.63)	2.72 (1.57)
People who think their schoolwork is pointless wouldn't make good friends.*	2.84 (1.69)	2.60 (1.64)
Those who feel inadequate at school are unintelligent.	2.44 (1.57)	2.44 (1.62)
People who are burnt out have some character flaw.	2.50 (1.61)	2.47 (1.68)

*Item eliminated via factor analysis.

3–9) of the spring academic semester. All participants gave their written consent prior to study participation and approval was obtained from the institutional review board before any data were collected.

Results and Discussion

Student Sample

First, beliefs about burnout within an academic context, “school burnout,” and perceived burnout stigma were evaluated. A minority of students (10.2%) had never heard of the term school burnout and approximately a quarter (27.2%) reported “maybe but unsure” (**Figure 1**). However, most students (62.6%) had heard of the term school burnout, which suggests school burnout is a salient problem visible to students. Furthermore, over 50% of students reported that those suffering from school burnout may be stigmatized and that the university should provide support for these students.

Next, regarding perceived burnout stigma, exploratory factor analysis was conducted. Means and standard deviations of items are reported in **Table 1**. Skewness of items ranged from 0.32 to 0.89 ($SE = 0.10$) and Kurtosis ranged from -0.16 to -0.99 ($SE = 0.20$). Exploratory factor analysis (EFA) of the 10-burnout stigma items yielding a dominant first factor with an eigenvalue of 7.05. The next largest eigenvalue was 0.83. All items demonstrated strong factor loadings, ranging from 0.660 to 0.889 with good scale reliability ($\alpha = 0.95$). Principal components factor analysis using varimax rotation demonstrated a single factor (67.40% of the variance). Initial model fit indices conducted with structural equation model (SEM) via Mplus (Version 8) utilizing all ten items loading onto a single latent factor revealed marginal model fit: $\chi^2(36) = 92.11$, $p < 0.001$, CFI = 0.87, TLI = 0.88, SRMR = 0.066. After examination of modification indices, items 1 and 8 were removed, and a covariation between items 6 and 7 was added. Fit indices then demonstrated acceptable (good) model fit: $\chi^2(20) = 47.03$, $p < 0.001$, CFI = 0.96, TLI = 0.94, SRMR = 0.052.

Occupational Sample

Item descriptives for the perceived burnout stigma measure from the occupational sample are reported in **Table 1**. Skewness of items ranged from 0.35 to 0.98 ($SE = 0.20$) and Kurtosis ranged from 0.03 to -0.98 ($SE = 0.40$). The EFA yielded a dominant

first factor with an eigenvalue of 6.75, eight times larger than the next eigenvalue (0.780) with strong factor loadings ranging from 0.686 to 0.876 producing good scale reliability ($\alpha = 0.94$). Similar to the student sample, the principal components factor analysis using varimax rotation demonstrated a single factor (64% of the variance). SEM based model fit indices using all ten items set to load onto a single latent factor revealed marginal model fit: $\chi^2(36) = 165.62$, $p < 0.001$, CFI = 0.89, TLI = 0.87, SRMR = 0.065. After examination of modification indices, items 1 and 8 were removed, and a covariation between items 6 and 7 was added. Fit indices then indicated good model fit: $\chi^2(20) = 49.94$, $p < 0.001$, CFI = 0.97, TLI = 0.95, SRMR = 0.058.

Overall, perceived stigma for both school and occupational burnout appear to be appreciable (in regards to mean scale values) suggesting that burnout is perceived to be stigmatized in school and work settings. Students indicate they are aware of school burnout and its relationship to one's health. Importantly, a sizable majority of students (71.6%) feel that school burnout may be stigmatized. The findings that burnout is known and stigmatized indicate that those who experience burnout may feel judged by their peers, and supports the view that burnout stigma is widespread. Furthermore, there appears to be a single factor representing an eight-item burnout stigma instrument (BSI-8) that can be used to assess perceived burnout stigma in both work and academic populations.

Although these findings are promising, many important questions remain. First, the factor structure identified requires confirmation using independent samples. Second, whether own burnout relates to perceptions of stigmatization needs examination as some evidence indicates that those who are burnt out are more likely to endorse perceptions of general mental health stigma than those who are not burnt out (Dyrbye et al., 2015). Third, does perceived burnout stigma serve as a risk factor for mental health?

STUDY 2

This study sought to extend the examination of burnout stigma in both occupational and academic samples by confirming the factor structure of the burnout stigma measure (BSI-8)

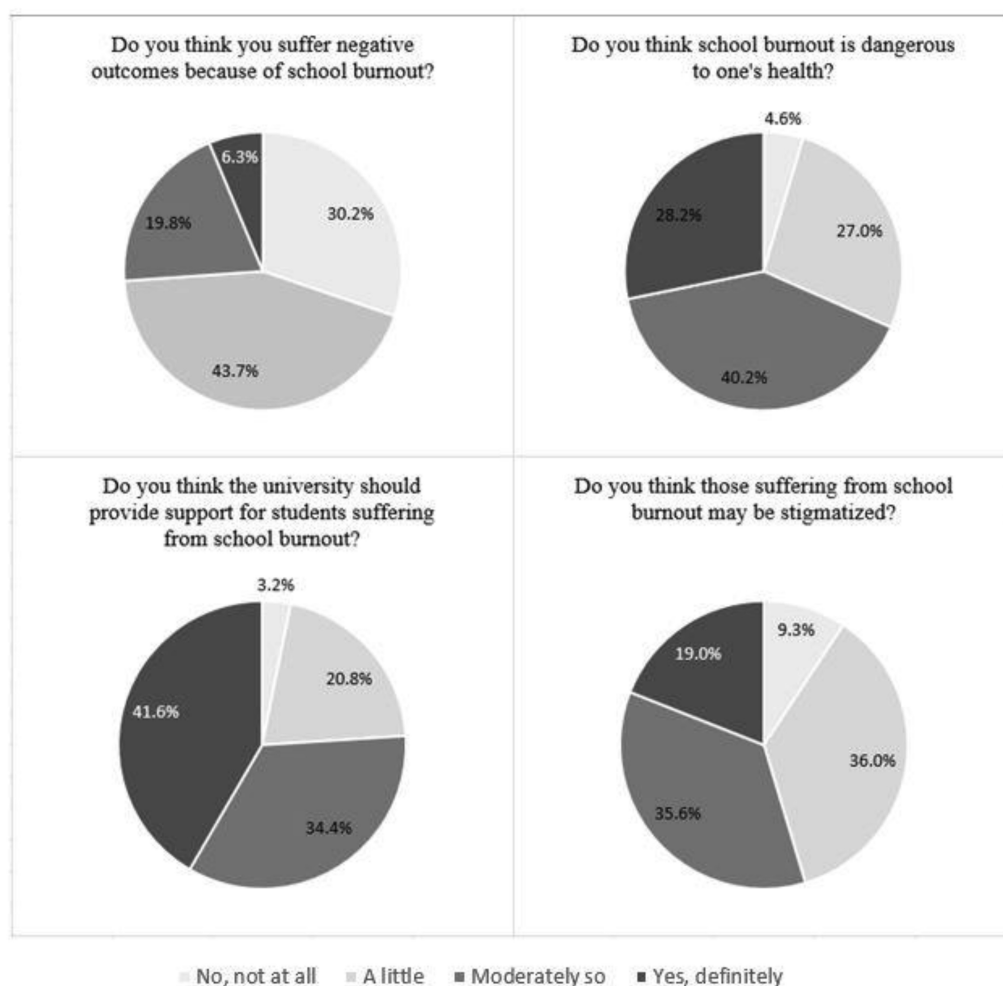


FIGURE 1 | Responses to items exploring the construct validity of school burnout and burnout stigma.

identified in Study 1 using confirmatory factor analysis. It also investigates associations between the BSI-8, burnout, and several indicators of mental health (e.g., depression, anxiety, and stress). To date, conflicting evidence exists regarding associations between burnout and stigma, and no research has explored this relationship with burnout-specific stigma. For example, Dyrbye et al. (2015) showed that in medical students increased perceptions of general mental health stigma correspond to greater burnout symptomology whereas Mullen and Crowe (2017) report a small negative correlation between these constructs in school counselors. Also, in sample of occupational mental health non-professionals residing in Japan, Mitake et al. (2019) found inconsistent relationships between burnout and perceived mental-illness-related stigma. Although investigating *self*-stigma and not *perceived* mental-illness-related stigma, a comparative study of Lithuanian and USA non-medical mental health care providers demonstrated that global MBI scores were linked to self-stigma of seeking help, but only in the Lithuanian sample (Endriulaitienė et al., 2019). The following study therefore examines the potential relationship between

burnout symptomology and perceived burnout stigma in samples of workers and students. Finally, it also explores whether burnout stigma, independently of one's burnout, serves as a risk factor for adverse mental health outcomes (self-reported depression, anxiety, and stress) in occupational and academic settings.

Materials and Methods

Participants

For the occupational sample, 122 employed adults ($M_{\text{age}} = 32.19$, $SD = 10.41$ years, Males = 69.43%) participated. Eligibility criteria included working at least 30 h per week or 130 h of work per month. Work sample demographics include: 70% Caucasian, 9% African American, 9% Asian, 7% Hispanic, and 5% endorsed either biracial or non-disclosed ethnicity. For the academic sample, 500 undergraduate students (85% females, $M_{\text{age}} = 19.57$ years, $SD = 1.77$) participated. Students who completed at least one full academic semester were eligible for study participation. Sample demographics include: 65% Caucasian, 17% African American, 2% Asian, 8% Hispanic, and

8% endorsed either biracial or non-disclosed ethnicity with 18% Freshmen, 32% Sophomore, 30% Junior, and 20% Senior.

Measures

Burnout stigma

The 8-item burnout stigma instrument (BSI-8) created by the authors in Study 1 was used in Study 2. Phrasing was adapted to fit occupational and school settings, for instance “work” was replaced with “schoolwork” ($\alpha = 0.94$ work sample, $\alpha = 0.96$ school sample).

Burnout

Burnout in the occupational sample was measured with the Maslach Burnout Inventory-General Survey (MBI-GS; Schaufeli et al., 1996). The MBI-GS consists of 16 items that constitute three scales: exhaustion (5 items, $\alpha = 0.91$), cynicism (5 items, $\alpha = 0.93$), and professional efficacy (6 items, $\alpha = 0.89$). Burnout in the academic sample was measured with the Maslach Burnout Inventory-Student Survey (MBI-SS; Schaufeli et al., 2002). The MBI-SS consists of 15 items that constitute three scales: exhaustion (5 items, $\alpha = 0.92$), cynicism (4 items, $\alpha = 0.93$), and professional efficacy (6 items, $\alpha = 0.92$). Items include, “I feel emotionally drained by my studies,” “I have become less enthusiastic about my studies,” and “I can effectively solve the problems that arise in my studies,” for exhaustion, cynicism, and professional efficacy, respectively. Both MBIs use a 7-point frequency rating (0 = never to 6 = everyday). Higher scores on exhaustion and cynicism and low scores on efficacy are indicative of greater burnout. MBI efficacy scores were reverse coded to compute composite scores. Summed subscale scores yielded an overall burnout score, with higher scores indicating greater burnout.

Mental health indicators

Indicators of mental health were measured with The Depression, Anxiety and Stress Scale-21 Items (DASS-21; Lovibond and Lovibond, 1995). The DASS-21 is a self-report measure of three scales designed to measure the emotional states of depression, anxiety, and stress. Participants are asked to read over statements and indicate how much the statement applied to them over the past week (0 = did not apply to me, 3 = applied to me very much or most of the time). Each of the DASS-21 subscales contains 7 items with composite subscale scores for depression (DASS-D), anxiety (DASS-A), and stress (DASS-S) being calculated by summing the scores for the relevant items. Higher scores equate to higher symptomology. Reliability was high with $\alpha > 0.95$ for all the subscales in both samples.

Procedure

As in Study 1, data were obtained using an online survey. The occupational sample was recruited using Amazon Mechanical Turk and paid \$2 (USD). The student sample came from undergraduate classrooms as an option for voluntary extra class credit. Extra credit was generally less than 1% of the final grade. Student data were collected in the middle (weeks 3–9) of the spring academic semester. All participants gave written consent prior to participation and the institutional review board approved the study before data collection.

Statistical Analyses

Confirmatory factor analyses (CFA) of the burnout stigma scale model as identified in Study 1 (unidimensional loading of 8 items and allowing items 6 and 7 to covary) were conducted via structural equation modeling (SEM) in Mplus (Version 8) using robust maximum likelihood estimation. CFAs were done independently for the occupational and academic samples. Hu and Bentler's (1999) recommendations informed evaluation of model fit, which is considered good when chi-square is non-significant, CFI and TLI approximate or are greater than 0.95, and SRMR is below 0.08. Pearson correlations examined the bivariate relationships between burnout stigma, burnout (global scores from the MBI-GS in the occupational sample and the MBI-SS in the academic sample), and the depression, anxiety, and stress subscales of the DASS-21. Three hierarchical multiple regressions (HMR) were conducted controlling for burnout to evaluate the unique contribution of burnout stigma in predicting variance in depression, anxiety, and stress scores.

Results and Discussion

Specifying a single factor and allowing covariance between items 6 and 7 yielded a good model fit in both samples: occupational sample, $\chi^2(20) = 48.17$, $p < 0.001$, CFI = 0.94, TLI = 0.93, SRMR = 0.029; academic sample, $\chi^2(20) = 44.70$, $p < 0.001$, CFI = 0.96, TLI = 0.95, SRMR = 0.019. Burnout stigma was not related to burnout in either the occupational ($r = 0.03$) or academic ($r = 0.06$) samples. Burnout stigma, however, was related to all three DASS-21 subscales in the occupational sample and academic samples ($p < 0.05$, see Table 2).

In the occupational sample, HMR analyses (presented in Table 3) showed that after controlling for burnout, burnout stigma accounted for additional variance in depression, $\Delta F(1, 119) = 7.73$, $p = 0.006$, anxiety, $\Delta F(1, 119) = 13.34$, $p < 0.001$, and stress, $\Delta F(1, 119) = 9.61$, $p = 0.002$. Burnout stigma uniquely predicted 3% of the variance in depression scores, 7% of the variance in anxiety scores, and 4% of the variance in stress scores. Similarly, in the academic sample, HMR analyses showed that after controlling for burnout, burnout stigma accounted for additional variance in scores of depression, $\Delta F(1, 497) = 11.13$, $p = 0.001$, anxiety, $\Delta F(1, 497) = 11.93$, $p = 0.001$, and stress, $\Delta F(1, 497) = 11.33$, $p = 0.001$. Burnout stigma uniquely accounted for approximately 2% of the variance in scores of depression, anxiety, and stress.

Overall, these findings confirm the factor structure of the perceived burnout stigma measure initially produced in Study 1. Extending the examination of this measure of stigma to associations with covariates showed that, contrary to prior research (Dyrbye et al., 2015; Mullen and Crowe, 2017), burnout stigma was not related to one's own burnout in either sample. These discrepant findings may reflect differences in the populations sampled as well as other important methodological differences. For example, Dyrbye et al. (2015) used only the emotional exhaustion and cynicism MBI subscales which were then categorized into low, medium, and high symptomologies. Furthermore, via chi-square tests, burnout relationships were evaluated with a stigma endorsement measure that was

TABLE 2 | Correlation matrices of stigma, burnout, and DASS-21 in the work and student samples.

Variable	<i>M ± SD</i>	1	2	3	4	5
Work Sample						
1. Burnout stigma	21.40 ± 10.97	1.00	0.03	0.23 [*]	0.30 ^{**}	0.24 ^{**}
2. MBI-GS	40.45 ± 18.52		1.00	0.70 ^{**}	0.59 ^{**}	0.70 ^{**}
3. DASS-D	7.64 ± 10.08			1.00	0.81 ^{**}	0.82 ^{**}
4. DASS-A	6.28 ± 9.46				1.00	0.87 ^{**}
5. DASS-S	8.77 ± 9.01					1.00
Student Sample						
1. Burnout stigma	22.56 ± 11.69	1.00	0.06	0.15 ^{**}	0.15 ^{**}	0.16 ^{**}
2. MBI-SS	44.21 ± 12.06		1.00	0.46 ^{**}	0.35 ^{**}	0.39 ^{**}
3. DASS-D	5.21 ± 4.65			1.00	0.72 ^{**}	0.73 ^{**}
4. DASS-A	5.99 ± 4.98				1.00	0.79 ^{**}
5. DASS-S	6.41 ± 4.33					1.00

N = 122 for occupational sample. *N* = 500 for academic sample. MBI-GS, Maslach Burnout Inventory; DASS-D, Depression Anxiety Stress Scale – Depression, DASS-A, Depression Anxiety Stress Scale – Anxiety; DASS-S, Depression Anxiety Stress Scale – Stress, MBI-SS, Maslach Burnout Inventory – Student Survey. **p* < 0.05, ***p* < 0.01, two-tailed.

TABLE 3 | Hierarchical multiple regressions of DASS-21 scales on burnout stigma controlling for personal burnout in occupational and academic samples.

Criterion	Step	Predictors	β	<i>p</i>	Model <i>R</i> ²	Model ΔR^2	Model <i>F</i>
Work							
DASS-D	S1	MBI-GS	0.70	0.000	0.49		<i>F</i> (1, 120) = 113.50, <i>p</i> < 0.000
	S2	MBI-GS	0.69	0.000	0.52		
		Stigma	0.18	0.006		0.03	ΔF (1, 119) = 7.73, <i>p</i> = 0.006
DASS-A	S1	MBI-GS	0.59	0.000	0.34		<i>F</i> (1, 120) = 62.79, <i>p</i> < 0.001
	S2	MBI-GS	0.57	0.000	0.41		
		Stigma	0.26	0.000		0.07	ΔF (1, 119) = 13.34, <i>p</i> < 0.001
DASS-S	S1	MBI-GS	0.70	0.000	0.49		<i>F</i> (1, 120) = 116.66, <i>p</i> < 0.001
	S2	MBI-GS	0.69	0.000	0.53		
		Stigma	0.20	0.002		0.04	ΔF (1, 119) = 9.61, <i>p</i> = 0.002
Student							
DASS-D	S1	MBI-SS	0.46	0.000	0.23		<i>F</i> (1, 498) = 150.08, <i>p</i> < 0.000
	S2	MBI-SS	0.45	0.000	0.25		
		Stigma	0.15	0.001		0.02	ΔF (1, 497) = 11.13, <i>p</i> = 0.001
DASS-A	S1	MBI-SS	0.35	0.000	0.13		<i>F</i> (1, 498) = 87.45, <i>p</i> < 0.001
	S2	MBI-SS	0.35	0.000	0.15		
		Stigma	0.15	0.001		0.02	ΔF (1, 497) = 11.93, <i>p</i> = 0.001
DASS-S	S1	MBI-SS	0.39	0.000	0.15		<i>F</i> (1, 498) = 100.62, <i>p</i> < 0.001
	S2	MBI-SS	0.39	0.000	0.17		
		Stigma	0.15	0.001		0.02	ΔF (1, 497) = 11.33, <i>p</i> = 0.001

N = 122 for occupational sample. *N* = 500 for academic sample. MBI-GS, Maslach Burnout Inventory; DASS-D, Depression Anxiety Stress Scale – Depression; DASS-A, Depression Anxiety Stress Scale – Anxiety; DASS-S, Depression Anxiety Stress Scale – Stress, MBI-SS, Maslach Burnout Inventory – Student Survey.

unstandardized and not previously examined (i.e., author created questions, self-stigma vs. public stigma vs. treatment stigma questions mixed, and no factor structure examination). Lastly, previous research measured general mental health stigma and not stigma that is specific to burnout (Dyrbye et al., 2015; Mullen and Crowe, 2017). Thus, given these differences in samples and measurement, further research needs to explore any potential association between burnout and burnout stigma.

Finally, this study demonstrated that perceived burnout stigma was associated with negative affect (symptoms of depression, anxiety, and stress). The link between burnout stigma and negative affect symptoms was especially robust as it occurred in both the occupational and academic samples. These relationships also held after controlling for one's burnout. Thus, even though this study provided evidence on the reliability of the factor structure and some evidence of the validity of the

burnout stigma measure, concerns regarding direction of effect arise. Study 3 attempts to address such concerns.

STUDY 3

Although Study 2 showed that burnout stigma is related to mental health (i.e., depression, anxiety, and stress scores), causal inferences are limited by the cross-sectional nature of the data. This study therefore sought to determine the temporal ordering of perceived burnout stigma and mental health indicators using two waves of data collected 6 weeks apart in a student sample. Cross-lagged stability models and bidirectional analyses were used to examine temporal relationships. Cross-lagged stability models allow examination of longitudinal relationships between variables while also controlling for their stability by having each Time 2 variable simultaneously regressed on each Time 1 variable. The occurrence of a significant cross-lagged effect reflects a relationship beyond that which can be accounted for by the stability of the constructs and their association at Time 1. The presence of bidirectional or synchronous effects between perceived burnout stigma and mental health indicators were also examined in non-recursive models.

Materials and Methods

Participants

Undergraduate students ($n = 682$; 92% Females, $M_{\text{age}} = 20.03$, $SD = 1.89$ years) completed an online survey at two time points 6 weeks apart. Eligibility criteria include completing a full semester of college. Student demographics include: 69% Caucasian, 10% Black, 14% Hispanic, 2% Asian, and 5% endorsed other with 24% Freshmen, 29% Sophomore, 24% Junior, and 23% Senior.

Measures

Burnout stigma

The BSI-8 created by the authors was again used with phrasing adapted to reflect the school settings ($\alpha = 0.95$ at Time 1, $\alpha = 0.96$ at Time 2).

Mental health indicators

The Depression, Anxiety and Stress Scale (DASS-21; Lovibond and Lovibond, 1995) served as an indicator of mental health in this study. Reliability was high with $\alpha > 0.93$ for all the subscales at both time waves. As Study 2 showed high intercorrelations among the subscales and similar relationships between the subscales and burnout stigma, the global composite score was used for the main analyses of this study by summing all DASS-21 items.

Results and Discussion

Examination from the cross-lagged stability models demonstrated that the effect from Time 1 burnout stigma to Time 2 DASS-21 was significant, $\beta = 0.10$, $p < 0.05$, but the effect from Time 1 DASS-21 to Time 2 burnout stigma was not, $\beta = 0.01$, ns (**Figure 2A**). To examine the possible bidirectional (synchronous) effects between the two indices, non-recursive models were estimated. In order to identify a bidirectional

effects model, several conditions need to first be satisfied. The present model satisfies these conditions in that earlier measures of perceived burnout stigma and DASS-21 scores are presumed to be predetermined variables and thereby uncorrelated with the disturbance terms in both Time 2 equations and both cross-lagged effects are constrained to be zero. These analyses produced findings that were consistent with the results obtained in the cross-lagged stability models. Again, in each model (**Figure 2B**), the effect from stigma to DASS-21 was significant ($\beta = 0.19$, $p < 0.05$) but the effect in the opposite direction was not ($\beta = 0.01$, ns). It should be noted that analyses substituting DASS subscales for the global scores yielded similar results, however, for ease of presentation they are not reported here.

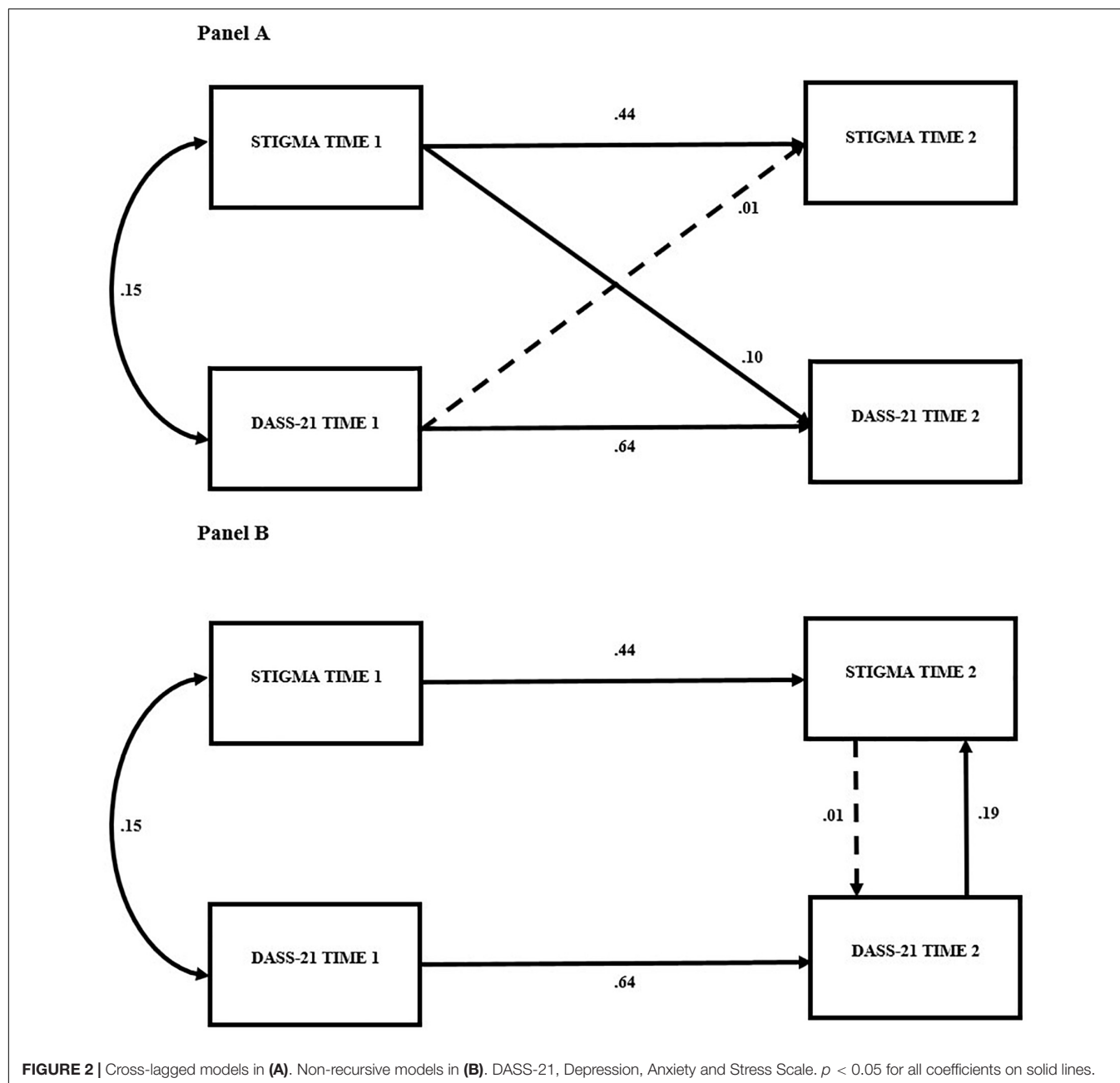
These findings indicate that perceived burnout stigma predicted indicators of mental health, specifically symptoms of negative affect, 6 weeks later. Taken together, the results provide evidence that perceived burnout stigma may negatively influence indicators of mental health and that this relationship is not bidirectional. This research is the first to show that perceived burnout stigma can signal issues pertaining to mental health. While these data are not experimental, it is reasonable to conclude that they support further study of a potential causal relationship. Although these findings are instructive, it should be noted that differing temporal lags (e.g., time intervals) may improve (or weaken) predictive strength.

Regarding assessment utility of the BSI-8, it would be advantageous to demonstrate the measure as potentially robust to sample and response pattern differences. One way to help do this is to use modern test theory, specifically item response theory (IRT; Hambleton et al., 1991), and supplement the classical test theory (CTT) approaches used in the prior studies. Study 4 therefore provides an IRT evaluation of the BSI-8.

STUDY 4

Classical test theory (CTT) relies on correlational techniques like Cronbach's alpha coefficients, exploratory factor analysis, and confirmatory factor analysis. Although CTT has advantages (e.g., ease of interpretation, requires smaller sample sizes, less stringent statistical assumptions) and can be effective at creating internally consistent scales, item response theory (IRT) augments the limitations of CTT by providing a more in-depth analysis of item properties (see Rusch et al., 2017 for limitations of CTT and advantages of IRT). IRT refers to a group of latent trait models such as Rasch models and rating scale models that give rise to useful techniques, such as item information analysis and differential item functioning that can be used to psychometrically optimize scales by increasing precision and minimizing measurement error (Drasgow and Hulin, 1990; Foster et al., 2017).

Although IRT approaches require larger samples and make stricter statistical assumptions than CTT, the item parameters they yield are – barring any differential item functioning – potentially subpopulation invariant (Embretson and Reise, 2000; for qualifications see Asun et al., 2017). This is a major advantage for the current research as this serves to produce test items



and measurement scales that can function consistently across a range of samples, such as academic and work samples. Thus, item parameter invariance is a major advantage of IRT over CTT as it can allow researchers to generalize how items operate across populations. The current study evaluates burnout stigma responses via an IRT approach to measurement development.

Materials and Methods

Participants

Seven hundred seventeen undergraduate students (90% females, $M_{\text{age}} = 20.10$ years, $SD = 1.92$) completed the BSI-8 via an online survey. Students who completed at least one full

academic semester were eligible for study participation. Sample demographics include: 68% Caucasian, 11% African American, 4% Asian, 15% Hispanic, and 2% endorsed either biracial or non-disclosed ethnicity with 15% Freshmen, 35% Sophomore, 32% Junior, and 18% Senior.

Procedure

Participants were undergraduates from classrooms offering an option for voluntary class credit by completing an online survey. Extra credit was generally less than 1% of the final grade. Student data were collected in the middle (weeks 3–9) of the academic semester. All participants gave their written consent prior to study participation and the

institutional review board approved the study before any data were collected.

Statistical Analysis

Item response theory analysis was conducted using the graded response model (GRM; Samejima, 1969). The GRM models how well an item differentiates between similar people, via the discrimination parameter (α), and how severe a person's stigma toward burnout must be in order to endorse a given response level to an item, via the threshold parameters (β); each item has 6 threshold parameters, corresponding to the number of response options ($k = 7$) minus 1. Like all IRT model parameters, these are interpreted relative to theta (θ), which is a person's location on the latent trait continuum. For this scale, higher levels of theta correspond to more severe burnout stigma. Theta scores are normally distributed with $M = 0$ and $SD = 1$.

Results and Discussion

Principal components analysis showed that the data met the requirement of sufficient unidimensionality (Reckase, 1979). The unidimensional model was appropriate based on a predominant first factor explaining 73% of the variance. Item parameters and fit statistics are shown in **Table 4**. All items demonstrated good psychometric properties. The model-data fit was acceptable, as indicated by χ^2/df ratios less than three (LaHuis et al., 2011). The item discrimination parameters show good differentiation among responses, leading to high levels of item information (i.e., accurate information about an individual's level of burnout stigma). The threshold parameters are spread out evenly across normally distributed latent continua, leading to good item information at all levels of burnout stigma. This is easily seen via option response functions (ORFs) that show the relation between an individual's level of burnout stigma, labeled "Theta – Burnout Stigma" on the abscissa, and the probability of responding to that item with a given level of endorsement (i.e., *Strongly Disagree to Strongly Agree*) on the ordinate. **Figure 3A** displays ORFs from each scale item. Each trace line represents the probability of endorsing the item at a specific level based on the person's amount of stigma toward burnout. The smooth lines identify peaks for each response option, and coverage of the full continuum all reflect ideal ORF characteristics.

Figure 3B models the test information function (TIF) for the full scale. Higher levels of information result in more accurate person score estimates and, therefore, lower levels of error in

the estimate of an individual's level of stigma toward burnout whether items are scored using IRT or traditional sum or average methods. The TIF shows high levels of information for a majority of the trait range from $\theta = -0.5$ to $\theta = 2.5$, indicating that the scale does a good job scoring people who have average to high levels of stigma against burnout but is less efficacious for scoring those very low in stigma. This may be interpreted as less problematic, especially if the scale is used in clinical settings, as mental health providers may be less concerned with identification of those who do not have higher stigma scores.

In regard to measurement efficiency, the location of the test information is determined by the location of the items' threshold parameters. As there is a good deal of overlap in the threshold locations, future research could investigate the utility of a short form version of this scale consisting of three to four items. The short form scale then would be useful for repeated measurement in longitudinal or experience sampling research.

In sum, the results of the IRT analysis validate the excellent psychometric properties of the eight-item burnout stigma instrument (BSI-8) by showing consistently high information across a large range of the latent continuum, good model-data fit, high item discrimination parameters, and equally spaced item threshold parameters. These results corroborate the good psychometric properties demonstrated in the exploratory and confirmatory factor analyses conducted earlier and lay a solid foundation for additional substantive construct validation.

GENERAL DISCUSSION

The current research establishes a novel measure of perceived burnout stigma. Over four studies using occupational and academic samples and utilizing measurement development approaches derived from both classical test theory and item response theory, an eight-item burnout stigma instrument (BSI-8) predictive of indicators of mental health emerged that demonstrated excellent psychometric properties. As documented in an extensive literature, burnout is a prevalent and burdening condition linked to a myriad of negative outcomes affecting the well-being of diverse populations. Importantly, stigma is one significant barrier to help-seeking behaviors. The present studies highlight the presence of appreciable levels of perceived burnout stigma in students enrolled in university studies as well as individuals holding vocational positions in the workforce.

TABLE 4 | Grade response model parameter estimates and fit statistics.

Item	α	β_1	β_2	β_3	β_4	β_5	β_6	S- χ^2/df
2	1.41	-1.01	-0.28	0.27	0.89	1.59	2.42	1.74
3	2.52	-0.45	0.14	0.53	0.90	1.47	2.12	2.06
4	1.99	-0.73	-0.11	0.35	0.69	1.26	1.95	2.49
5	2.45	-0.40	0.18	0.57	0.99	1.50	2.47	1.94
6	1.77	-0.66	-0.03	0.47	0.94	1.56	2.38	1.91
7	2.10	-0.60	0.06	0.43	0.93	1.57	2.19	1.45
9	2.20	-0.25	0.36	0.71	1.15	1.69	2.34	2.68
10	2.53	-0.24	0.31	0.64	1.07	1.72	2.24	2.00

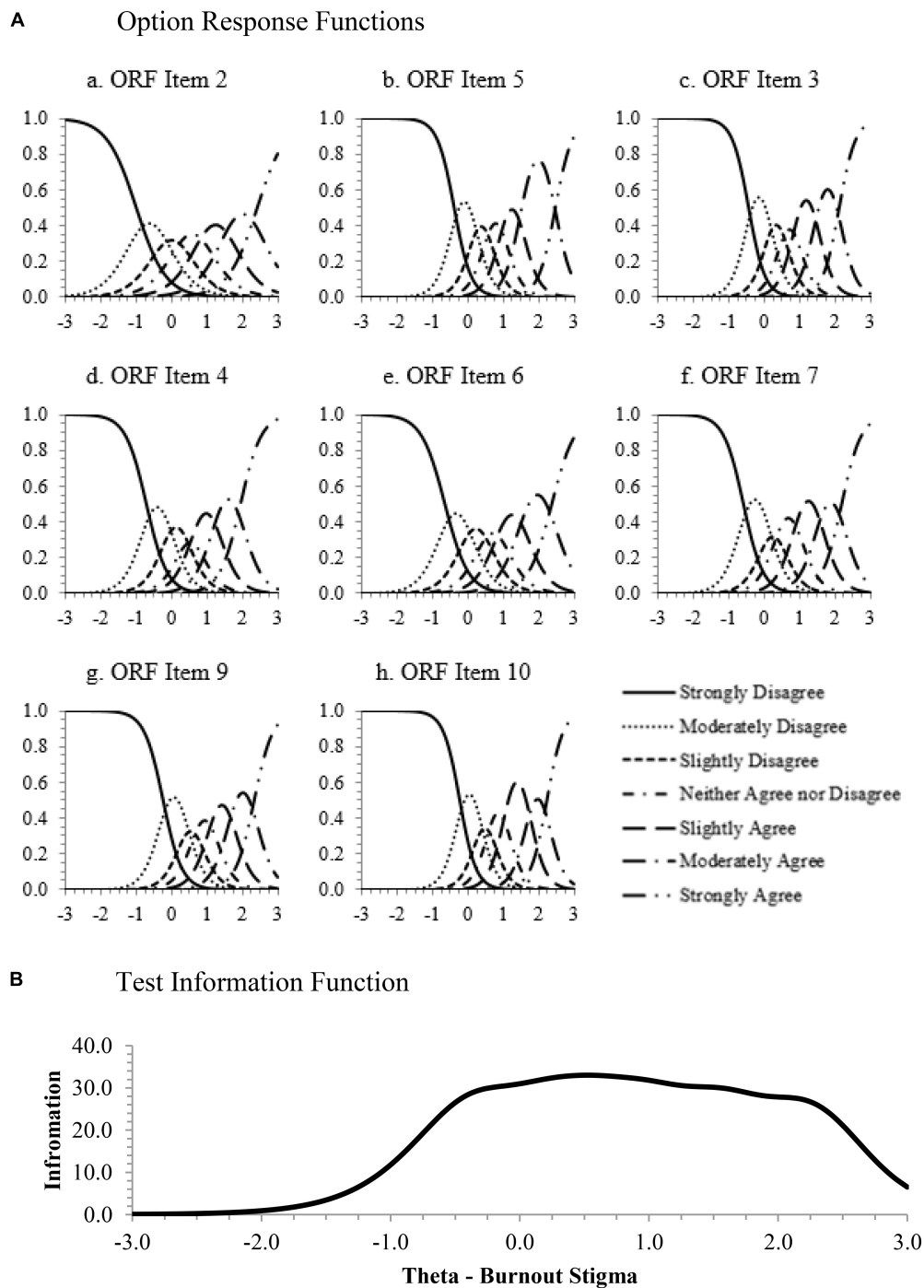


FIGURE 3 | Item response theory graphs. **(A)** Option response functions. **(B)** Test information function.

This work built on Bianchi et al. (2016) by providing more support to show that burnout is viewed as a stigmatized condition. The current work found higher levels of burnout stigma than previous research, which could reflect the use of differing instruments across studies (Bianchi et al., 2016). While previous research explored the stigma level of burnout

as compared to depression (Mendel et al., 2015; Bianchi et al., 2016), this research is the first to show that burnout stigma can signal issues pertaining to mental health, particularly negative affect.

The link between the stigmatization of burnout and mental health issues is not surprising, as other forms of mental health

stigma predict depression (Pyle et al., 2015; Lee et al., 2017). The relationship between burnout stigma and mental health indicators supports the authors' prediction that burnout stigma may affect individuals similarly to other forms of mental health stigma. School and work-based policies should discuss burnout stigma and efforts should be made to decrease its effects. This is reflected in the current data as students felt the university should play a role in helping combat burnout. In order to ameliorate the effects of perceived burnout stigma, interventions may seek to improve social support and encourage positive coping strategies for people at risk for burnout (Chronister et al., 2013).

Burnout stigmatization can be understood through the lens of social-cognitive stigma theory. According to this model, society creates stereotypes about specific groups, which leads to prejudice and discrimination (Corrigan, 2018). In the case of burnout, participants endorsed items that aligned with the stereotype that people who are burnt out are somehow at fault for their condition and should work harder to meet societal demands. Thus, codifying the types of prejudice and discrimination that may result from burnout symptomology is important in academic settings, the work place, and in counseling. For instance, it is possible that the struggles of burnt out individuals will be dismissed, or more negatively evaluated by others, including peers, teachers and bosses. Counselors should apply this knowledge to their work with students and employed adults who experience burnout. They might consider applying cognitive-restructuring techniques to address directly the stigma faced by their clients (Hays, 2009).

In order to more comprehensively understand perceived burnout stigma and the more nuanced ways stigmatization may affect people, future research may find it fruitful to explore the phenomenological experiences of burnt out individuals. A qualitative approach examining the accounts of such individuals would help supplement, improve, and further validate the instrument created from this research. Including individuals with lived experience is a central component when studying stigmatized groups (Corrigan, 2018). Community-based participatory research is a useful method for this process. This method involves working with affected individuals in a collaborative way that allows them to drive the research based on lived experiences. The current project attempted to explore perceived burnout stigma utilizing previously established conceptualizations of the construct, and the BSI-8 may be further evaluated using qualitative methodologies by those who experience burnout.

Future research may also explore potential differences in burnout stigma constructs. Perceived burnout stigma, which was the focus of the current research, and internalized (self) burnout stigma may operate differently. Both perceived stigma and self-stigma measure stereotyped attitudes that are influenced by cultural, historical, and situational factors (Dovidio et al., 2000). Thus, an individual's perception of public stigma and how they personally internalize the stigma may differentially predict help seeking behaviors, stress appraisals, physiological reactivity, and so on. However, self-stigma may be a stronger predictor of mental health than perceived

stigma, and several factors such as support and coping styles may explain why perceived stigma is internalized as self-stigma in certain people (Chronister et al., 2013). While this study explored perceived burnout stigma as a first step toward understanding the public stigmatization of this construct, future research is needed to develop measures of both perceived and self-burnout stigma and evaluate their relationship to burnout.

Notwithstanding the importance of this research, its limitations deserve attention. First, the samples studied were limited; the student samples came from only one university and were predominately Caucasian and female (although U.S. universities are comprised of more females than males, U. S. Department of Education, National Center for Education Statistics, 2017) and the occupational samples were collected using the Amazon Turk platform. Additional and more varied sampling is necessary (including expanding sampling regarding socioeconomic status, ethnicity, gender, and culture), especially regarding inferences pertaining to covariate associations. However, use of the IRT approach does help buffer against potential sub-population differences in the response structure corresponding to the burnout stigma items. Relatedly, only one measure (DASS-21) served to represent negative affect in this research. Future research could examine how burnout stigma predicts more clinically diagnostic measures of mental illness (e.g., Beck Depression Inventory) as well as attitudes and behaviors more directly related to health seeking behaviors (see Mullen and Crowe, 2017 for a potential causal framework).

Another issue deserving future attention is the relationship between burnout stigma and depression stigma. While the orthogonality of burnout and depression and the potential causal relationship between them are still being evaluated, burnout and depression-related stigma differ in how they are socially understood and represented (Bianchi et al., 2016, 2018). Continued research should explore the different "groupness" qualities for depression vs. burnout (Corrigan, 2018). As this research is the first to report on perceived burnout stigma in the U.S., research into how these differing forms of stigma uniquely relate to mental health challenges or other negative outcomes might be fruitful. Findings suggest that combatting perceived burnout stigma may help lead those suffering from mental health challenges to avenues supportive of health treatment.

In summary, this research provides evidence that burnout is stigmatized in academic and occupational contexts and indicates that burnt out individuals may be at risk for the negative mental health effects of stigma. This research provides preliminary data on a new instrument to measure perceived burnout stigma which can be used by psychologists, counselors, and researchers to evaluate the impact of this phenomenon and explore potential interventions to prevent negative outcomes.

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 Florida State University Office for Human Subjects Protection. The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

RM and JT contributed to the conception of the topic and the first draft of the manuscript. RM designed the studies. RM and GF performed the statistical analyses. GS and FF wrote sections of the manuscript. All authors contributed to manuscript revisions and approved the submitted version.

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Conflict of Interest: GF was employed by the company Maritz.

The remaining 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.

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I'm Not Good for Anything and That's Why I'm Stressed: Analysis of the Effect of Self-Efficacy and Emotional Intelligence on Student Stress Using SEM and QCA

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Stress negatively affects the well-being and the quality of life of the society. Specifically in the academic context, it is relevant to analyze its levels due to its impact on performance and learning. There are factors that affect the said stress including, among others, self-efficacy, and emotional intelligence. The purpose of this study is to analyze how emotional intelligence and perceived self-efficacy affect student stress. In order to show this influence, two complementary methodologies are implemented: the structural equation models (SEMs) and the comparative qualitative analysis (QCA). A total of 477 students (85% of women) from a private University of Valencia participated in the study, with ages ranging from 18 to 53 years old ($M = 21.57$, $SD = 3.68$). The assessment instruments used were as follows: Emotional Intelligence Scale (TMMS-24) to measure emotional intelligence; General Self-Efficacy Scale (GSS) to measure self-efficacy; and Perceived Stress Scale (PSS) to measure stress. The results in the SEM endorse the hypotheses that emotional clarity and self-efficacy are negatively related to stress and positively related to emotional attention (EA), explaining 25% of the variance. The QCA results show that none of the variables is a necessary condition for inducing stress. Nevertheless, different combinations of these variables are sufficient conditions to explain 35% of the high stress levels. The most important combination over high stress levels seems to be the interaction between high levels of EA and low levels of self-efficacy. Regarding the low levels of perceived stress, there are sufficient conditions to explain 50% of them. Mainly, the most important interaction is between low levels of self-efficacy and low levels of EA. The comparison of both methodologies enables the broadening of new horizons at the methodological level applicable to different contexts.

Keywords: stress, self-efficacy, emotional intelligence, qualitative comparative analysis, structural equation models

INTRODUCTION

Stress is one of the most studied psychosocial factors related to many aspects of life, such as work development (or job performance) (Burton et al., 2017), academic performance (Caballero et al., 2015), health and emotional well-being (Dhabhar, 2014; Klein et al., 2016; Reed et al., 2016), illness (Cohen et al., 2007), or adaptation to specific situations (Boswell et al., 2013; Banerjee and Chatterjee, 2016; Stuart et al., 2016).

In general, stress refers to the manner in which an individual responds to certain environmental situations that overwhelm her and that she considers threatening (or intimidating), feeling that her well-being is compromised. Therefore, it is not a uniform process, but rather an experience depending on the interaction of different factors. Among these factors, there are environmental conditions and individual traits, such as attitudes, motivations, emotional responses, and, specifically, the manner of dealing with situations (El-Ghoroury et al., 2012; Mahmoud et al., 2012; Boswell et al., 2013; Folkman, 2013; Gómez et al., 2014).

The university context is a potentially stressful environment, in which the student may experience a certain lack of control in light of the demands and requirements of the environment (Pulido Rull et al., 2011; De la Fuente, 2015). According to several studies, stress in the academic context is closely related to overload of academic tasks, time constraints (Arribas, 2013; Alfonso et al., 2015), high frequency of evaluations, work and daily tasks pressure, competitiveness, and other aspects that may be perceived by the subject as obstacles that exceed her abilities to achieve success (Fernández et al., 2015). Previous research show that academic stress may be present in the student at any stage of her academic life (Putwain, 2007), confirming its increase as the subject progresses academically and reaches higher levels, such as the university level, where the workload and responsibility, together with the changes that the student experiences in her life, generate an increase in academic stress (Berrio and Mazo, 2012).

Any stimulus or situation faced by an individual has the potential to become a stressful event, capable of producing in the individual a decrease in her physical and mental health, well-being, or quality of life (Lazarus, 2000). For a stimulus or situation to be valued as such, this depends on the transactions or exchange processes that take place between the individual and the context (Lazarus and Folkman, 1986; Lazarus, 2000). In this regard, the transactional stress model (Lazarus and Folkman, 1986) states that evaluative and attribution processes are essential in stress perception (Lazarus and Folkman, 1984). This model considers two sequential appraisal processes: in the first place, the so-called primary appraisal, where the significance of the stressor or the stressful event is evaluated, and in the second place, the so-called secondary appraisal, where the grade of control over the stressor and the available resources are evaluated. In this sense, in the presence of a stimulus or stressful situation, the individual will judge it as relevant if it produces a significant change in her relationship with the environment or if it alters her state of balance (well-being). If the stimulus is judged as relevant, then the individual will proceed to analyze the degree of controllability she has over that situation. She will also analyze the available options and resources: those necessary and those available in the

individual's repertoire. After this second appraisal, which, in turn, can modify the primary one, if the stressful stimulus continues to be judged as threatening, the individual will implement a series of coping strategies, depending on the resources available (personal, social, or cultural) and on the degree of controllability of the situation. This will give way to the so-called problem-oriented strategies and strategies oriented toward emotional regulation. According to the success of these strategies, a series of positive or negative coping results will be produced. If the results of coping are negative, there will be an increase in perceived stress.

There are numerous factors that can affect these appraisal processes. Alfonso et al. (2015) point out that, among the factors involved in the stress perceived by students, it is necessary to consider, on the one hand, biological variables, such as age and gender, and socioeconomic variables, such as place of residence or the receipt of financial aid and scholarships; and on the other, psychosocial variables, such as social support, emotional intelligence (EI), self-concept, self-efficacy, coping mechanisms, and psychoeducational strategies, just to name a few examples that must likewise be considered.

Currently, there is evidence regarding the role of personal resources in light of the emergence of stress and the protection of the subject when facing the said stress (Bruehlman-Senecal et al., 2016; Cabanach et al., 2017). Several researches emphasize the influence of personal variables when it comes to cushioning the negative effects of stress in academic contexts (Salanova et al., 2005; Loureiro, 2008). Noteworthy, among others, are the beliefs of self-efficacy (León-Rubio et al., 2011), the coping strategies used by the subject when facing stress (Bonanno and Burton, 2013; Cabanach et al., 2013), or the EI (Aguilar et al., 2014; Bryant and Malone, 2015; Hodzic et al., 2016).

The individual's EI and her perception of her own abilities (self-efficacy) stand out among the resources that she can use to deal with stressful situations (León-Rubio et al., 2011). For Lazarus and Folkman (1986), in a situation of stress, the assessment that the subject makes about the stressors is very important, and also the set of emotions and feelings that are associated with it. In this regard, an individual's ability to perceive her own emotions and those of others, and to use them appropriately (key aspects of EI), will influence the subject's perception of the situation and, therefore, her capacity to face this stress (Min, 2014; Yamani et al., 2014; Extremera et al., 2016). In the same vein, Lazarus and Folkman (1986) highlight the efforts that the individual undertakes at the behavioral and cognitive level to face the stressful situation, as well as the capacity perceived by herself to successfully deal with the environmental conditions, as is the case of the perception of self-efficacy (Martínez et al., 2010; Cabanach et al., 2013).

Insofar as the EI is concerned, the literature suggests that high EI levels are related to a lower perception of stress (Extremera et al., 2016; Serrano and Andreu, 2016; Zhang et al., 2016) as well as to greater levels of happiness and satisfaction (Ruiz-Aranda et al., 2014).

This positive influence of EI as regards self-perceived stress levels is probably due to the relationship between the EI and the coping strategies used. In general, high levels of EI are related to the use of more adaptive strategies (Augusto-Landa et al., 2011;

Fernández-Berrocal et al., 2012), as is the case of coping strategies geared toward contemplation and problem solving. On the contrary, low levels of EI would be associated with strategies based on avoidance, superstition, and/or rumination (Martínez et al., 2010).

One of the most important models of EI is the Mayer and Salovey model (1990) (Salovey et al., 1995), which is included within the models of ability. EI is understood as the ability to perceive and express emotions; the ability to use these emotions to facilitate thinking comprehension as well as the motive for the emotion; and the ability to regulate both one's own emotions and those from others. Thus, this model emphasizes the adaptive use of emotions, which are understood as a facilitator for a more effective reasoning. Likewise, it is encompassed from this model that the EI would form the following dimensions: emotional attention (EA), which is the ability to cater and to observe one's own emotions and feelings; emotional clarity (EC), which refers to the understanding of one's own emotional states; and emotional reparation, which refers to the person's beliefs about her own ability to regulate feelings and emotions. While both higher levels of EC and emotional reparation suggest higher levels of EI, this is not the case for EA. For this case, high and low levels of EA would indicate inadequate levels of EI, since excessive EA can lead to the so-called rumination. For this reason, these three dimensions should all be considered in relation with EI separately (Guerra-Bustamante et al., 2019; Martínez-Marín and Martínez, 2019). According to this, the literature suggests (Augusto-Landa et al., 2011; Serrano and Andreu, 2016) that while the EA dimension maintains a positive relationship with perceived stress (Davis and Nichols, 2016; Villanueva et al., 2017), the dimensions of EC and emotional repair (ER) show a negative relationship with the mentioned perceived stress (Aguilar et al., 2014; Ruiz-Aranda et al., 2014; Bryant and Malone, 2015; Perera and DiGiacomo, 2015; Schönfeld et al., 2016; Zeidner and Matthews, 2016). Low scores in the different components of EI are related to high levels of perceived stress (Austin et al., 2010), but in the case of EA, this relation is more complex. Even when EA was classified in three levels: low, adequate, and excessive attention to emotions (inverted U-effects), no significant association between the levels of EA and perceived stress was found (Guerra-Bustamante et al., 2019).

All this seems to be observed in different areas, but especially in the academic context (Ruiz-Aranda et al., 2014; Perera and DiGiacomo, 2015; Serrano and Andreu, 2016; Zhang et al., 2016). In the said context, it would appear that, in relation to the perception of stress, the ability to manage one's own emotions, such as the attention that the individual lends to her feelings and comprehension thereof, is very influential (Augusto-Landa et al., 2011).

Similarly, the literature highlights the close relationship between beliefs of self-efficacy and the stress perceived by the subject in different areas (Bresó et al., 2011; Hahn et al., 2011). The evidence suggests that high levels of self-efficacy are associated with low levels of perceived stress (Karademas and Kalantzi-Azizi, 2004; Zhao et al., 2015; Dominguez-Lara, 2018). In consonance with this, low levels of efficacy expectations are related with high levels of anxiety and stress

(Soyso and Wilcomb, 2015; Valle et al., 2015; Grøtan et al., 2019). The reason for these associations is the role of expectations as protective or buffering factors against stress (Frick et al., 2016). Thus, several studies (Paoloni and Bonetto, 2013; Cabanach et al., 2017) state that beliefs related to perceptions of competence influence the cognitive assessment that the subject makes as regard the demands of the environment, as well as the activation of certain strategies depending thereon. Specifically, it seems that people with high levels of perceived efficacy show greater confidence when responding to the demands of their environment, which, in turn, influences the perception of a threat (Cabanach et al., 2017). Evidence indicates that subjects with high self-efficacy beliefs interpret context demands as less stressful and threatening than subjects with low self-efficacy beliefs (Aguilar et al., 2014; Nastaskin and Fiocco, 2015; Zhao et al., 2015; Schönfeld et al., 2016).

This situation is observed and has been widely perceived in the university context (Aguilar et al., 2014; Cabanach et al., 2017), confirming that the levels of self-efficacy beliefs correlate negatively and significantly with the levels of self-perceived stress (Zhao et al., 2015; Schönfeld et al., 2016). It would seem that subjects with high self-efficacy beliefs interpret the demands of the context as less stressful and threatening (or intimidating) than those who show low self-efficacy beliefs (Aguilar et al., 2014; Zhao et al., 2015; Schönfeld et al., 2016) and more frequently use optimistic and problem-solving strategies. Several researches try to verify the possible relationship between both variables EI and self-efficacy beliefs (Aguilar et al., 2014; Joseph et al., 2015; Honicke and Broadbent, 2016). In general, there seems to be a mutual influence between emotions and self-efficacy beliefs. On the one hand, a high level of self-efficacy beliefs is directly related to a greater experience of positive affection, as well as a significantly lesser experience of negative affection (Sansinenea et al., 2008). On the other hand, positive moods increase the levels of perceived competence, while the experience of negative moods decreases this perception (Checa and Fernández-Berrocal, 2019). All these studies consider that EI plays a very important role in self-efficacy beliefs, because a good handling of emotions increases the feeling of competence and the perception of success toward academic tasks, and also toward tasks of other kind (Khani and Mirzaee, 2015; Morales-Rodríguez and Pérez-Mármol, 2019).

In general, the literature reflects the positive relationship between EI and self-efficacy and the negative relationship of these two variables with stress experience (Aguilar et al., 2014; Serrano and Andreu, 2016; Cabanach et al., 2017). In this fashion, the studies undertaken with university students underline the existence of significant relationships between the perception of emotions, self-efficacy, and stress experience (Martínez et al., 2011; Alfonso et al., 2015).

The Lazarus and Folkman (1986) transactional stress model explains how an individual's differences, determined by the subject's emotional involvement and her ability to clarify and regulate her own emotions, may play a key role in how she evaluates the situation as more or less threatening (Augusto-Landa et al., 2011; Ruiz-Aranda et al., 2014; Serrano and Andreu, 2016; Matthews et al., 2017). Similarly, the control over one's

own emotions and the capacity to objectify them play a very important role in the elaboration of self-efficacy beliefs. The individual makes an assessment of the resources at her disposal to face a situation more or less in accordance with reality, as well as an assessment of the possibilities of successfully solving the task using such resources (Cabanach et al., 2017). Therefore, the introduction of the emotion factor can help to explain how the subject values a situation and the extent to which she considers herself capable of facing it successfully (Salguero et al., 2012). In addition, the person–situation interaction model suggests that the nature of stressful situations moderates the activation of coping strategies and styles (Villasana et al., 2016).

In other words, both EI and self-efficacy beliefs would influence students' cognitive appraisal of the situation, the so-called primary appraisal. Although they could also affect the secondary appraisal, or become a resource to face the situation, self-efficacy would actually play a key role in the so-called secondary appraisal by influencing the individual's assessment of her coping resources (Figure 1).

Therefore, low levels of EI could provoke a subject's appraisal of the situation as more threatening, while such levels coupled with a low perception of self-efficacy would influence a perception of a scarcity of coping resources for her. These effects would lead to higher levels of perceived stress. Specifically, the literature suggests that it is expected that EA will be positively and significantly related to perceived stress, since this excess of EA seems to be related to rumination and the use of less functional, or healthy, strategies (LeMoult et al., 2013; Martínez-Marín and Martínez, 2019). It also suggests that EC and ER will be negatively related to stress, since they are resources that facilitate the use of more functional strategies by improving the management of stress (Bryant and Malone, 2015; Perera and DiGiacomo, 2015; Schönfeld et al., 2016; Zeidner and Matthews, 2016) (hypothesis 1). Similarly, as discussed above, given that self-efficacy appears to affect the individual's self-perceived ability to cope with stress and her assessment of the resources available to

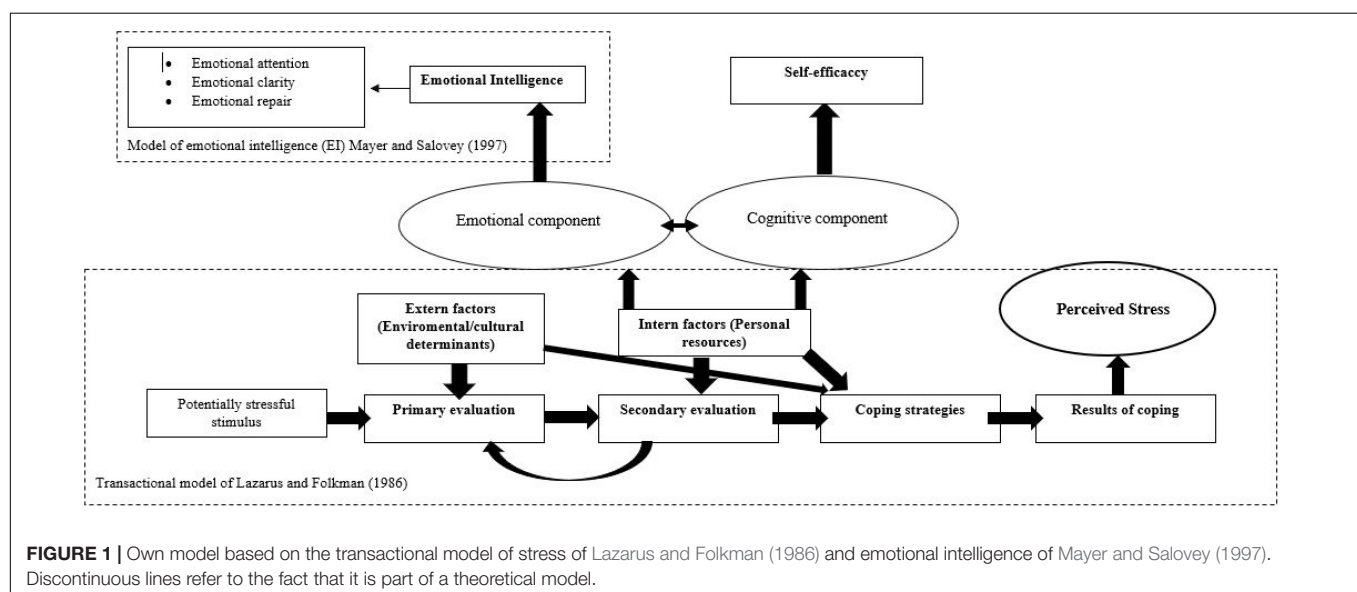
her (Soysa and Wilcomb, 2015; Valle et al., 2015; Grøtan et al., 2019), it is expected that self-efficacy will be negatively related to the levels of perceived stress (hypothesis 2).

Despite the importance of stress in the lives of individuals (Moore et al., 2016) and specifically in the case of university students (Lapointe et al., 2018), and the role played by EI as well as self-efficacy in the said stress, few studies have simultaneously analyzed the role played by both aspects as regard stress (Aguilar et al., 2014). In response to this, the present research aims to determine the role played by self-efficacy and EI over perceived stress. In this regard, the Lazarus and Folkman transactional stress model (Lazarus and Folkman, 1986) considers that certain personal and social resources may act as protection from stress or risk factors. For Lazarus and Folkman (1986), in a situation of stress, the assessment that the subject makes of the stressors, as well as the set of emotions and feelings associated with it, is very important. In this regard, the ability of the individual to perceive her own emotions and those of others and to use them appropriately (key aspects of EI) will influence the perception of the situation by the subject and, therefore, in her capacity to face the said stress (Min, 2014; Yamani et al., 2014; Extremera et al., 2016), as well as the perception of self-efficacy (Martínez et al., 2010; Cabanach et al., 2013).

Likewise, most of the existing studies have focused on the so-called linear models, which are based on the observation of linear relationships between the variables under study, obviating other types of non-linear interaction. By contrast, qualitative comparative analysis (QCA) can study beyond the individual contribution of each one of the variables to observe possible non-linear interactions between them (Villanueva et al., 2017; Castellano Rioja et al., 2019; Crespo-Hervás et al., 2019; Giménez-Espert et al., 2019).

Linear Models Versus QCA

In the field of psychology, most of the research starts from linear models, such as linear regression models and their



successive evolutions: structural equation models (SEM) and PLS models (SEM-PLS). Linear models are based on the individual contribution of each variable and do not take into account (*a priori*) the interaction or the combination between the different variables studied. They do not have into consideration the different possible combinations or paths that can lead to the same result (equifinality). Neither they take into account that the variables, or factors, that explain a given result may not be the same as those that explain this result in the opposite direction (Ragin, 2008; Eng and Woodside, 2012; Boquera et al., 2016). Also, in lineal models, there is a limit to the number of interaction effects that can be included in an analysis (Seawright, 2005; Vis, 2012).

By contrast, the QCA is an analytical technique that does allow the in-depth analysis of how a combination of causal conditions (variables) contributes to a given outcome. QCA models are based on Boolean logic and assume the influence of a particular attribute, or attributes, on a specific outcome. They are based on the way these attributes are combined (variables or, according to specific terminology, conditions), rather than on the individual contribution of each variable. This technique also allows to perceive different combinations or paths that can lead to the same result (equifinality). It also makes it possible to analyze that, although some variables may give rise to a given result, it does not necessarily imply that the same variables are equally relevant to obtaining the opposite result when in the opposite direction (Ragin, 2008). In addition, QCA addresses multiple contextual causes in a simple way, allowing for greater horizontal complexity than linear models (Seawright, 2005; Vis, 2012). It offers a more systematic way of analyzing complex causality and logical relationships between causal conditions and variable outcomes than the linear models (Legewie, 2013). In addition, it also allows working with small samples (Ragin, 2008; Eng and Woodside, 2012). The analysis establishes the so-called *necessary conditions*, which are those causes that must always be present in order for a specific result to be given; and the so-called *sufficient conditions*, which can give rise to a given result, although they do not always have to be present for a result to be given. QCA models make it possible to identify the percentage of explained variance (coverage), as well as the indicators of goodness of adjustment (consistency) (Ragin, 2008; Eng and Woodside, 2012). According to this, literature recommends the use of the two methodologies in a complementary manner, despite the differences between linear models and QCA (Seawright, 2005; Vis, 2012; Boquera et al., 2016; Villanueva et al., 2017; Castellano Rioja et al., 2019; Giménez-Espert et al., 2019). SEMs will offer different but complementary results to those provided by the QCA.

As mentioned before, the objective of the present study is to analyze the influence of EI and self-efficacy in the prediction of stress levels in university students, while comparing two complementary methodologies: the SEM and QCA. It came up by the given importance of stress and its prediction in the lives of individuals, and especially in academic contexts; by the impact that EI and self-efficiency can have on such stress; by the scarcity of studies in this context that have addressed the role that both personal factors can have in the level of self-perceived stress; and because of the need to combine different, complementary,

methodological approaches. On the basis of this general objective and the theoretical framework considered, as indicated above, two hypotheses have emerged—H1: EA will be positively and significantly related to perceived stress, while EC and ER will be negatively related to stress. H2: Self-efficacy will be negatively related to the levels of perceived stress.

MATERIALS AND METHODS

Participants and Procedure

This study involved 477 university students from the Valencian Community. Specifically, the students belonged to the Faculty of Psychology, Teaching and Educational Sciences of a private University of Valencia. The average age of all the subjects surveyed was 21.57 years old ($SD = 3.68$), with a minimum age of 18 and a maximum age of 53 years. The percentage of men surveyed is 14.16%, while that of women is 85.84%. Due to the nature of the study, participants answered voluntarily and the questionnaires were anonymous. The study was approved by the bioethics committee of the Catholic University of Valencia (PRUCV/2015/660). All participants received detailed information about the aims and procedures and were informed of confidentiality. Data collection and data analysis took place between October 2016 and January 2017.

Statistical Analysis

First descriptive analyses of the participants were estimated, and then, calibration values for fsQCA were calculated; after that, SEM and a fuzzy-set QCA (fsQCA) were performed. In the SEM, the estimate provided by the robust method of maximum likelihood estimation (ML) recommended to correct the possible absence of multivariate normality was applied in all cases. The adequacy of the model was verified through the significance of chi-square and its robust correction provided by Satorra-Bentler ($S-B\chi^2$) (Satorra and Bentler, 1994; Hu and Bentler, 1995). Other coefficients were also calculated to check the suitability of the models proposed, such as the ratio of χ^2 and its degrees of freedom (χ^2/df) and $S-B\chi^2$ and its degrees of freedom, being acceptable values lower than 5 (Carmines and McIver, 1981; Brynne, 2009). Finally, the coefficients of the robust goodness-of-fit indices of the proposed models were checked: the comparative fit index (CFI) and the incremental fit fix (IFI). For these indicators, values above 0.90 are considered as indicators of good fit (MacCallum and Austin, 2000; Kline, 2005). Finally, the root mean-square error of approximation (RMSEA) is shown, with scores lower than 0.08 being considered as indicators of good fit (Browne and Cudeck, 1993).

For QCAs, raw data from the participants' responses were transformed into fuzzy set responses. First, as the literature suggested, all missing data were eliminated and all questionnaire constructs, or scores (variables), were calculated by multiplying the scores of the items (Boquera et al., 2016; Villanueva et al., 2017; Giménez-Espert et al., 2019). Then, the values were recalibrated between 0 and 1 (Ragin, 2008) by means of Claude and Christopher's fsQCA 2.5 software (2014), taking into consideration the three thresholds that the literature suggests

(Woodside, 2013): 10% (low agreement or totally outside the set), 50% (intermediate level of agreement, neither inside nor outside the set), and 90% (high agreement or totally within the set). In consonance with the literature, once the responses were transformed, necessary and sufficient condition tests were performed in order to evaluate the effect of EI and self-efficacy on a particular outcome (high levels of perceived stress) and on the absence of it (low levels of perceived stress). On the one hand, a condition is necessary when it must always be present for the occurrence of a particular outcome (consistency in necessary analysis must be greater than 0.90). On the other hand, a condition (or combination of conditions) is sufficient when it gives rise to a given result, but it can also be reached by other conditions or combinations thereof (Ragin, 2008). The fsQCA generates three possible solutions: complex, parsimonious, and intermediate. The complex solution is the most restrictive, and the parsimonious solution is the less restrictive. Previous studies (Ragin, 2008) recommend to consider the intermediate solution, the one presented here. On sufficiency analysis, the overall solution coverage considers the variance explained by all the paths, or combinations of conditions (variables), while the overall solution consistency considers the possible reliability or fit of a model. When the total consistency of the model is greater than 0.75, a sufficiency outcome is considered adequate. In addition, raw coverage indicates how many cases, or observations, can be explained by each path (condition or combination of conditions), while the unique coverage expresses the number of observations (variance) that can be explained by a particular combination of conditions, but not by another combination of conditions. Finally, the consistency indicates reliability or fit of a path (condition or combination of conditions) that would explain an observation (Eng and Woodside, 2012).

Statistical Package for the Social Sciences (SPSS, Version 23, ©IBM) was used to perform descriptive analyses and calibration values. EQS (Structural Equation Modelling Software, Version 6.3, Bentler, 1985–2016, Multivariate Software Inc.) was used to evaluate the psychometric properties of instruments and structural equations models. Nevertheless, fsQCA (version 2.5, ©Raging and David, 1999–2008; Claude and Christopher, 2014) was used to perform the QCA analysis.

Measures

Trait Meta Mood Scale (TMSS-24) (Salovey et al., 1995)

In this study, the Spanish version of the EI scale (TMMS) from Salovey et al. (1995), adapted by Fernández-Berrocal et al. (2004), was used. It is an instrument composed of 24 items, presented on a 5-point Likert-type scale, where 1 corresponds to strongly disagree and 5 to strongly agree, distributed in three dimensions with eight indicators each. On the one hand, the EA dimension (eight items) refers to the ability to feel and express feelings in an appropriate way. The EC dimension (eight items) refers to the ability to understand one's own emotional states, and finally, the ER dimension (eight items) corresponds to the ability to correctly regulate emotional states. This instrument has shown adequate psychometric properties in previous studies. The definitive model consists of 20 items

distributed in the three dimensions proposed by Fernández-Berrocal et al. (2004). This model has shown adequate validity and reliability indicators in previous studies, which also have been obtained in this study: $[\chi^2(df) = 516.33(167); S-B\chi^2(df) = 406.07(167); \chi^2/df = 3.09; CFI = 0.93; IFI = 0.93; RMSEA = 0.058 (IC = 0.051–0.065); \alpha = 0.87$ for the whole scale; α for the attention dimension = 0.86; for the clarity dimension = 0.89; α for the reparation dimension = 0.86].

General Self-Efficacy Scale (Schwarzer and Baessler, 1996)

Sanjuán et al. (2000) have validated the adaptation for the Spanish population of this scale. It is a one-dimensional scale and is made up of 10 items, presented on a Likert-type scale with four alternatives of answer, where 1 corresponds to incorrect and 4 to certain. This scale assesses the stable feeling of personal competence to manage a wide variety of stressful situations. It has shown adequate psychometric properties in a sample of university students (Sanjuán et al., 2000). As regard the psychometric properties in the present study, they seem to be adequate: $[\chi^2(df) = 122.51(27); S-B\chi^2(df) = 95.71(27); B\chi^2/df = 4.54; IFC = 0.94; IFI = 0.94; RMSEA = 0.077 (IC = 0.061–0.094); \alpha = 0.88]$.

Perceived Stress Scale (PSS) (Cohen et al., 1983)

Consisting of a single dimension, it aims to measure the degree to which people perceive their life situation over the past month as stressful. It is a Likert-type scale with five answer options, where 1 corresponds to never and 5 to always. It has been validated in the Spanish context by Remor (2006) both in its extended version (14 items) and in its reduced version (10 or 4 items) and in Spanish university students (Extremera et al., 2007). The versions (i.e., in the 14, 10, and 4 versions) of the scale show good internal consistency (Pedrero and Arroyo, 2010). Following the recommendation of Pedrero Pérez and Olivar (2010), the scale must be considered as a one-dimensional structure. Thus, several re-specifications of the PSS (deleting items 6 and 9) were made to achieve a factorial solution with a good fit for the sample under study. The adequate validity and reliability indicators justify its use in this study: $[\chi^2(df) = 103.31(20); S-B\chi^2(df) = 85.43(20); \chi^2/df = 5.16; CFI = 0.93; IFI = 0.93; RMSEA = 0.085 (IC = 0.067–0.104); \alpha = 0.84]$.

RESULTS

First, the main descriptors and calibration values for the variables under study are presented (Table 1).

Structural Equation Model (SEM)

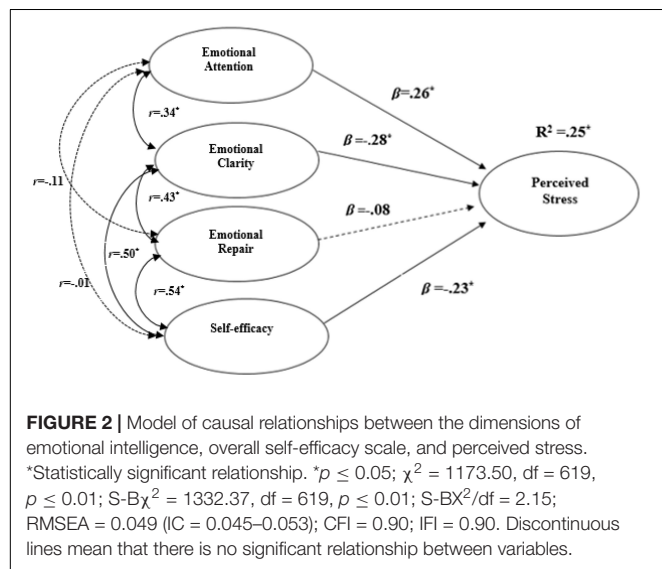
In order to calculate the SEM, the different items that compose the scales of indicators of latent variables and dimensions were determined. As the authors of the scale and the literature consulted suggest, each of the EI dimensions was considered separately, and all variables (EI dimensions and self-efficacy) were correlated with each other.

The results of the causal relationships model showed a good overall fit: $\chi^2 = 1173.50, df = 619, p \leq 0.01; S-B\chi^2 = 1332.374,$

TABLE 1 | Main descriptions and calibration values.

	EA	EC	ER	PS	GSE
<i>M</i>	84642.40	67595.37	69765.23	3944192.7	44587.88
<i>SD</i>	121517.22	95120.6	96867.5	227475151.9	60117.03
<i>Min.</i>	16	8	12	10	27
<i>Max</i>	1620000	390625	390625	1600000000	262144
Calibration values					
P10	3379.2	2381.4	1689.6	978432	2190.4
P50	43200	27648	34560	10616832	19683
P90	200000	200000	200000	80356478.6	112465.76

M, mean; *SD*, standard deviation; *min*, minimum; *max*, maximum; *P10*, 10th percentile; *P50*, 50th percentile; *P90*, 90th percentile; *EA*, emotional attention; *EC*, emotional clarity; *ER*, emotional repair; *PS*, perceived stress; *GSE*, general self-efficacy.



$df = 619$, $p \leq 0.01$; $S-BX^2/df = 2.15$; $RMSEA = 0.049$ ($IC = 0.045-0.053$); $CFI = 0.90$; $IFI = 0.90$. **Figure 2** shows the standardized coefficients of each of the relationships that have proven to be statistically significant predictors of the perceived stress variable. The model explained 25% ($R^2 = 0.25$) of the variance, and it was found that the factors of EA and EC showed a statistically significant relationship in the positive ($\beta = 0.26$) and negative ($\beta = -0.28$) sense, respectively. Overall, self-efficacy also showed a statistically significant negative relationship ($\beta = -0.23$) with perceived stress. The analysis showed that self-efficacy was positively and significantly related to ER ($r = 0.54$; $p = 0.02$) and to EC ($r = 0.50$; $p = 0.02$), but it was not related to EA ($r = -0.01$; $p \geq 0.05$). Also, EI variables were positively related among them as follows: EA with EC ($r = 0.34$; $p = 0.02$), ER with EC ($r = 0.43$; $p = 0.04$), but not EA with ER ($r = -0.11$; $p \geq 0.05$).

Comparative Qualitative Analysis of Fuzzy Sets (fsQCA)

Necessary Analysis

Based on the results obtained on the necessary analysis, it appears that there is no necessary condition for the high or low levels

TABLE 2 | Necessary analysis for perceived stress.

	High levels of perceived stress		Low levels of perceived stress	
	Cons	Cov	Cons	Cov
EA	0.64	0.61	0.52	0.63
~EA	0.61	0.50	0.68	0.71
EC	0.60	0.59	0.53	0.66
~EC	0.65	0.52	0.67	0.69
ER	0.60	0.61	0.50	0.65
~ER	0.65	0.50	0.69	0.69
GSE	0.62	0.58	0.54	0.66
~GSE	0.64	0.52	0.66	0.69

~, absence of condition; Cons, consistency; Cov, coverage; condition needed: consistency ≥ 0.90 ; EA, emotional attention; EC, emotional clarity; ER, emotional repair; GSE, general self-efficacy.

of perceived stress, since all consistency values were under 0.90 (Ragin, 2008) (Table 2).

Sufficiency Analysis

With regard to the sufficiency analyses, the combination of conditions that led to high and low levels of perceived stress (Table 3) was calculated. Regarding sufficient conditions, to calculate the models, all variables were absent for the high level of stress with the exception of EA, which was present. The frequency cut-off in the truth table was set at 1, and the consistency cut-offs were set at 0.78.

The intermediate solution indicated two combinations of causal conditions that can produce high levels of perceived stress that accounted for 35% of the cases (overall consistency = 0.76; overall coverage = 0.35) and four combinations of causal conditions that lead to low levels of perceived stress that explained 50% of the cases (overall consistency = 0.79; overall coverage = 0.50) (Table 3). As mentioned before, in sufficiency analysis, the concept of raw coverage refers to the variance explained, which means the number of observations that can be explained by a particular combination of conditions. The consistency of the solution expresses the possible reliability, or fit, of a model. According to the previous literature, in fsQCA, a model is informative when its overall consistency is ≥ 0.75 (Eng and Woodside, 2012). The obtained solution seems, therefore, appropriate.

In the prediction of high levels of perceived stress, the two pathways or combinations that accounted for 35% of the cases were the result of the interaction of low levels of self-efficacy and high levels of ER and EA (raw coverage = 29; consistency = 0.78) that explained 29% of the people with high levels of stress; and the interaction of low levels of EC, high levels of ER, and high levels of EA (raw coverage = 0.29; consistency = 0.76) that explained another 29% of the cases with high levels of stress. In other words, 29% of the people with high levels of stress had low levels of self-efficacy along with high levels of ER and high levels of EA, while another 29% of the people with high levels of stress had low levels of EC as well as high levels of ER and EA. That is, a student who shows low self-efficacy, along with high EA and ER

TABLE 3 | Summary of the main sufficient conditions for the intermediate solution of perceived stress.

Frequency cutoff: 1	High levels of perceived stress		Low levels of perceived stress			
	Consistency cutoff: 0.78		Consistency cutoff: 0.83			
	1	2	1	2	3	4
Emotional attention	•	•		◦		◦
Emotional clarity		◦	◦	•	◦	•
Emotional repair	•	•	◦	◦	•	
Self-efficacy	◦		•		◦	◦
Raw coverage	0.29	0.29	0.30	0.28	0.27	0.27
Unique coverage	0.06	0.05	0.09	0.03	0.05	0.01
Consistency	0.78	0.76	0.83	0.85	0.81	0.87
Overall solution consistency	0.76		0.79			
Overall solution coverage	0.35		0.50			

•, presence of condition; ◦, absence of condition; ~, absence of condition. Expected vector for perceived stress: 0.0.0.1 (0: absent; 1: present). Expected vector for ~ perceived stress: 0.1.1.1 using the format of Fiss (2011).

or those with low levels of EC along with high levels of EA and high levels of ER, will show higher levels of perceived stress. On the other hand, to the prediction of low levels of perceived stress, four pathways were observed that explained 50% of the cases with low levels of perceived stress (overall consistency = 0.79; overall coverage = 0.50). The most relevant pathways or combinations to predict this perceived stress were the result of the interaction of low levels of ER and EC and high levels of self-efficacy (raw coverage = 0.30; consistency = 0.83) explaining 30% of the cases with low levels of perceived stress. The other pathway was the combination of low levels of ER and EA and high levels of EC (raw coverage = 0.28; consistency = 0.85) explaining 28% of the cases. The third combination was low levels of self-efficacy and EC, with high levels of ER (raw coverage = 0.27; consistency = 0.81). Finally, the last pathway was the combination of low levels of self-efficacy and EA, with high levels of EC (raw coverage = 0.27; consistency = 0.87).

DISCUSSION

In the academic context, it is relevant to assess the levels of perceived stress of university students and its repercussion on the students' levels of performance and psychological well-being. In this fashion, there are numerous studies that analyze strategies to cope with stressful situations in academic environments, all having in common the existence of variables that may modulate the response to the stressor, highlighting the emotional skills of the student (Aguilar et al., 2014; Bryant and Malone, 2015; Hodzic et al., 2016) as well as her belief of self-efficacy (Salanova et al., 2005; León-Rubio et al., 2011).

Responding to the proposed objective of analyzing the existing relationships between the study variables with perceived stress levels through the combination of two complementary methodologies, the results obtained in the SEM go in the line of earlier studies (Extremera et al., 2016; Serrano and Andreu, 2016; Zhang et al., 2016); thus, EC and ER are related in a negative manner with stress levels and EA in a positive manner with the

said stress levels. Furthermore, self-efficacy is negatively related to the stress level, supporting findings from previous research (Cabanach et al., 2017). In general, predictive values similar to previous studies have been observed, as regard the amount of explained variance of emotions in relation to stress; in this case, the main variable that explains the levels of perceived stress in university students is EC (Serrano and Andreu, 2016). In this fashion, a greater belief in self-efficacy and emotional competence appears to cushion the level of stress perceived by the students (Aguilar et al., 2014; Zhao et al., 2015; Extremera et al., 2016; Schönfeld et al., 2016). There appears, therefore, to be empirical evidence that supports both H1 and H2.

A primary appraisal, dependent on external factors, and a secondary appraisal, dependent on internal factors, would intervene when evaluating the situation as stressful, according to the model of Lazarus and Folkman (1986). Within the secondary appraisal, an emotional component (EI) and a cognitive component (self-efficacy) are to be found, which influence the level of perceived stress in the academic context. On the one hand, the results showed that high levels of self-efficacy would be related to low levels of perceived stress, in consonance with previous studies (Karademas and Kalantzi-Azizi, 2004; Zhao et al., 2015; Dominguez-Lara, 2018) and thus confirming hypothesis 2. On the other hand, the components of EI should be taken into account separately, since it has been seen that higher levels of EA were positively related to perceived stress, following the line of previous studies (Guerra-Bustamante et al., 2019; Martínez-Marín and Martínez, 2019) and supporting hypothesis 1 (Davis and Nichols, 2016; Villanueva et al., 2017). Otherwise, as indicated by previous studies (Bryant and Malone, 2015; Perera and DiGiacomo, 2015; Schönfeld et al., 2016; Zeidner and Matthews, 2016), EC was positively related to perceived stress, but ER did not do as expected, which partially supports hypothesis 1 (the greater the repair and EC, the lower the level of stress). A person with high expectations of self-efficacy, high scores on ER and clarity, and moderate scores on attention is associated with lower levels of perceived stress. Thus, the student will make a secondary assessment of the situation,

and she will have healthy coping strategies that will allow her to reduce her stress levels (Martínez-Marín and Martínez, 2019).

It would be interesting to continue working along these lines in future research due to the difference between the components of EI on stress levels as well as due to the complex behavior of EA indicated by previous studies (Guerra-Bustamante et al., 2019).

In response to the comparison between the two data analysis methodologies, the majority of studies in psychology have focused on analyzing the levels of perceived stress through linear models (Ruiz-Aranda et al., 2014), but they have not studied these aspects through other types of non-linear relationships, much less by the combination of two complementary methodologies such as the SEM and the QCA model. Thus, the combined use of different methodologies enables furthering the relationship between the variables under study. QCA models enable the in-depth analysis of how a series of combined causal conditions (or individually) contribute to a given result. This type of techniques also enables observing the different pathways or combinations that lead to the same result (equifinality). Our results suggest that, even if none of the conditions are necessary for the perceived stress (both high and low levels), there does appear to be two sufficient combinations that would explain 35% of the cases, one of them explaining that 29% is the interaction between high EA, low EC, and high self-efficacy and, conversely, high EA, high ER, and low EC with 29% of explained variance. Incidentally, insofar as the prediction of low stress levels are concerned, the analyses suggest the existence of four pathways, explaining 50% of the cases, the two most explanatory pathways being the result of the interaction between high self-efficacy and low ER and low EC (30% of explained variance) and the other pathway ensuing from the interaction of low EA, low ER, and high EC explaining 28% of the variance. All this seems to go in line of earlier studies, suggesting that the combination of emotional competences and a perception of self-efficacy would lead to more appropriate coping strategies based on planning and problem solving (Augusto-Landa et al., 2011; Fernández-Berrocal et al., 2012), which, in turn, would imply lower levels of perceived stress.

It is observed from a comparison of both methodologies that the fsQCA models have a higher predictive value in enabling the combination of diverse conditions, an increase of between 10% and 25% being observed with respect to the SEM in the prediction of perceived stress levels contingent on whether high or low levels of stress are predicted. Likewise, it is observed that the prediction of high stress levels does not depend on the same factors or conditions as the prediction of low stress levels, something that could not be ascertained from analyses based on linear models. Also, in the SEM, ER is insignificant, while in the QCA models through the combination of different variables, it appears as part of the final result and its presence together with low self-efficacy or high EA may lead to increased stress levels.

Nevertheless, it would appear from a comparison of both methodologies that the QCA models prove to be more illustrative of stress than linear models and that they enable to render account of non-linear relationships; that is, the conditions that may result in high stress levels do not necessarily have to be the

same ones that result in low levels of the said stress. Likewise, the QCA models enable the identification of different pathways or combinations that lead to a determined result (equifinality). The QCA models do not focus on the contribution or individual significance of each variable, although the results of the needs analysis may provide a picture in this regard and be a first approximation to determine which variables are more important. This, of course, is not the main objective of this analysis, but it can be used in an exploratory fashion, requiring inherent analysis of the linear models in order to draw conclusions. On the basis of the foregoing, given that the linear and QCA models correspond to different objectives, complementarity must be advocated, rather than focusing on just one or the other. In research, the simultaneous use of both techniques is recommended, as specified in earlier studies (Schneider and Wagemann, 2010; Woodside, 2013; Barton and Beynon, 2015; Felício et al., 2016; Rey-Martí et al., 2016). For all this, the two methodologies would be complementary.

Despite the contributions made by this study, given that the same provides an innovative perspective through the use of two complementary methodologies underused thus far in the discipline and enabling, in turn, the contribution of relevant information as regard perceived stress in university students, this research is not without its limitations. One of the major constraints is related to the study sample, both in terms of sampling procedures, which were not probabilistic, and in terms of geographical location, given that this study was based solely on students of a single university of the Valencian Community, which makes the generalization of the results difficult, although the recourse to the same university and faculty enables controlling much of the peculiar variance. Another constraint is related to the use of questionnaires; although they are a common tool in research, they may introduce social desirability biases. Also, the questionnaires used do not measure stress or academic self-efficacy specifically but stress and self-efficacy in general. The environment with which students usually relate has not been analyzed, and neither has their academic performance (grades). It would be interesting to take it into account in future research in order to provide us with key information on perceptual aspects or intervention strategies. In addition, the analysis of other sociodemographic variables such as age will be taken into account, in case it could influence the results. This should be taken into account in future research.

Future research should focus on using probabilistic sampling procedures and increasing the sample under study in other universities and geographical areas in order to ensure the generalization of results. Similarly, it would be interesting to include objective stress measures such as cortisol levels. Finally, it would be interesting to analyze the moderating role of other variables such as gender or age and compare the said results with the QCA models.

CONCLUSION

As both EI and perceived self-efficacy seem to play a determining role in stress levels, and as satisfactory management of stress

in academic contexts has a positive impact on the emotional well-being and the academic performance of university students, the present study is of special interest. It combines two analytical methodologies that allow to know in greater depth the phenomenon of the study. Also, the promotion of the design of measures and intervention programs aimed to improve the students' quality of life. This comparison of innovative methodologies enables to broaden new horizons at the methodological level, which can be applied to different contexts.

DATA AVAILABILITY STATEMENT

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

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ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Catholic University of Valencia (PRUCV/2015/660). Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

All authors participated and contributed in the study design, the data collection, the statistical analysis, the interpretation of data, and drafted the manuscript. Besides, all authors read and approved the final manuscript.

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Associations Between Social Capital and Depressive Symptoms Among College Students in 12 Countries: Results of a Cross-National Study

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Introduction: A mental health crisis has hit university campuses across the world. This study sought to determine the prevalence and social determinants of depressive symptoms among university students in twelve countries. Particular focus was placed on the association between social capital and depressive symptoms.

Methods: A cross-sectional study was conducted among students at their first year at university in Europe, Asia, the Western Pacific, and Latin and North America. Data were obtained through a self-administered questionnaire, including questions on sociodemographic characteristics, depressive symptoms, and social capital. The simplified Beck's Depression Inventory was used to measure the severity of depressive symptoms. Social capital was assessed using items drawn from the World Bank Integrated Questionnaire to Measure Social Capital. Multilevel analyses were conducted to determine the relationship between social capital and depressive symptoms, adjusting for individual covariates (e.g., perceived stress) and country-level characteristics (e.g., economic development).

Results: Among 4228 students, 48% presented clinically relevant depressive symptoms. Lower levels of cognitive (OR: 1.82, 95% CI: 1.44–2.29) and behavioral social capital (OR: 1.51, 95% CI: 1.29–1.76) were significantly associated with depressive symptoms. The likelihood of having depressive symptoms was also significantly higher among those living in regions with lower levels of social capital.

Conclusion: The study demonstrates that lower levels of individual and macro-level social capital contribute to clinically relevant depressive symptoms among university students. Increasing social capital may mitigate depressive symptoms in college students.

Keywords: social determinants of health, social capital, mental health, depressive symptoms, university students, multilevel analysis

INTRODUCTION

Over the past decade, a mental health crisis has challenged many university campuses across the world (Auerbach et al., 2018). A recent study showed that the occurrence of poor mental health among college students can be as high as 51% in some countries (Auerbach et al., 2018). Mental health issues during the college years have been associated with an increased risk of substance abuse, substantial impairment of quality of life and suicidal thoughts and behaviors (Pedrelli et al., 2016; Mortier et al., 2018). For many students, it also correlates with poor academic performance and dropping-out, which can deleteriously affect social mobility (Bruffaerts et al., 2018).

While several studies have documented trends in mental health issues among college students fewer have aimed to explain them, and there is still a knowledge gap regarding the underlying determinants of the increasing rates (Bruffaerts et al., 2018; Ngin et al., 2018). In light of the risks and consequences associated with mental health issues in college students, understanding what impacts their mental health is imperative. Traditional research exploring students' mental health has focused primarily on individual-level characteristics such as age, gender and lifestyle behavior (e.g., heavy episodic drinking) as risk factors for depressiveness, but relatively little attention has been paid to wider social determinants of health (Geisner et al., 2012; Pedrelli et al., 2013; Ngin et al., 2018). More recently, social capital, broadly defined as features of social structures, including norms, interpersonal trust, and mutual support that act as resources for individual, has been identified as an upstream determinant of mental health (Fujiwara and Kawachi, 2008; Kawachi et al., 2008; Bassett and Moore, 2013). Cumulative evidence has shown that individuals with higher levels of social capital enjoy better mental health than individuals with lower levels of social capital. Yet, despite the mounting evidence regarding the importance of social capital on health the bulk of evidence to date has been conducted among adults and adolescents. The evidence about the association between social capital and health outcomes among college students remains limited (Morgan and Haglund, 2009; Borges et al., 2010).

Moreover, when determining factors associated with mental health, it is vital to take into account that individual determinants are incorporated in more distal contexts at the macro-level. Currently, most projections on student mental health as well as on social capital and health are limited to within-country studies rather than multilevel or cross-national studies (Steptoe et al., 2007). Depressiveness in college students, however, can vary significantly by geographic context. Therefore, cross-country research is needed to enable comparisons and identify possible

levers from a broader perspective. The aim of this study was to investigate students' mental health across a variety of countries and to examine the associations between depressive symptoms and social capital.

Therefore, we hypothesized that students reporting lower levels of social capital experience greater depressive symptoms, and that country-level differences in social capital can partly explain between-country variations in depressive symptoms.

MATERIALS AND METHODS

The present study reports findings from the Social Capital and Student Health Study (SPLASH study). The SPLASH study is an annual international survey examining mental health and related factors among undergraduate students across the world. The study received ethical approval by Institutional Review Boards and ethics committees at all participating institutions.

Participants

The present study utilizes the 2018–2019 SPLASH study dataset, encompassed of self-reported data from about 4,200 university students across twelve countries in Europe (Albania, Germany, Italy, Kosovo, Switzerland), Asia (Malaysia, Oman, South Korea, Taiwan), the Western Pacific (Australia), and Latin and North America (Brazil, United States). At each institution that enrolled in the SPLASH study, a sample of degree-seeking students over the age of 18 years old were recruited.

Procedures

In the present study, between one and two universities were sampled in each country and there were no exclusion criteria for institutional enrollment. All first-year students in the participating institution were invited to complete a self-administered questionnaire. The sampling scheme differed by country. Students from four universities (Brazil, Germany, Italy, and Oman) participated during a regular class lesson and students from the remaining universities participated in a web-based survey. Participation in the study was voluntary and anonymous. Before participating, students were informed that they could terminate participation at any point while filling out the questionnaire.

The sample size was calculated with a sensitivity of 95%, a margin of error of no more than $\pm 5\%$ using the estimated prevalence of depressive symptoms (mild/moderate) in each country (i.e., each university) and the student enrollment at each university. For detailed information on the prevalence rates in each country, the number of students enrolled at

each university and, the exact sample size calculation see the **Supplementary Material**.

Measures

Sociodemographic Characteristics

Self-reported information was collected on a range of factors that have been identified as being relevant to an individual's mental health, including age, gender, accommodation type during the semester, academic discipline and family socioeconomic status.

Depressive Symptoms and Suicidal Ideation

The outcome of interest was depressive symptoms. Depressive symptoms were measured using the Simplified Beck Depression Inventory (BDI-S) (Schmitt and Maes, 2000). The Beck Depression Inventory (BDI), in general, is one of the most widely used instruments for measuring depression and has excellent psychometric properties, including high internal consistency ($\alpha = 0.92$) and demonstrated a lack of racial bias in university settings (Cassady et al., 2019). Measuring depressive symptoms in the university setting has been widely used and replicated by other authors (Cassady et al., 2019).

The BDI-S is a more efficient version of the BDI that has been shown to be no less reliable or valid (Sauer et al., 2013). It has 20 items and measures the severity of depressive symptoms on a six-point Likert response scale book-ended by 0 = 'Never' and 5 = 'Almost Always' (Schmitt and Maes, 2000). A single unweighted score for individual respondents can be computed by summing their responses for all items of the scale. The score can range from 0 (minimum score) to 100 (maximum score) (Schmitt and Maes, 2000).

Schmitt et al. (2006) have also provided standard values for detecting clinically relevant depressive symptoms, with a cut-off score at ≥ 35 representing clinically relevant depressive symptoms (Schmitt et al., 2006). The authors of the BDI-S have demonstrated high internal consistency (Cronbach's $\alpha = 0.93$). In the present study, Cronbach's alpha was comparably high ($\alpha = 0.91$).

The assessment of suicidal thoughts was based on item #9 of the BDI-S which asked students to indicate if they have had thoughts about killing themselves. The suicide item of the Beck's depression inventory is considered a robust predictor of suicide attempts (Green et al., 2015).

Social Capital

Items drawn from the World Bank Integrated Questionnaire to Measure Social Capital (IQ-SC), a psychometric validated instrument, were used to measure social capital (Grootaert et al., 2004). Students were asked a wide range of questions relating to the "cognitive" and "behavioral" social capital dimensions. The cognitive dimension of social capital was assessed through five questions about the respondent's: (a) trust in other people, (b) perceived helpfulness of others, and (c) perceptions of whether the one could borrow money from others in case of need. Four items were measured on a five-point Likert scale (e.g., 1 = 'Agree' strongly to 5 = 'Disagree strongly') and one question had a binary response option (e.g., 0 = 'You can't be too careful' or 1 = 'People can be trusted'). Composite scores for the individual

five items were calculated by summarizing the individual sub item scores, such that a high score indicates higher levels of cognitive social capital. Individual scores for behavioral social capital, for example, can range from 0 to 18 and for cognitive social capital from 0 to 22.

The Cronbach's alpha for the cognitive dimension was $\alpha = 0.71$. The behavioral dimension of social capital was measured by the respondents (a) participation in community activities during the past twelve months, (b) time or monetary contribution to a community project, (c) belonging to a group, (d) having a close friend, and (e) getting together with people to have food or drinks in the past month. Items were either binary (yes/no) or Likert scale, with all scales recoded, where necessary, so that higher values represented higher levels of social capital. The Cronbach's alpha for the behavioral dimension was $\alpha = 0.72$.

Self-Rated Health

Self-rated health was assessed via the single item: "How would you rate your health in general?" and five-point scale response option (1 = 'Excellent,' 2 = 'Very good,' 3 = 'Good,' 4 = 'Fair,' 5 = 'Poor'). For the analysis, the responses were dichotomized into fair/poor health versus the rest.

Perceived Stress

Perceived stress was measured using Cohen's Perceived Stress Scale (PSS-10) (Cohen et al., 1983). It constitutes 10 questions, on a 5-point Likert response scale ranging from 0 = 'Never' to 4 = 'Very often,' on extent to which a respondent considers life stressful in the last month (Cohen et al., 1983). Individual scores on the PSS can range from 0 to 40 with higher scores indicating higher perceived stress. In particular, scores from 0 to 13, 14 to 26 and 27 to 40 represent the threshold for low stress, moderate stress and high perceived stress, respectively. The PSS-10 has been widely shown to demonstrate validity and reliability (Andreou et al., 2011). In the present study, the Cronbach's alpha was acceptable with $\alpha = 0.76$.

Alcohol Consumption and Heavy Episodic Drinking

Alcohol consumption and heavy episodic drinking was assessed using the Audit-C questionnaire (Bush et al., 1998). Scores for the AUDIT-C range from 0 to 12, with higher scores indicating a more hazardous drinking pattern (Bush et al., 1998). Heavy episodic drinking was defined as an AUDIT-C score of five or greater for men and four or greater for women. Several studies have found the AUDIT-C to be valid and reliable across various settings and different racial/ethnic groups (Seth et al., 2015). Cronbach's alpha was high ($\alpha = 0.95$). For the analysis, students were distinguished into low-risk and high-risk drinkers.

Physical Activity

Physical activity levels were measured using the short form of the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003; Hagströmer et al., 2006). The IPAQ has been recognized as a valid and reliable tool and consists of seven questions in which respondents are asked to report the number of days and the duration of their vigorous, moderate, and walking activity during the last week (Craig et al., 2003). A detailed

description of the IPAQ scoring protocol is available elsewhere (Hagströmer et al., 2006).

Country-Level Predictors

Since inequalities between different societies and nations are related to differences in economic development, countries were grouped according their level of purchasing power parity (PPP)-adjusted level of economic development as determined by the World Bank (2019). The World Bank classifies the world's economies into four income groups: Low-income (not present in our study), lower-middle-income (Kosovo), upper-middle-income (Albania, Brazil, Malaysia), high-income (Australia, Germany, Oman, Taiwan, South Korea, Switzerland, United States). The World Bank determines the level of economic development by national income per person, or GNI per capita and by the classification threshold (World Bank, 2019).

Data Analysis Strategy

We dichotomized the outcome according to BDI-S scores: not clinically depressed (<35) vs. clinically relevant depression ≥ 35). This reflects the use of the BDI-S in clinical practice as a screening tool to identify those who deserve further investigation (Nollett et al., 2019). Descriptive statistics were performed to characterize the sample and to determine the levels of social capital, self-rated health, depressive symptoms, perceived stress and health behaviors in each country.

A multilevel binary logistical regression was conducted to account for the hierarchical structure of the data (i.e., individuals nested within countries). Three models were performed. Model 1 included potential confounders of depressive symptoms (e.g., age, sex, and socioeconomic status) and Model 2 included the individual-level variables such as perceived stress and physical activity. In Model 3 country-level characteristics (e.g., economic development) were added. For all models, intra-class correlations (ICC) were calculated to measure the total variance in depressive symptoms that might be attributable to between-country variation (Level-2 units). The single equation can be written as follows:

$$\text{logit}(P_{ij}) = \gamma_{00} + \gamma_{10}x_{ij} + \gamma_{01}z_j + \gamma_{11}x_{ij}z_j + u_{0j} + u_{1j}x_{ij}$$

Here P_{ij} denotes the binary response variable that an individual will experience the outcome (i.e., clinically relevant depressive symptoms). The subscripts i and j reflect individual university students (at level 1) in the countries (at level 2). x_{ij} denotes the individual level predictors (e.g., social capital) and z_j indicates the country-level predictors (e.g., economic development). μ_{0j} represents the random residual for level 2. The segments $\gamma_{00} + \gamma_{10}x_{ij} + \gamma_{01}z_j + \gamma_{11}x_{ij}z_j$ and $\mu_{0j} + \mu_{1j}x_{ij}$ represent the fixed effect and random part of the model, respectively.

Data analysis was performed using the statistical program STATA, version 15.0. Statistical significance level was set at $p < 0.05$.

Sensitivity Analysis

To test the robustness of the results, two sensitivity analyses have been conducted to determine the influence of individual

countries on the overall estimates. In the first sensitivity analysis countries with very high rates of depressive symptoms (e.g., Brazil) were excluded **Supplementary Table S2**), and the in the second sensitivity analysis a linear regression analysis using depressive symptoms as a continuous scale was performed (**Supplementary Table S3**).

Findings

Sample Characteristics

Tables 1, 2 present the descriptive statistics for students with and without depressive symptoms. A total of 4228 first-year students participated in the survey. The total sample was comprised of students from Albania ($n = 258$), Australia ($n = 397$), Brazil ($n = 549$), Germany ($n = 708$), Italy ($n = 402$), Kosovo ($n = 142$), Malaysia ($n = 444$), Oman ($n = 278$), South Korea ($n = 319$), Switzerland ($n = 251$), Taiwan ($n = 214$), and the United States ($n = 266$). A more detailed Table including the mean age of students in each country can be found in the **Supplementary Material (Supplementary Table S1)**.

The majority of the participants were female (64.7%). Forty-eight percent of students scored positive on clinically relevant

TABLE 1 | Sociodemographic characteristics of university students with and without depressive symptoms ($N = 4228$).

	Not clinically relevant (BDI-S < 35) %	Clinically relevant (BDI-S ≥ 35) %	p-value
Total	51.9	48.1	
Gender			
Male	56.1	43.9	<0.001
Female	50.4	49.6	
Age			
18–20 years	55.6	44.4	<0.001
21–25 years	49.0	51.0	
26–30 years	33.9	66.1	
Socio-economic status			
Low	41.8	58.2	<0.001
High	61.5	38.5	
Living during term time			
Parents' house	52.2	47.8	<0.001
Relatives' house	19.7	80.3	
College residence	49.8	50.2	
Rented house/flat	64.7	35.3	
Other	57.6	42.4	
Academic Discipline			
Natural Sciences	56.8	43.2	<0.001
Social Sciences	56.9	43.1	
Humanities	56.7	43.3	
Applied Sciences: Medicine and Healthcare professions	43.2	56.8	
Applied Sciences: Engineering and technology	53.0	47.0	
Business and economics	59.4	40.6	
Professions (e.g., architecture)	24.9	75.1	
Formal Sciences: information technology, mathematics	37.0	63.0	

TABLE 2 | Health-related behavior among university students with and without depressive symptoms ($N = 4228$).

	Not clinically relevant (BDI-S <35) %	Clinically relevant (BDI-S ≥35) %	p-value
Physical activity			
Low	50.5	49.5	<0.001
Moderate	44.9	55.1	
High	67.6	32.4	
Heavy episodic drinking			
Low-risk drinkers	48.2	51.8	<0.001
High-risk drinkers	56.6	43.4	
Suicide ideation			
Never	71.6	28.4	<0.001
Atleast once	15.8	84.2	
Self-rated health			
Good	55.0	45.0	<0.001
Fair/poor	38.7	61.3	
Smoking status			
Non-smoker	43.7	56.3	<0.001
Ever smoker	55.2	44.8	
Perceived Stress			
Low	94.1	5.9	<0.001
Moderate	46.2	53.8	
High	12.0	88.0	
Social Capital: Behavioral Dimension			
Low	43.2	56.8	<0.001
High	66.1	33.9	
Social Capital: Cognitive Dimension			
Low	34.5	65.5	<0.001
High	54.1	45.9	

depressive symptoms ($\text{BDI-S} \geq 35$) (Table 1). Prevalence estimates of clinically relevant depressive symptoms ranged from a low of 24% in Germany to a high of 86% in Brazil (Figure 1).

A significantly higher proportion of students with clinically relevant depressive symptoms were from families with lower socioeconomic backgrounds ($p < 0.001$) (Table 1). Students with a lower stock of social capital had higher prevalence of depressive symptoms ($p < 0.001$) than students with higher levels social capital levels (Table 2).

Factors Associated With Depressive Symptoms

Results of the multilevel logistic models are shown in Table 3. After controlling for potential confounding factors (age, gender, and socioeconomic status), both low levels of cognitive (OR: 1.82, 95%CI: 1.44–2.29) and behavioral social capital (OR: 1.51, 95%CI: 1.29–1.76) were significantly associated with clinically relevant depressive symptoms (Model 1). The unadjusted and adjusted analysis yielded approximately the same magnitude of effects suggesting that age, sex, and SES may not be a major confounding factor to the association between social capital and depressive symptoms.

The odds of reporting clinically relevant depressive symptoms were significantly higher among students with high perceived stress (OR: 17.57, 95%CI: 11.33–27.26) than students with lower perceived stress. A higher level of physical activity per week

was inversely associated with depressive symptoms (OR: 0.62, 95%CI: 0.49–0.78).

When accounting for country-level characteristics, the analyses showed that students living in lower to upper-middle-income economies (e.g., Albania, Brazil, Kosovo, Malaysia) had higher odds (OR: 3.47, 95%CI: 1.43–8.42) of reporting clinically relevant depressive symptoms (Table 3, Model 3). In an additional analysis, aggregating responses of trust (proportion of students agreeing that people can be trusted), we found that individuals living in countries with low levels of trust had a significantly higher risk of depressiveness (OR: 2.87, 95%CI: 1.08–7.58) (Supplementary Table S4). Low trust countries included: Albania, Australia, Brazil, Italy, Kosovo and Malaysia.

Sensitivity tests revealed that neither excluding countries with very high prevalence estimates (Supplementary Table S2) nor using the BDI-S scores (Supplementary Table S3) as a continuous variable substantially change our findings. When excluding countries with very high rates of clinically relevant depressive symptoms, students with a lower stock of cognitive social capital (OR: 1.90, 95%CI: 1.47–2.46) and behavioral social capital (OR: 1.38, 95%CI: 1.16–1.63) were still significantly more likely to report clinically relevant depressive symptoms (Supplementary Table S2). When using the BDI-S scores as a continuous variable results still showed that lower levels of cognitive social capital ($\beta = 5.90$, $p < 0.001$) and behavioral social capital ($\beta = 4.12$; $p < 0.001$) were predictors for clinically relevant depressive symptoms, confirming the findings of the logistic regression analysis (Supplementary Table S3).

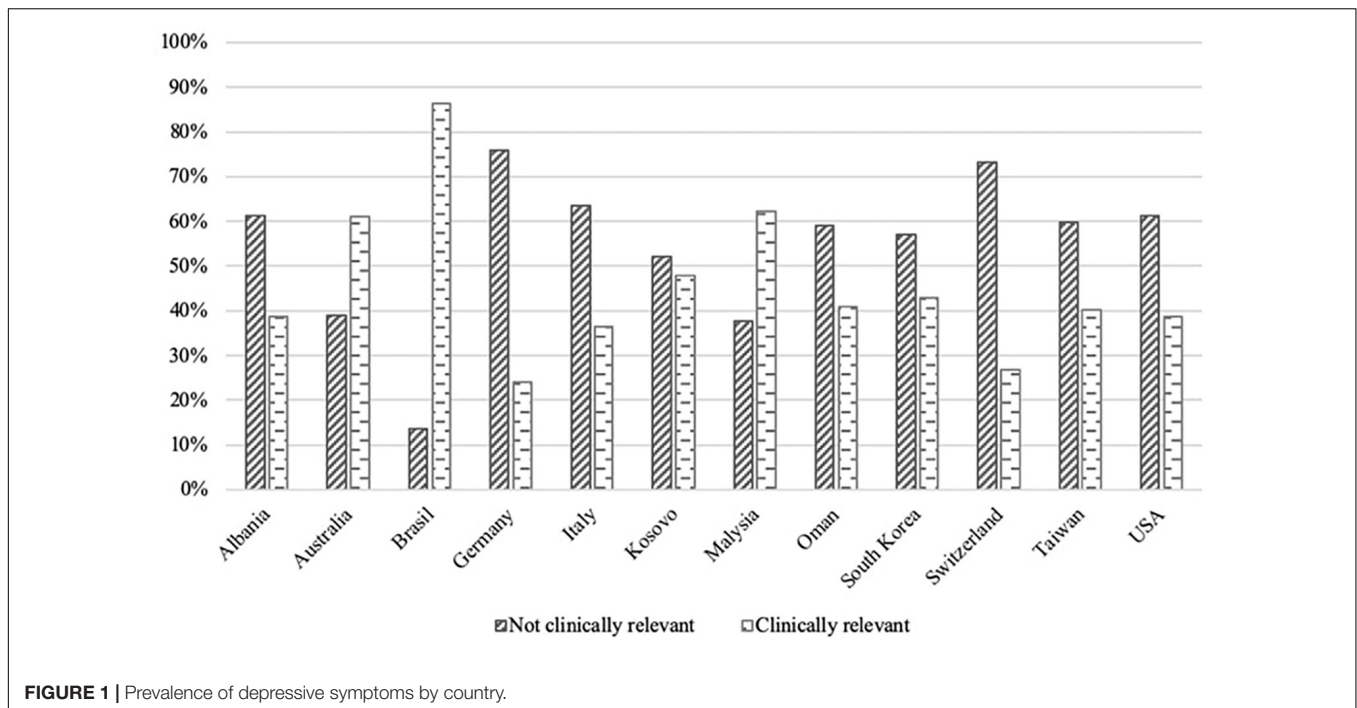
Without including any individual-level characteristics variable, 19% of the variance in individual depressive symptoms came from the country level (Table 3, Model 1). After adding individual-level characteristics, the variance increased to 22% (Table 3, Model 2).

DISCUSSION

This study investigated the prevalence of depressive symptoms and the importance of social capital on depressive symptoms in university students from twelve countries. The prevalence of depressive symptoms was high (48%), with considerably high rates among students from Brazil (86%). The overall prevalence of depressive symptoms in our study is consistent with the average rates reported in previous research (Ibrahim et al., 2013; Auerbach et al., 2018). Auerbach et al. (2018), for instance, found that the 12-month prevalence estimates of common mental disorders ranged from a low of 22% in Belgium to a high of about 48% in Australia.

Furthermore, in the present research, we expand current literature on the prevalence of depressive symptoms among university students and examined the association between social capital and depressive symptoms. Findings supported our primary hypothesis that students with a lower stock of social capital experience greater depressive symptoms.

As expected, at the individual-level social capital is significantly associated with clinically relevant depressive symptoms, also after accounting for age, gender and family



socio-economic status. Meaning that students with low individual perceptions of social capital are at greater risk of clinically relevant depressive symptoms. These results are in line with prior studies that have shown significant associations between individual-level social capital and mental health and self-rated health (Borges et al., 2010; Cohen-Cline et al., 2018).

The results of the multilevel logistic regression analyses also put forward important macro-level aspects of social capital. Students living in lower to upper-middle income countries presented higher odds of presenting clinically relevant depressive symptoms. Moreover, countries, in which students had the lowest level of social capital also had the highest levels of depressive symptoms. An additional examination revealed that the tendency to report distrust was highest among students in Albania, Brazil and Malaysia, while those in Germany and Switzerland reported the lowest level distrust. One could speculate over the reasons for these international differences, but they are likely to be the product of quite particular political, historical and social and cultural factors. In particular, because these countries seem to be ones with high levels of corruption, ethnic conflict, political repression, instability and upheaval. Brazil, for example is characterized by its inherent socioeconomic inequalities with gaps among different social classes, general distrust in both people and in the government, economic recession, ideological polarization, loss of purchasing power, cuts in public investments (Vincens et al., 2018). All which have been found to be detrimental for mental health (van Deurzen, 2017). Debates on the welfare and labor reforms are on-going and underinvestment in public services has caused frustration and anger amongst Brazilians (The Fund for Peace, 2019). Similar contextual factors can be found in Albania, Kosovo and Malaysia. Kosovo, as developing country and Albania, as one of the poorest countries

in Europe, are characterized by high rates of unemployment, poverty, social exclusion and gender disparities (World Bank, 2018). In Malaysia ethnic inequality and income seem to persist, although the Gini coefficient has dropped considerably over the past years. All factors represent main causes of mental health issues (Marmot, 2014).

Concerning the very high rates of depressive symptoms in Brazil, it is important to take the location of the University of Brasilia into account. Brasilia is the federal capital of Brazil and the political hub of the country experiencing great economic and political difficulties (Vincens et al., 2018). Furthermore, the survey in Brazil was conducted after the election of President Bolsonaro, whose administration has made concerted attacks on universities, including cuts to financial aid for disadvantaged students. At the University of Brasilia, yet, around 70% of students receive scholarships and/or depend on FIES. Thus, many students were faced with uncertainty regarding the future of their education. Previous studies have reported that financial difficulties can have a strong and independent effect on depression (Economou et al., 2013).

Several theoretical explanations may account for the findings regarding associations between depressiveness and social capital (Kawachi and Berkman, 2001; Fujiwara and Kawachi, 2008). The stress buffering model, for example, theorizes that social capital can provide opportunities for (psycho) social support which may act as a 'buffering factor' for stress (Kawachi and Berkman, 2001). The main effect model hypothesizes that living in a highly trusting environment can have a protective effect against mental illness (Kawachi and Berkman, 2001). Moreover, considering social capital at the macro-level, specifically, it is possible that countries with high levels of social capital have better health because they have better public services

TABLE 3 | Results for multilevel models, displaying adjusted odds-ratios (OR) and 95% confidence intervals (CI) for social capital and depressive symptoms.

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Social capital behavioral dimension			
<i>High social capital (Ref)</i>	1.00	1.00	1.00
<i>Low social capital</i>	1.51 (1.29–1.76)	1.45 (1.21–1.74)	1.48 (1.23–1.77)
Social capital cognitive dimension			
<i>High social capital (Ref)</i>	1.00	1.00	1.00
<i>Low social capital</i>	1.82 (1.44–2.29)	1.67 (1.27–2.22)	1.65 (1.25–2.20)
Gender			
<i>Male (Ref)</i>	1.00	1.00	1.00
<i>Female</i>	1.36 (1.16–1.60)	1.09 (0.90–1.32)	1.10 (0.91–1.33)
Age			
	1.00 (1.00–1.00)	1.00 (1.00–1.00)	1.00 (1.00–1.00)
Socioeconomic Status			
<i>High (Ref)</i>	1.00	1.00	1.00
<i>Low</i>	1.45 (1.24–1.70)	1.32 (1.11–1.58)	1.33 (1.11–1.58)
Self-Rated Health			
<i>Good (Ref)</i>		1.00	1.00
<i>Poor/Fair</i>		2.50 (1.94–3.22)	2.49 (1.93–3.21)
Perceived Stress			
<i>Low Stress (Ref)</i>		1.00	1.00
<i>High Stress</i>		17.57 (11.33–27.26)	17.65 (11.38–27.39)
Smoking Status			
<i>Non-Smoker (Ref)</i>		1.00	1.00
<i>Ever Smoker</i>		1.06 (0.81–1.38)	1.06 (0.82–1.39)
Heavy Episodic drinking			
<i>Low-risk drinkers (Ref)</i>		1.00	1.00
<i>High-risk drinkers</i>		0.99 (0.75–1.13)	0.99 (0.80–1.24)
Physical Activity			
<i>Low (Ref)</i>		1.00	1.00
<i>Moderate</i>		0.92 (0.75–1.13)	0.92 (0.75–1.13)
<i>High</i>		0.62 (0.49–0.78)	0.62 (0.49–0.79)
Country-Level Characteristics/Contextual Factors			
Level of Income			
<i>High-income economy (Ref)</i>			1.00
<i>Lower to upper-middle income economy</i>			3.47 (1.43–8.42)
ICC	0.19 (0.09–0.36)	0.22 (0.11–0.41)	0.17 (0.08–0.33)

Adjusted for age, sex and SES; Ref = Reference group.

(Halpern, 2005). Researchers have put forward that there is a reciprocal relationship between state-level social capital and government performance (Halpern, 2005). Furthermore, higher social trust has been associated with lower rates of government corruption and better infrastructure (La Porta et al., 1997). A second possibility is that the effect might relate to shared mutual norms and values. It is possible that in high-trust countries people are nicer to one another, are more supportive and that life, in general, is less conflictual. The third possibility includes income inequality (Kawachi et al., 1997). Kawachi et al. (1997) noted a strong correlation between income inequality and both per capita group membership and lack of social trust (Kawachi et al., 1997). Less well-off individuals may be less likely to subscribe to social groups such as sports clubs. Therefore, it is possible, that increased income inequality reduces social capital which in turn results in poorer health in the relevant

groups. The numbers of studies that directly investigate whether cross-national differences in health can be explained by cross-national variations in social capital is limited. The strongest evidence for macro-level social capital having an impact on health probably comes from Kawachi et al. (1997) and Helliwell (2004). Kawachi et al. (1997), discovered that United States states which had higher levels of social mistrust had higher levels of all age-adjusted total mortality and higher rates of fair/poor health (Kawachi et al., 1997). Helliwell (2004) found a close relationship between social capital and suicide (Helliwell, 2004).

Implications

There are several implications that render from these results. First, targeting young people remains fundamental because poor health can seriously affect students' education, an essential determinant of health. Higher educational attainment, in

particular, has been associated with better social and economic development (e.g., higher income) and with an increase of one's capacity for better decision-making regarding health (Marmot, 2017).

Given the high rates of depressive symptoms there are a few implications directed toward universities. Higher levels of social capital may have positive effects on students' mental health. Therefore, universities should consider strengthening and implementing interventions focusing on enhancing social capital. This could involve, for example, promoting social and sports clubs to reduce social isolation or promoting students to refrain from time-out on phones, but time-in with conversations with friends and classmates. Furthermore, there is an urgent need for on-campus mental health counseling services. The concept of social capital should be considered as an add-on component in mental health interventions.

Last, given the macro-level findings, it is possible that students' level of mental health reflects broader social and political problems in society. Therefore, the policy prescription would not only be to improve individuals' social capital, but to turn the focus on wider social as well political contexts when analyzing students' health.

Strengths and Limitations

A major strength of the study is that it fills a gap in the current literature by offering new insight into students' mental health and data on social capital. The international multicenter study design enabled us to make comparisons across countries and to contribute to the discussion of the macro-level aspects of social capital. However, the study has limitations that must be considered. First, the cross-sectional data precludes any inferences of causality or directionality of the effects of social capital on health. A lower stock of social capital may lead to reduced levels of health, but poor health could also generate more moderate levels of social capital. Therefore, longitudinal studies investigating social capital and depressive symptoms are needed. Second, data were obtained through self-reported questionnaires and self-reporting and recall bias for both mental health and social capital cannot be excluded. Over- or underreporting which may have inflated or deflated the associations between social capital and depressiveness is possible. Third, only one to two universities per country participated in the study. Therefore, the sample may not be completely representative of the entire student population in each country. Furthermore, this did not allow us to include an additional level (i.e., university level) in the multilevel analysis. This meant that we could not study campus-level social capital as a predictor of mental health status, and that some portion of the country-level variance in the outcome was actually attributable to campus-level variance.

Nonetheless, at this point of time this sample is larger than in most other epidemiological studies investigating students' health (Barker et al., 2018; Ngini et al., 2018). Nevertheless, it would be beneficial to replicate the study in more universities in each country. Last, although we adjusted for a large number of factors, some variables such loss of a close family member or family history of depression, that could contribute to depressiveness, were not assessed.

CONCLUSION

This study identified that lower levels of social capital, at both the micro-level and macro-level, are associated with depressive symptoms among college students. Students' poor mental health might reflect broader social and political problems in society. While we tend to think of college students as being a protected and privileged group in society, the findings suggest that they can also be "canaries in the coalmine." Continued effort on the identification of specific factors that improve or worsen students' mental health is needed in order to better understand the onset and course of illness and to develop effective prevention and intervention strategies.

DATA AVAILABILITY STATEMENT

The dataset for this study is available on request to the corresponding author.

ETHICS STATEMENT

The present study received ethical approval by Institutional Review Boards and Ethics Committees at all participating institutions.

AUTHOR CONTRIBUTIONS

IB conceived the idea of the study. IB, AV, JW, FF, SK, EB, GL, and IK designed the study. JW and FF collected the data at Bielefeld University (Germany). KS and AA-S collected the data at the University of South Australia (Australia). AV and LM collected the data at the University of Brasília (Brazil). EB collected the data at the University of Zurich (Switzerland), the University of Tirana (Albania), and University for Business and Technology (Kosovo). BL collected the data at the Baylor University (United States). AA-S collected the data at the Sohar University (Oman). P-HL collected the data at the National Taiwan Normal University (Taiwan). SK collected the data at the University of Malaya (Malaysia). IB collected the data at the Harvard T.H. Chan School of Public Health (United States) and the Sapienza University of Rome (Italy), conducted the statistical analyses with the help of GL and IK, and wrote the first draft of the manuscript with the support from all authors. All authors significantly participated in interpreting the results, revising the manuscript, and approved its final version.

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SUPPLEMENTARY MATERIAL

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The Impact of COVID-19 on Anxiety in Chinese University Students

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COVID-19 had become a pandemic raising concerns of widespread panic and increasing anxiety and stress in individuals all over the world (World Health Organization, 2020a). Lots of countries had closed their schools. As the first country to do so, Chinese colleges and universities were making use of different modes of learning, including online-learning based on different platforms to achieve the goal suggested by Ministry of Education in China, “suspending classes without suspending learning,” since middle February. This paper is the first one which aims to investigate the anxiety of Chinese university students after the outbreak of COVID-19 right before the start of new spring term. 3611 university students (female: male = 1.48:1) aged between 18 to 24 from all over China were enrolled to this study from a top university in China. The Self-Rating Anxiety Scale – SAS (Zung, 1971) was used to assess anxiety 2 days before the start of new spring term in middle February. All four-year undergraduate students were included in the study. The mean SAS score was 40.53 (SD = 10.15), significantly higher than the national norm (Mean = 29.78, SD = 10.07, and $p \leq .001$), and there were still 557 (15.43%, Mean = 58.75, and SD = 8.9) students met the cutoff of 50 and were screened positive. Comparisons among sexes, grades and majors were also conducted. Significant differences were found between all males and all female ($p \leq .001$), and between all students majoring arts and sciences in the anxiety sample ($n = 557$, $p = 0.05$). The results also showed that the mean SAS scores were not correlated with the regions they came from/lived in. This study concluded that the Chinese university students showed higher anxiety for COVID-19.

Keywords: anxiety, university students, COVID-19, China, SAS

INTRODUCTION

COVID-19, the infection caused by a novel coronavirus detected in December 2019 in Wuhan (Hubei province), is now a pandemic announced by World Health Organization, raising concerns of widespread panic and increasing anxiety in individuals (World Health Organization, 2020a,b). This outbreak has also seen entire cities in China effectively placed under mass quarantine since late January 2020. Brooks et al. (2019) reviewed and reported quarantine could bring “post-traumatic stress symptoms, confusion, and anger. Stressors included longer quarantine duration, infection fears, frustration, boredom, inadequate supplies, inadequate information, financial loss,

and stigma.” Some researchers also suggested long-lasting effects (Brooks et al., 2019). Besides, previous researches showed that infectious diseases of uncertainty in recent years such as SARS, Ebola, the 2009 and 2010 H1N1 influenza pandemic, Middle East respiratory syndrome and equine influenza all caused negative psychological effects (Bai et al., 2004; Taylor et al., 2008; Wu et al., 2009; Liu et al., 2012; Sprang and Silman, 2013; Rith-Najarian et al., 2019). In situations that are uncertain and evolving such as COVID-19, it is common to feel stressed, anxious, or upset, among other emotional reactions. Medical staff, children, patients with suspected infection, and quarantined family members have been reported under physical and psychological pressure (Chen et al., 2020; Duan and Zhu, 2020; Wang Y. et al., 2020; Xiang et al., 2020).

Depression and anxiety are both common mental disorders with a prevalence of 10–44% in developing countries and depression is the fourth leading cause of morbidity (Azad et al., 2017). University students are at high risk for depression and anxiety symptoms (Zivin et al., 2009; American College Health Association, 2018) and are exposed to multiple stressors unique to this developmental period (Beiter et al., 2015; Drake et al., 2016). Some studies conducted during SARS and H1N1 in China have indicated obvious anxiety and stress of university students and suggested coping strategies (Jia et al., 2003; Chen et al., 2004; Li et al., 2011).

In response to the COVID-19 outbreak, the Chinese Government has ordered a nationwide school closure as an emergency measure to prevent spreading of the infection. Ministry of Education of China and Ministry of Industry and Information Technology of China (2020) suggested “suspending classes without suspending learning,” hence there were over 100 million students in China making use of different modes of learning, including online-learning based on different platforms to achieve the goal starting from middle February 2020. Schools can actively promote a health-conscious schedule, good personal hygiene, encourage physical activities, appropriate diet, and good sleep habits, and integrate such health promotion materials into the school curriculum (Brazendale et al., 2017). University campus life and learning have a critical role in the psychological development of students and the home confinement-related issues were hypothesized having psychological impact on university students. However, how would the closure of schools and online-learning affect university students? Will COVID-19 and quarantine increase or decrease their anxiety? Are there any relations between the high numbers of confirmed cases and their increased anxiety? Though previous studies have indicated increased stress and anxiety during epidemic (Jia et al., 2003; Chen et al., 2004; Li et al., 2011), these study samples were all comparatively small (from 316 to 1200 participants). As COVID-19 is now pandemic and there are rapidly increasing cases and mortalities in some countries, such as Italy, Iran, South Korea, Japan, etc., many countries have announced to close schools and start online-learning immediately. However, no research had been found on the impact of COVID-19 on the anxiety of university students. Our current study conducted in February in China may be of some reference for people related and the implementation

of the coping strategies and prevention programs in future. It would also help us to establish a baseline data, and better mental health is likely to improve the academic performance of the students.

This paper aims to investigate the anxiety of Chinese university students after the outbreak of COVID-19 right before the start of new spring term. For all the undergraduate students, this is the first time in their lives to start a new term in this way, no face-to-face classroom learning but totally via internet and online platform. Our hypotheses are university students would have higher anxiety than usual for the start of new term and their most concern is new term and COVID-19.

MATERIALS AND METHODS

Participants

A total of 3800 questionnaires were distributed to undergraduate students aged between 18 to 24 in a top multidisciplinary and research-oriented university directly under the jurisdiction of the Ministry of Education in north China during 10 am February 15 to 10 am February 17, 2020. 3611 (female: male = 1.48:1) valid questionnaires were received, and the response rate is 95.03% (see **Table 1**). All four-year undergraduate students from all the 26 colleges and schools were included in the study. The participants were also classified into two groups according to their majors and degrees: arts and sciences, in which arts include economics, literature, history, philosophy, foreign languages, law, management, Marxism, Chinese languages and culture, business, tourism and finance, and sciences include mathematics, physics, chemistry, life science, environmental science and engineering, medicine, pharmacology, electronic information and optical engineering, material science and engineering, computer science, cyber science, artificial intelligence, software, and statistics and data science. The participants for this study also represented the distribution of the enrolled students from different regions of China in this university, where there was a high ratio of undergraduate students from Tianjin, Hebei, Shandong, Henan, Shanxi and Sichuan province, and there were several from Hong Kong, Macau, and Taiwan regions. There were also 93 students from Hubei province and 42 from Wuhan city, where the majority of cases affected by COVID-19 were identified.

Procedure

Following the granting of ethical approval from the university to conduct this study, undergraduate students in all grades

TABLE 1 | Demographic characteristics of participants.

Grade	Total number	Males	Females	Arts	Sciences
1	1754	689	1065	863	891
2	1087	433	654	567	520
3	654	283	371	279	375
4	116	49	67	37	79
Total	3611	1454	2157	1746	1865

from one to four were enrolled through online study platforms and groups recently established for the remote learning in new semester to participate in the study during 10 am February 15 to 10 am February 17, 2020 right before the new semester started. Students who agreed in writing to participate were each given an online questionnaire package to complete and return to the researchers. The questionnaire package used in this cross-sectional study consisted of three components: a sociodemographic questionnaire that required each student to provide their sexes, year of study, city or province they were living, major and colleges, or schools; a measure of student anxiety (the Self-Rating Anxiety Scale); an open question about their most concern.

The Self-Rating Anxiety Scale

The Self-Rating Anxiety Scale – SAS (Zung, 1971) was used to assess anxiety 2 days before the start of new spring term, within 1 month of COVID-19 outbreak in China. The SAS is a 20-item self-report assessment device built to measure anxiety levels, based on scoring in 4 groups of manifestations: cognitive, autonomic, motor, and central nervous system symptoms. A person should indicate how much each statement applies to him or her within a period of one or two weeks prior to taking the test. Each question is scored on a Likert-type scale of 1–4 (based on these replies: “a little of the time,” “some of the time,” “good part of the time,” “most of the time”). Some questions are negatively worded to avoid the problem of set response. Overall assessment is done by total score. Among the 20 items, 5 were reverse scored. The total raw scores range from 20–80 and then needs to be converted to an “Anxiety Index” score which can then be used on this scale below to determine the clinical interpretation of one’s level of anxiety. The validity and reliability of the instrument has been found to be adequate among Chinese participants. According to Chinese norm based on the research on 1158 participants, the levels of anxiety were classified as, 25–49 is normal range; 50–59 is mild anxiety levels; 60–69 is moderate anxiety levels; 70 and above is severe anxiety levels.

Statistical Analysis

The data were organized and analyzed using SPSS 22.0 software. The surveyed population was divided into different groups according to the SAS scoring criteria. Measurement data were expressed as mean and standard deviation (SD). Counting data are expressed by the number of people (%). The analysis of the relationship between sex, major, grade, region, and anxiety initially used the two sample *t*-test. The correlation between SAS scores and confirmed affected cases in different regions were analyzed by Pearson’s product-moment correlation analysis, and $p < 0.05$ on double sides was statistically significant.

RESULTS

Overall SAS Mean Scores

The mean SAS score was 40.53 (SD = 10.15; see **Table 2**), below the cutoff of 50 and significantly lower than that (Mean = 41.93,

SD = 10.14) during SARS outbreak in 2003 in China (Chen et al., 2004). One sample *t*-test was conducted and $p \leq .001$. However, the mean SAS score was significantly higher than that of the national norm (Mean = 29.78, SD = 10.07, and $p \leq .001$), and there were still 557 (15.43%) students identified as anxious of different levels with the maximum score of 100, whom were from different provinces and at different grades with different majors.

Group Comparisons

Two-sample *t*-test was conducted and it was found that there were significant differences on SAS scores between males and females ($p \leq .001$) but not between students of arts and sciences ($p = 0.4$). SAS mean scores of grade one were found significantly different from those of grade two and three ($p \leq .001$) but not grade four ($p = 0.15$). There was also significant difference between SAS mean scores of grade two and three ($p \leq .001$). The SAS mean scores of grade four were found not significantly different from any other grades which may be due to comparatively small sample of grade four.

There were around 21.82% of the participants who replied “good part of the time” or “most of the time” for “I feel more nervous and anxious than usual,” about 12.51% of the undergraduate students who chose “good part of the time” or “most of the time” for “I feel afraid for no reason at all” and 20.41% found themselves upset easily or feel panicky for “good part of the time” or “most of the time.” Furthermore, 1192 (33.01%) participants answered “A little of time” or “Some of the time” for “I feel that everything is all right and nothing bad will happen.” 1370 (37.94%) participants chose “A little of time” or “Some of the time” for “I feel calm and can sit still easily.” In addition, there were 734 (20.33%) students felt weak and got tired easily for “good part of the time” or “most of the time.”

SAS Score Ranges

Table 3 showed the SAS score ranges of participants. There were 56 participants who were severely anxious among whom 32 males and 24 females. Only one male came from Xiangyang city in Hubei province and the rest 55 participants were from other provinces.

In **Table 4**, we examined the 557 students whose SAS scores was above the cutoff and therefore identified as anxious. According to Chen et al. (2004), the mean scores of students identified as anxious during SARS was 55.14 (SD = 6.58). One sample *t*-test showed that significant difference ($p \leq .001$) was found between the mean SAS scores during SARS and COVID-19 in this study (mean = 58.75, SD = 8.9). We also conducted two sample *t*-test among students of different grades, and no significant difference was found (see **Table 2**). Significant differences were found between all males and all female ($p \leq .001$) and between all students majoring arts and sciences ($p = 0.05$) in the anxiety sample.

We also conducted two sample *t*-test for the 93 students were living in Hubei. Their mean SAS score was 40.07 (SD = 11.49), but no significant difference ($p = 0.4$) was found with comparison to that of all participants (mean = 40.53,

TABLE 2 | SAS mean scores of participants and comparisons.

Comparisons	Mean (SD)	Number	t-test	P value
This study	40.53 (10.15)	3611	13802470.44	0.00
National norm	29.78 (10.07)	1158		
This study	40.53 (10.15)	3611	-1797531.03	0.00
SARS study	41.93 (10.14)	316		
This study	40.53 (10.15)	3611	500.62	0.00
H1N1 study: controls	35.8 (6.4)	1200		
This study	40.53 (10.15)	3611	266.02	0.00
H1N1 study: quarantine	37.7 (7.9)	1200		
Males	40.28 (10.99)	1454	-29.80	0.00
Females	40.7 (9.55)	2157		
Arts	40.53 (9.82)	1865	0	0.40
Sciences	40.53 (10.46)	1746		
Those anxious in this study	58.75 (8.9)	557	125391.12	0.00
Those anxious during SARS	55.14 (6.58)	316		
Hubei province	40.07 (11.49)	93	-0.35	0.38
All China	40.53 (10.15)	3611		
Wuhan city	40.51 (10.6)	42	-0.02	0.40
Hubei province	40.07 (11.49)	93		
Wuhan city	40.51 (10.6)	42	-0.00	0.40
All China	40.53 (10.15)	3611		

TABLE 3 | SAS score ranges of participants.

SAS		25–49	50–59	60–69	70–100	Total
Anxiety	Level	Normal	Mild	Moderate	Severe	
Subtotal participants		3054	358	143	56	3611
Males		1234	123	65	32	1454
Females		1820	235	78	24	2157
Percentage of males in total males (%)		84.87	8.46	4.47	2.20	100
Percentage of females in total females (%)		84.38	10.89	3.62	1.11	100
Percentage of males in total (%)		34.17	3.41	1.80	0.89	40.27
Percentage of females in total (%)		50.40	6.51	2.16	0.66	59.73
Arts subtotal (%)		1444 (82.70)	190 (10.88)	81 (4.64)	31 (1.78)	1746 (100)
Sciences subtotal (%)		1610 (86.33)	168 (9.01)	62 (3.32)	25 (1.34)	1865 (100)
Grade1 subtotal (%)		1510 (86.09)	153 (8.72)	69 (3.93)	22 (1.25)	1754 (100)
Grade2 subtotal (%)		895 (82.34)	129 (11.87)	43 (3.96)	20 (1.84)	1087 (100)
Grade3 subtotal (%)		556 (85.02)	59 (9.02)	27 (4.13)	12 (1.83)	654 (100)
Grade4 subtotal (%)		93 (80.17)	17 (14.66)	4 (3.45)	2 (1.72)	116 (100)

TABLE 4 | The 557 participants whose SAS scores are above 50 and therefore identified as anxious.

Grade	Total number		Males		Females		Arts		Sciences	
	Subtotal	Mean (SD)	Subtotal	Mean (SD)	Subtotal	Mean (SD)	Subtotal	Mean (SD)	Subtotal	Mean (SD)
1	244	58.52 (7.98)	98	59.78 (8.81)	146	57.67 (7.24)	140	59.39 (8.14)	104	57.34 (7.60)
2	192	58.81 (10.02)	72	62.52 (13.04)	120	56.58 (6.74)	110	58.69 (8.92)	82	58.96 (11.33)
3	98	59.66 (9.16)	38	59.90 (9.94)	60	59.50 (8.63)	45	59.47 (9.63)	53	59.81 (8.75)
4	23	56.79 (6.35)	12	57.71 (5.22)	11	55.80 (7.25)	7	56.96 (7.64)	16	56.72 (5.69)
Total	557	58.75 (8.9)	220	60.59 (10.53)	337	57.55 (7.42)	302	59.09 (8.67)	255	58.34 (9.16)

SD = 10.15). Among them there were 15 participants whose SAS scores are above 50 (mean = 59.78, SD = 11.82). A student from Xiangyang city was found most anxious and

his SAS scores are 100, while others were mildly anxious (mean = 56.88, SD = 5.06). Among the 93 students, there were 42 from Wuhan city and their mean SAS score was

40.51 (SD = 10.6), not significantly different from that of the 93 students ($p = 0.4$), or of the whole participants ($p = 0.4$). There was 7 students from Wuhan city has SAS scores about 50 and were all mildly (No. = 4) or moderately (No. = 3) anxious (Max = 68.75).

The Correlation Analysis of SAS Scores and Confirmed Affected Cases in Each Province

We also conducted the correlation analysis of the SAS scores and the confirmed cases in each region.

1. Between SAS Scores and Confirmed Cases in Each City except Wuhan or Each Province except Hubei Province.

As the confirmed affected cases in Wuhan is far higher than all other cities or provinces, we first deleted the 42 participants from Wuhan and 126 participants whom we did not know which city they were from (for whom we only knew their provinces), then we got 3444 participants from 296 cities. Pearson's product-moment correlation analysis was conducted and it was found that $t = -0.03$, $df = 110$, and $p = 0.97$. The alternative hypothesis is that true correlation is not equal to 0 and 95 percent confidence interval is -0.19 to 0.18 . We also conducted the correlation analysis between SAS scores and the confirmed cases in each province except Hubei province and got the same result which confirmed that students' SAS scores has no significant correlation with the confirmed affected cases of COVID-19 in their cities or provinces.

2. Between SAS Scores and Confirmed Affected Cases in Each City except Hubei Provinces.

We then had a close look of all the cities except Hubei province where COVID-19 first outbreak and spread widely. We conducted the Pearson's product-moment correlation and found that $t = -0.13$, $df = 98$, and $p = 0.89$. The alternative hypothesis is true correlation is not equal to 0 and 95 percent confidence interval is -0.21 to 0.18 . The results indicated that SAS scores has no significant correlation with the confirmed affected cases of COVID-19 in each city outside Hubei province all over China.

3. Between SAS Scores and Confirmed Affected Cases in Each City in Hubei Provinces.

A Pearson's product-moment correlation analysis was also conducted between the SAS Scores of 93 students from different cities in Hubei province and the confirmed affected cases in these places. The results showed that $t = 0.33$, $df = 91$, and $p = 0.75$ and the alternative hypothesis is that true correlation is not equal to 0. The 95 percent confidence interval is -0.17 to 0.24 . Therefore, no significant was found either.

Students' Main Concern

In the current study, we also designed an open question to ask our participants to write down one sentence of their most concern. The majority of the answers are, such as, when the new term will properly start, if their summer

holidays will be shortened then, etc. The Cronbach's α is 0.87. The word cloud of answers to this open question showed that the most obvious words were: start of new term, come on, COVID-19 and school. Some other words they also concerned were: class, online learning, China, anxiety, Wuhan, and teacher, etc.

DISCUSSION

Overall Anxiety Is Higher Than Usual and the General Population During COVID-19

Any major epidemic outbreak will have negative effects on individuals and society. A study on the public psychological states of 600 people during COVID-19 outbreak showed that their SAS score was 36.92 (SD = 7.33) and 6.33% had anxiety (Wang C. et al., 2020). Our results indicated that university students had higher anxiety than the general population after the outbreak of COVID-19, which showed that the COVID-19 had negative psychological impact on university students on anxiety at least. This confirmed the previous findings and was in accordance with recent articles urging mental health care for people affected by the epidemic. Studies have suggested that public health emergencies can have many psychological effects on college students, which can be expressed as anxiety, fear, and worry, among others (Mei et al., 2011). There was no such national norm of anxiety level (such as SAS score) for Chinese college students but we compared our results with the SAS scores of university students during SARS and H1N1, and concluded that university students have higher anxiety during COVID-19 than SARS (only in anxious group) and H1N1. Besides, Cao et al. (2020) indicated that 24.9% of medical students were afflicted with experienced anxiety because of the COVID-19 outbreak. Compared to our study, higher percentage of medical students had anxiety than the general university students amid COVID-19. In addition, the results showed that the majority (66.99%) of participants were facing different levels of challenges and found difficult to sit still for a longer time, and there were quite a few of them (15.43%) were identified as anxious of different levels. And there were 20.33% of students felt weak and got tired easily. It had been almost a month that the majority of Chinese people were recommended to stay at home to prevent the spread of COVID-19, and our students have kept a slack hand and also lacked proper exercises and social lives. The results showed that quite a few students were suffering stress, fear or uneasy and being affected by the uncertainty of COVID-19 and all these should be taken into account when teachers were delivering online classes. Compared to SARS in 2003 when university students then experienced same quarantines as now, internet was playing a major role nowadays in speedy information spread, open online discussion, feeling expressions, etc. News report and social media also caused complex emotions, such as depression, anxiety, stress, upset, fear, frustration, anger, etc. about the health staff infected and died, daily life difficulties, social unfair and corruption, helplessness of the ordinary people

living in Wuhan, etc. According to the feedback from various psychological counseling telephone hotlines set up for COVID-19 around China, anxiety was one of the main characteristics of callers. Studies have confirmed that individuals who have experienced public health emergencies still have varying degrees of stress disorders, even after the event is over, or they have been cured and discharged from hospital (Cheng et al., 2004; National Health Commission of China, 2015). University students were at an important developmental age for their values and judges, and could be easily affected by the opinions and views from social media, therefore, their emotions were also vulnerable.

Group Comparisons

Significant sex differences were found and female students showed more anxiety than male students. This confirmed with previous researches that females were more likely to suffer from anxiety (Azad et al., 2017), such as the prevalence of depression and anxiety in Pakistan is 34% (range 29–66% in women and 10–33% in men (Mirza and Jenkins, 2004). But there was no significant difference between students majoring in arts and sciences. However, students in grade one had lower anxiety level than grade two and three while grade two had higher anxiety than grade three. This could be explained that grade two and three students had more academic burdens. The postpone of new term and online-learning, etc. caused by COVID-19 would have more effect on their lives and plan, such as the cancelation of GRE, TOEFL, IELTS in February and March will affect their applications for abroad studies in near future, etc. Especially for students in grade two, they just started the professional curriculum in the second year and the scores for each course are more important than in grade one as the scores would be evaluated if they could be recommended for postgraduate students without examinations in the following year. However, compared to students in grade two, grade three was a more stable year and students became more mature and would have better ability or experience to handle fluctuant emotions. This is why students in grade three had lower anxiety than grade two.

No Correlation of SAS Scores and Confirmed Affected Cases

In the current study we also investigated if confirmed affected cases of COVID-19 in their cities or provinces had any correlation with students' increase anxiety, however, no significant correlation was found, even in Wuhan city and Hubei province where had 73% of the confirmed affected cases of whole China (National Health Commission of China, 2020). This showed that university students were not much affected by things happening just around them because the convenience of internet brought a national and international vision for them. Young people nowadays obtain information largely via internet on which information travels. Social media are especially popular among young people, which in

turn affect their lives. Young people have a high level of trust in information online and it tends to be the place they look first. Therefore, the confirmed affected cases in each city or province would not affect their anxiety, but rather the direction of public opinion. People had been quarantined for 3 weeks when we conducted this study, and the spread of COVID-19 had been well controlled by Chinese government, therefore, our undergraduate students would no longer worry too much about the confirmed cases in each city considering the whole situation in China was getting better which in contrast to the sharp increase of cases abroad.

Students' Main Concern

In line with our hypotheses, their main concerns were “the start of new term,” “come on,” “COVID-19,” and “school”. Even COVID-19 changed their lives and habits in the past month, they were facing the start of new term which would take place online rather than face-to-face. They were anxious but also curious about the new challenges, so “come on” was another hot word to encourage themselves, Wuhan and China. “Come on” was also one of the hottest words during the COVID-19 in China, given government media, social media and donated stuffs used the words very frequently. Some other words they also concerned such as class, online learning, China, anxiety, Wuhan, and teacher, etc. were all hot topics in China too on various social media and closely related to the undergraduate students.

Limitations of This Study

This study had some limitations. Firstly, our sample was still small, though already much bigger compared to the previous similar studies. Furthermore, our sample was from one top university in north China, hardly representative of all China. Future studies could improve the study design by recruiting more students from different regions of China and also from various universities, such as top ten, top 50, top 100, universities under the jurisdiction of Ministry of Education and those of local government, multidisciplinary universities and academies, etc. Secondly, in this current study we only investigated the anxiety of students, not depression, post-traumatic stress disorder, and other possible mental problems. Thirdly, we did not include the coping strategies and prevention programs in this study which could be explored further in future studies. Additionally, we did not collect the information about if participants were infected or not infected, or with infected family members, and the major source used by students to obtain information about covid19, which could be improved in future studies.

CONCLUSION

It was concluded that Chinese undergraduate students during COVID-19 outbreak showed higher anxiety. However, in general

the psychological status of university students was fairly good, which laid a good foundation for the new term's online-learning. A further study after a few weeks of new term comparing their anxiety was also suggested. Furthermore, as this is the first study on the impact of COVID-19 on the anxiety of undergraduate students, this data could also be used as baseline to further explore the causes of the higher anxiety and to take measure to reduce the anxiety in our students.

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 Nankai University Ethics Committee and were in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The participants

provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CW and HZ co-designed the study while HZ conducted the study and analyzed the data. CW interpreted the data, wrote, and revised the manuscript.

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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.

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Proof of Concept of an Eclectic, Integrative Therapeutic Approach to Mental Health and Well-Being Through Virtual Reality Technology

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Across three studies, we provide a proof-of-concept evaluation of an integrative psychotherapeutic application of virtual reality (VR) technology. Study 1 ($n = 36$) evaluated an unguided “safe-place” imagery task, where participants were instructed “to create a safe space. . . [such as] a scene, item, design, or any visual representation that makes you feel safe” using either the Google Tilt Brush application (VR condition), the standard Microsoft Paint application (2-D condition), or via eyes-closed mental imagery alone (IMG condition). Study 2 ($n = 48$) evaluated a narrative episodic recall task, where participants viewed their childhood and adult homes and places of schooling either using either the Google Earth VR application (VR condition) or the standard Google Earth application (2-D condition) or recalled these places with their eyes closed via mental imagery alone (IMG condition). Finally, Study 3 ($n = 48$) evaluated a guided wilderness imagery task, during which different scripts were narrated, specifically, a trail walk in autumn, a spring meadow, and a hillside walk in snowy winter, while either these same scenes were visually presented using the Nature Treks VR application (VR condition), the scenes were presented using the same software but shown on standard computer monitor (2-D condition), or participants’ eyes were closed (IMG condition). Order of intervention format was randomized across participants. Across all three studies, quantitative survey ratings showed that the VR format of intervention delivery produced greater positive affect and satisfaction and perceived credibility ratings as an intervention for trauma- and stressor-related disorders and psychological well-being as rated by university students who varied in traumatic and stressful life event history and symptoms of posttraumatic stress disorder, whereas qualitative findings revealed additional themes of experiential response including increased experience of presence and vividness in the VR condition. Future research directions and clinical applications are discussed.

Keywords: virtual reality, integrative psychotherapy, posttraumatic stress disorder (PTSD), dissociative experiences, wellbeing, positive affect (PA)

PROOF OF CONCEPT OF VIRTUAL REALITY INTEGRATIVE THERAPY FOR MENTAL HEALTH AND WELL-BEING

Whereas computer graphical environments are usually depicted on a two-dimensional (2-D) screen such as a standard monitor, virtual reality (VR) can be defined as “a computer-generated simulation of a lifelike environment that can be interacted with in a seemingly real or physical way by a person, especially by means of responsive hardware such as a visor with screen,” that is, using a head-mounted display (HMD) in place of a standard monitor (Virtual Reality, 2019). Depicting graphical stimuli in this way can increase their perceived vividness and the extent to which the user experiences a sense of “presence,” that is, that the user is “in” the computer graphical environment.

Current articles in popular scientific media tout the potential of today's VR technology for improving mental health and well-being (Temming, 2018; Weir, 2018; Martin, 2019); however, the peer-reviewed clinical psychology literature investigating VR applications to mental health is only in a nascent stage. For example, referring specifically to treatment for trauma and stressor-related disorders, clinical research published to date is almost exclusively limited to the evaluation of VR applications for exposure therapy (VRET), a treatment based on the principles of extinguishing conditioned fears by repeatedly habituating participants to stimuli reminiscent of their traumatic memories (Foa and Kozak, 1986). A recent systematic review and meta-analysis of 18 studies including a total 759 participants demonstrated that VRET reduced posttraumatic stress disorder (PTSD) and depressive symptoms compared to inactive control groups (e.g., waitlist) with a moderate effect size, but no significant differences were found when comparing VRET with active control groups (e.g., non-VR exposure therapy) (Deng et al., 2019). Moreover, effect sizes were seen to correlate positively with increasing number of sessions and to be maintained at 3- and 6-month follow-ups (Deng et al., 2019). One can conclude from these results that VRET is more effective than no treatment, but not more effective than non-VR exposure therapy. These results agree with an earlier systematic review suggesting significantly better PTSD outcomes for VRET when compared to inactive (waitlist) control, but only equivalent efficacy in comparison with active controls (e.g., traditional imaginal and *in vivo* exposure therapy) (Gonçalves et al., 2012). Such results are also broadly consistent with findings observed for VRET for other anxiety disorders (e.g., Opiş et al., 2012).

However, from the perspective of the psychotherapy integration movement, exposure represents only one of many different psychological interventions that could bring about recovery from trauma and stressor-related disorders, and it is puzzling that so little research has evaluated outcomes for other structured psychological interventions when administered within VR. In fact, writing more than 15 years earlier, one pioneering VR psychologist had recommended that “because VR could be part of the future of clinical psychology, it is critical to all psychotherapists that it should be defined broadly” (Riva, 2005, p. 220), describing several different applications for VR

informed by the different schools of psychotherapy. Specifically, Riva recommended that whereas “behavioral therapists may use a virtual environment for activating the fear structure in a phobic patient through confrontation with the feared stimuli” (pp. 225–226), consistent with the aforementioned concept of VRET, he further considered that “a cognitive therapist may use VR situations to assess situational memories or disrupt habitual patterns of selective attention; experiential therapists may use VR to isolate the patient from the external world and help him or her in practicing the right actions; [and] psychodynamic therapists may use virtual environments as complex symbolic systems for evoking and releasing affect” (pp. 225–226).

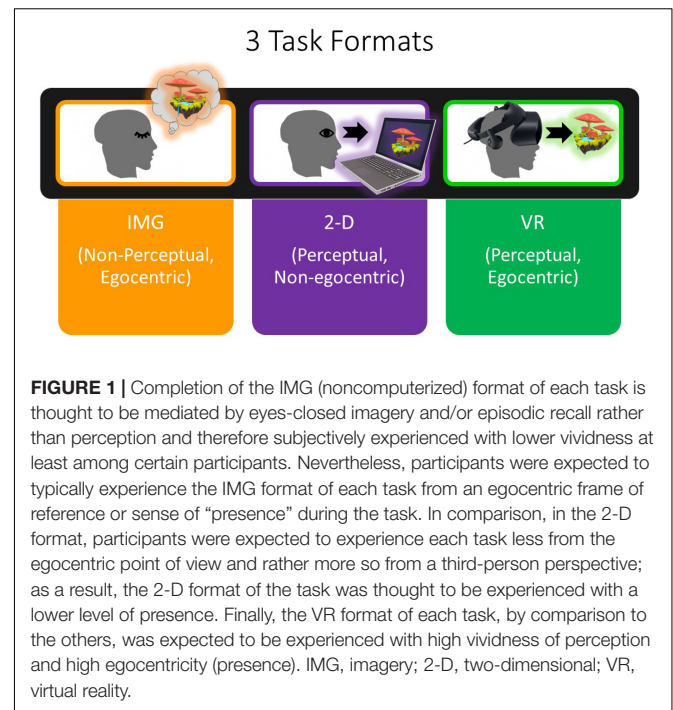
Consistent with the broad application of VR for clinical psychology advanced by Riva (2005), here we provide a proof-of-concept, single-session evaluation of a psychotherapy integration approach to the application of VR technology to improve mental health and well-being that we will term *virtual reality integrative therapy* (VRIT). One popular way to define psychotherapy integration is by emphasizing “common factors” (e.g., therapeutic alliance, empathy) rather than specific psychotherapy techniques or tasks (e.g., unguided or guided imagery, episodic recall) as supposed primary mediators of psychotherapy outcomes (Zarbo et al., 2016). However, the alternative principle of “technical eclecticism” defines the scope and practice of psychotherapy integration differently (Zarbo et al., 2016). Specifically, technical eclecticism involves administering specific psychotherapeutic interventions developed within various schools of psychotherapy without rigid adherence to the theoretical principles of any specific school (e.g., behavioral, cognitive-behavioral, interpersonal, psychodynamic) or even the need for understanding of the psychological mechanisms of change underlying therapeutic effects (Zarbo et al., 2016). Consistent with the technical eclecticism principle and considering psychotherapy as the provision of a menu of structured psychological interventions tailored to individual patient needs and preferences, here we administer three common psychotherapeutic tasks in each of three formats to evaluate the impact of delivery format on immediate affective responses and perceived satisfaction and credibility of the tasks as interventions for trauma- and stressor-related disorders and improving mental health and well-being more generally. Specifically, we administered each intervention: (1) in the traditional noncomputerized psychotherapy format as generally relying on mental imagery and episodic recall rather than stimulus perception while participants' eyes were closed [imagery condition (IMG)]; (2) in the traditional computerized format involving depicting visual stimuli in two dimensions via standard flat-screen (e.g., laptop) monitor (2-D perception condition); and (3) in the computerized format of VR involving depicting stimuli in three-dimensional format through the use of an HMD.

Further, although the eclectic approach to psychotherapy is generally described as disinterested in the study of psychological mechanisms of change but rather only in the practical clinical effectiveness of different interventions (e.g., Zarbo et al., 2016), the present work is interested to initiate the study of common psychological mechanisms of change mediating the outcomes of these different VR versus non-VR intervention formats.

One means to conceptualize these differing treatment delivery formats is to consider that the traditional noncomputerized intervention format, typically conducted with participants' eyes closed, will be mediated primarily through the use of memory and/or mental imagery, the latter defined as "the experience of perception in the absence of external sensory input" (e.g., Ji et al., 2019). In comparison, the computerized modes of treatment delivery will be rendered through direct perception of visual (and auditory) stimuli when conducted with eyes open. Although Ji et al. review studies showing that mental imagery often evokes strong emotional responses in comparison with verbal stimuli; neuroimaging studies provide a theoretical basis for considering mental imagery only as a form of "weak perception," that is, capable of evoking response in similar neural networks to direct perception but typically only at a comparably lower level (Pearson and Kosslyn, 2015; Pearson et al., 2015). As such, we develop the hypothesis that direct perception of stimuli as conducted in the realistic, immersive medium of VR should evoke stronger emotional response when compared with mental imagery and/or episodic recall as is typically conducted in traditional psychotherapy settings. This hypothesis is further in keeping with Riva (2005, p. 226) definition of VR "as an advanced imaginal system: an experiential form of imagery that is as effective as reality in inducing emotional responses." Moreover, VR is known to engender greater feelings of "presence" within the computer graphically depicted environments when compared to presenting the same stimuli on standard flat-screen (e.g., laptop) monitors (e.g., Lessiter et al., 2001). As such, we conceived that the IMG condition would typically involve the naturalistic egocentric frame of reference but did not involve direct perception of visual stimuli while participants' eyes were closed. In comparison, we considered that the 2-D condition would involve direct visual perception but from a third-person point of view. Finally, we regarded the VR condition as involving direct visual perception from the point of view of egocentricity (Figure 1).

Regarding choice of psychotherapeutic tasks, here we examine affective response to an unguided "safe place" imagery task (Study 1), to a structured "narrative" task involving location-based autobiographical recall (Study 2), and to a guided (script-driven) imagery task referring to natural wilderness environments (Study 3). These tasks were selected based on the eclectic perspective that they are each frequently used in the conduct of psychotherapy irrespective of any broader, integrative theory that might explain their clinical effectiveness. The order in which the three formats of each of these three tasks was administered was randomized across participants in a within-subjects design utilizing a common methodology involving collection of open-ended (qualitative) experiential responses to each format immediately following each task and comparative questionnaire (quantitative) ratings following the completion of all three formats of the task.

The present study recruited university students to participate in this initial proof-of-concept study (Study 1, $n = 36$; Study 2, $n = 48$; Study 3, $n = 48$). Besides acting as a sample of convenience,



university students were of interest to recruit given past literature suggesting that, as a group, college-attending young adults are frequently exposed to traumatic and nontraumatic stressors and experience a high degree of PTSD symptoms, including an increased risk for exposure to certain traumatic stressors such as sexual assault, compared to the general population (Avant et al., 2011; Read et al., 2011; Johnson and Johnson, 2013). Furthermore, university represents a period marked by adjustment to challenges in various life domains including social and psychological challenges (Credé and Niehorster, 2012) and is a period of time in which mental health concerns often emerge (Hunt and Eisenberg, 2010). As such, exploration of affective responses to psychotherapeutic tasks among a sample of university students may inform current understanding of trauma- and stressor-related disorders and psychological well-being within this population. The following section describes the general methodology used in all three studies, which is followed by a description of the rationale, specific methods and results unique to each study. This report concludes with a general discussion regarding the collective results of all three studies.

GENERAL METHODS

Research Procedures Across All Three Studies

This research involving human participants was reviewed and approved by the health sciences research ethics board of Western University, Canada. All participants provided informed consent prior to participation. The authors have no potential conflicts of interest to disclose. The authors also note that no adverse events occurred throughout the conduct of this research.

Individuals were invited to participate in the present three studies by viewing an advertisement presented on the university's psychology department research participation website. Interested participants met individually with the experimenter at a designated location on the university's campus and received partial credit toward requirements for an introductory psychology course in which they were enrolled. It was explained that participants were permitted to leave the study at any point without penalization.

Participants were asked to complete self-report questionnaires that assessed their degree of exposure to stressful and traumatic life events [Life Events Survey (LES; Sarason et al., 1978), Life Events Checklist for DSM-5 (LEC-5; Weathers et al., 2013), Adverse Childhood Experiences (ACE; Felitti et al., 1998)], or measured psychological symptoms associated with PTSD [Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5; Blevins et al., 2015)], dissociative experiences [Trauma-Related Altered States of Consciousness (TRASC; Frewen and Lanius, 2014; Frewen et al., 2016)], and depression and anxiety [Patient Health Questionnaire 4 (Kroenke et al., 2009)]. Further description of each of these psychometrically validated questionnaires can be found in the **Supplementary Material**.

Participants were randomized to either complete the VR format of the exercises first, second, or third in comparison to completing the exercises using an analogous 2-D display (laptop screen, 2-D format) or via eyes-closed mental imagery/recall alone (IMG format). In other words, all participants completed the exercises in all three formats, a VR format and two non-VR (2-D and IMG) formats, during the same experimental session, in counterbalanced random order. Concerning the VR administration, a Samsung Odyssey+ Windows Mixed Reality HMD was used along with the associated hand controllers. This HMD has a 110° field of view via a dual 3.5" AMOLED display providing 1,440 × 1,600 pixel resolution up to 90 Hz and includes integrated headphones facilitating AKG 360° spatial sound¹. All software applications were powered by a Microsoft Windows 10 computer and the Windows Mixed Reality functionality. All applications were also rated as being appropriate for use by "EVERYONE" by the international Entertainment Software Rating Board, indicating that the "content is generally suitable for all ages"².

After completing each exercise separately in each format, the researcher interviewed participants about their phenomenological response to the exercise: "What was that like? How did you feel? What did you experience?" Participants' qualitative responses to these questions were recorded verbatim and transcribed. After completing all three formats of the exercise, participants also completed a satisfaction and credibility survey as used in Frewen et al. (2015) and the Modified Differential Emotions Scale (mDES; Fredrickson et al., 2003) comparatively, that is, providing responses to each of the three exercises separately in the order in which they were completed.

Detailed description of these validated surveys can also be found in the **Supplementary Material**.

Research Design and Analysis Across All Three Studies

The research design for each study involved one within-group repeated-measures independent variable, namely, the FORMAT in which each psychotherapeutic exercise was delivered (i.e., IMG versus 2-D versus VR; **Figure 1**). In other words, all participants completed all three formats of the task. The study also included one between-group independent variable, referring to which of a possible six different counterbalanced random ORDERS that different participants completed the exercises in, although for the purposes of statistical analysis this grouping factor will be simplified to describing only whether the VR FORMAT was completed first (i.e., regardless of the ORDER in which the remaining two tasks were completed). As we were interested in specific emotional responses and satisfaction-credibility ratings to each of the three tasks in each of the three formats, statistical analysis of questionnaire responses was undertaken at the item level using multivariate approaches to control for multiple comparisons [i.e., split-plot multivariate analysis of variance (MANOVA) with Greenhouse-Geisser correction]. Two-tailed statistical significance was determined at $p < 0.05$ for multivariate effects and follow-up univariate effects. See the **Supplementary Material** for detailed results of all main effects and interactions for the MANOVA and follow-up analysis of variance (ANOVA) and paired t tests including obtained effect sizes and power analysis; by contrast, only statistically significant results are reported herein. We also evaluated whether baseline symptoms of PTSD (PCL-5 scores) predicted negative emotional responses on the mDES to each FORMAT of the task in the form of Pearson r . However, we emphasize that participants were not randomized to the three tasks [i.e., guided "safe place" imagery, narrative "life-review" exercise, and guided (scripted) imagery of natural wilderness environments], but rather these tasks were administered to different participants in three consecutive studies described separately in the foregoing.

Finally, in this mixed-methods study, participant responses to the open-ended questions were assessed using thematic analysis. Specifically, two student researchers independently identified codes summarizing participant responses to the open-ended questions into themes. These themes were subsequently compared to identify overlapping themes and a final set of agreed-upon codes in consultation with the principal investigator, the supervising psychologist. The student researchers then individually coded each participant response for the presence of the final set of codes, and instances of disagreement were broken by the supervising psychologist. Further, as this program of research was conducted consecutively over the course of three studies, we added to the code list used in Study 1 during Study 2, and to the list used in Study 2 during Study 3. However, only those codes that characterized a minimum 10% of participants' comments are described individually in this report, generally using one to three verbatim examples. Further, making use of the entire set of codes, we

¹<https://www.samsung.com/us/support/owners/product/hmd-odyssey-plus-mixed-reality>

²<https://www.esrb.org/ratings-guide/>

identified the mean number of codes identified in the comments collected across participants, as well as the standard deviation, and report in full the comments made by participants whose self-reported responses included a number of codes that was two standard deviations above the mean, thereby indicative of particularly qualitatively rich responses. Only codes descriptive of responses to the VR format of the tasks are described herein.

STUDY 1: UNGUIDED IMAGERY

Providing instruction in negative emotion regulation skills including so-called “self-soothing techniques” (e.g., Wright, 2009) is frequently undertaken in the context of psychological treatment for PTSD including as a precursor to traumatic memory-focused therapy (e.g., Cloitre et al., 2004). One such approach includes utilizing mental imagery to create a “safe space,” often used both as a “warm-up” to psychotherapy sessions and as a “sanctuary” following therapy sessions (e.g., Jubb, 2017). Within the context of treatment for PTSD, imagining the safe space could involve visualizing pleasant scenes or memories to protect from distressing experiences and intrusive traumatic memories.

Although most psychotherapists administer the safe space exercise as a mental imagery task, art therapy represents an alternative, behavioral-perceptual means of constructing a safe place. In general, art therapy can provide an avenue for helping individuals understand their thoughts and feelings, serve as a medium to express oneself, and explore the concept of psychological safety (e.g., Nielsen et al., 2019). Referring to PTSD treatment, art therapy has also been used for the purpose of consolidating traumatic memories, creating a coherent trauma narrative, and allowing for nonverbal expression of traumatic experiences (e.g., Wertheim-Cahen, 1991; Smeijsters, 2008; Gantt and Tinnin, 2009; Van Lith, 2016). Art therapy may also be useful for the direct management of distress and physical symptoms resulting from traumatic events (e.g., Ballou, 1995; Cohen et al., 1995; Morgan and White, 2003; Rankin and Taucher, 2003; Lyshak-Stelzer et al., 2007). For example, Hass-Cohen et al. (2018) demonstrated among a group of trauma-exposed participants that drawing pictures of the self, the problem, and coping resources significantly reduced the rating of the effect of the traumatic event, negative affect, and increased endorsement of resiliency resources, whereas Henderson et al. (2007) showed that three 20-min mandala drawing sessions were associated with significantly reduced PTSD symptoms compared to a control condition. Further, among persons with combat-associated PTSD, eight sessions of art therapy combined with cognitive processing therapy (CPT) resulted in significantly reduced PTSD symptoms compared to an equal number of sessions of CPT when combined with supportive psychotherapy (Decker et al., 2018). Indeed the use of art therapy for the treatment of mental health conditions represents a field of growing interest (e.g., Van Lith, 2016; Haeyen et al., 2018), and previous literature has examined the use of art therapy for treating a range of trauma-related psychological disorders including depression, bipolar disorder, schizophrenia, and PTSD

(e.g., Lyshak-Stelzer et al., 2007; Crawford et al., 2012; Van Lith, 2015).

However, use of art therapy exercises as implemented in the aforementioned clinical literature has used traditional art materials such as paint and pencil and paper, and to our knowledge, the ability of VR technology to provide an immersive modality for artistic expression within the context of psychotherapy for PTSD has not yet been studied. The present study therefore sought to be the first to compare affective responses associated with (1) simply imagining a safe space without the aid of a computer (IMG format), (2) drawing a 2-D safe space using a laptop and the standard Microsoft Paint application (2-D format), and (3) creating a three-dimensional safe space using the VR application Google Tilt Brush (VR format).

Study 1 Methods

Participants

The sample comprised 36 (29 females) university students. About three of every four ($n = 27$, 75%) of the participants reported that they had experienced at least one type of ACE (i.e., before the age of 18 years) (mean = 2.50, SD = 2.26, min. = 0, max. = 7); the same number ($n = 27$, 75%) had experienced at least one type of traumatic life event as an adult as measured by the LEC-5 (mean = 2.06, SD = 2.07, min. = 0, max. = 8), and all participants had experienced at least one type of stressful life event in the past year as measured by the LES ($M = 11.22$, SD = 5.18, min. = 4, max. = 21). Twelve participants (33%) scored above the recommended cutoff of 33 for probable *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)* PTSD diagnosis on the PCL-5 ($n = 12$), and the overall sample PCL-5 descriptive statistics was as follows: mean = 24.36, SD = 15.02. Among the 12 participants who met probable *DSM-5* PTSD diagnosis on the PCL-5, four (33%) also met probable diagnosis of the dissociative subtype of PTSD (D-PTSD) as measured by a score of at least three on at least one of the two TRASC items described by Frewen et al. (2015). Multivariate effects comparing responses to the baseline questionnaires between groups were nonsignificant in all cases, implying that the groups can be assumed to be equivalent at baseline irrespective of the ORDER in which they were randomized to complete the exercises in.

Task Formats and Instructions

The VR software application Google Tilt Brush was utilized in order to administer the VR format of the exercise³. In this application, while wearing the HMD, users utilize the VR hand controllers to draw whatever they wish, making use of various options for types of paint brushes, color, stimuli, backgrounds, and so on. First, participants were given a brief tutorial describing how to use the application. Following completion of the tutorial, instructions for the exercise given to participants were as follows: “Please use the application to create a safe space. This safe space can include, but is not limited to, the creation of a scene, item, design, or any visual representation that makes you feel safe.”

³<https://www.tiltbrush.com/>

By comparison, for the 2-D computer format of the exercise, the standard Paint application in Windows 10 was used⁴. Participants were again provided a brief tutorial on the use of the application, and participants were given the same instructions. Finally, for the noncomputerized format of the exercise, participants were instructed as follows: “Please use your imagination to think of, and imagine yourself in, a safe space. This safe space can include, but is not limited to, imagining a scene, item, design, or any visual representation that makes you feel safe.” Participants took as much time as they wished with each exercise, indicating when they were done verbally, usually within about 10 min. During debriefing following each exercise, participants described the scenes they imagined or constructed and what they experienced during each format of the task.

Study 1 Results and Discussion

Referring to response to the 10 items measured by the satisfaction and credibility questionnaire, at the multivariate level, first, referring to within-group effects, the main effect of TYPE was highly statistically significant, $F(20,14) = 6.666$, $p < 0.001$, $\eta^2 = 0.905$, whereas the effect of ORDER or the interaction between ORDER and TYPE was not. At the univariate level, the within-group main effect of TYPE was statistically significant for all satisfaction and credibility ratings except in the case of “distressing” ($p = 0.410$). All follow-up paired t tests indicated that participants were more satisfied in response to the VR exercise in comparison to the 2-D computer exercise except in the case of “easy to complete,” for which the difference fell short of statistical significance ($p = 0.054$). Further, all follow-up paired t tests indicated that participants were more satisfied in response to the VR exercise in comparison with the mental imagery exercise except in a single case whereby participants rated mental imagery to be more “easy to complete” than the VR exercise ($p = 0.039$). Note that obtained effect sizes for these paired comparisons involving the VR format were large in most instances (i.e., $d' > 0.80$); see **Supplementary Material** for full tabled effect sizes for all pairwise comparisons. Finally, mental imagery was regarded as more “credible as an intervention for mental health problems associated with stressful/traumatic life events” and was also considered more “easy to complete” in comparison to the 2-D computer exercise. Moreover, participants reported that they would more highly “recommend this exercise to a friend” and would more likely “complete this exercise again” in reference to the mental imagery exercise when compared to the 2-D computer exercise. Results are shown in **Figure 2**. We therefore conclude that the safe place exercise produced the greatest perceived satisfaction and credibility as an intervention for trauma- and stressor-related disorders and mental health and well-being more generally when completed within the immersive format of VR as compared to standard laptop screen (2-D) format or using visual imagery alone, whereas visual imagery was also preferred over the 2-D format in certain respects.

Referring to 10 positive affective states measured by the mDES-PA items, at the multivariate level, the main effect

of exercise FORMAT was also highly statistically significant, $F(20,14) = 14.28$, $p < 0.001$, $\eta^2 = 0.95$, whereas the effects of ORDER and the interaction between ORDER and FORMAT again were not. At the univariate level, the within-group main effect of FORMAT was statistically significant for all positive emotions except in the case of “love, closeness, trust” ($p = 0.252$). All follow-up paired t tests indicated that participants experienced greater positive emotions in response to the VR exercise in comparison to both the 2-D computer exercise and noncomputer exercise, whereas the latter two conditions differed only in response to a single rating, “amused, fun-loving, and silly,” whereby the 2-D computerized task received the higher rating; results are depicted in **Figure 3**. Further, obtained effect sizes for these paired comparisons involving the VR format were also typically large (i.e., $d' > 0.80$); see **Supplementary Material**. We therefore conclude that the safe place exercise produced the greatest positive affect when completed within the immersive format of VR as compared to constructing the safe place using a standard laptop screen or using visual imagery alone.

Finally, referring to 10 negative affective states measured by the mDES-NA survey, at the multivariate level, no between- or within-group main effects or interactions were statistically significant; therefore, no follow-up univariate tests were conducted. To afford comparability with the findings reported for positive affect, **Figure 4** also displays results for all self-reported negative emotions. However, whereas the vertical axis referring to positive affect in **Figure 3** runs between 0 and 10, the same axis in **Figure 4** referring to negative affect is fourfold smaller. As a result, we conclude that negative affect of any kind was reported only very rarely or at a very low intensity in response to any format of the exercise. Some participants did report a mild sense of feeling “embarrassed, self-conscious, blushing” while completing the exercises on computer, primarily relating to their believing they were of low artistic skill when completing the exercise, and their ongoing work was viewable to the experimenter; this variably occurred in both the VR and 2-D conditions.

Nevertheless, persons with higher PTSD symptoms reported greater negative affective states in response to the tasks, especially with regard to feeling “angry, irritated, annoyed,” “ashamed, humiliated, disgraced,” and “sad, downhearted, unhappy,” responses that were relatively consistent across task formats and averaged around a correlation of $r \approx 0.20$ (**Figure 5**). We therefore conclude that participants with PTSD are likely at increased risk of responding with increased negative affect to the task of unguided “safe place” imagery regardless of the format in which it is administered. Nevertheless, supplementary analyses found that, even among the 12 participants who scored above the recommended cutoff of 33 for probable DSM-5 PTSD diagnosis on the PCL-5, the majority had an average mDES-NA score of less than 1 on the 0- to 10-point scale across the 10 emotional states surveyed, and only a single person had an average score of 5 or more on the 0- to 10-point scale for any format (**Figure 6**). This emphasizes the rarity of clinically significant negative affective responses observed among any participant in the present study, including even among those who reported higher PTSD symptoms.

⁴<https://www.microsoft.com/en-us/p/paint-3d/9nblggh5fv99?activetab=pivot:overviewtab>

Unguided Imagery – Mean Satisfaction and Credibility

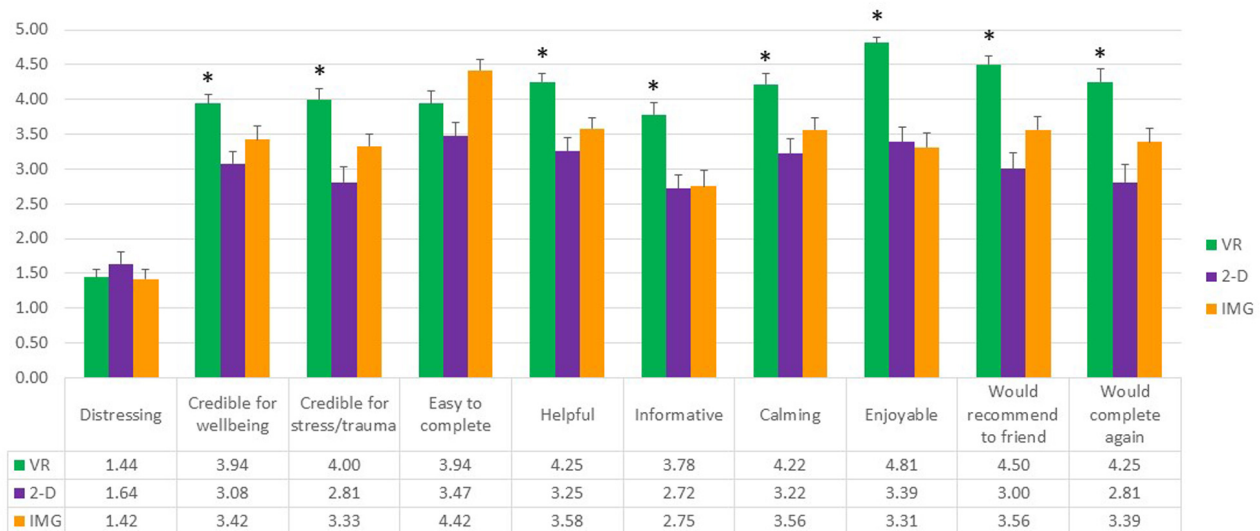


FIGURE 2 | Bars illustrate the mean ratings obtained on a 0- to 5-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. Asterisks denote the 8 of 10 ratings in which the mean rating for the VR condition significantly exceeded the mean rating for both of the 2-D and IMG conditions. Any other statistically significant pairwise comparisons are described in the text. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

Regarding the thematic analysis of open-ended comments, seven themes were observed by at least four (i.e., >10% of) participants, which were, in decreasing order of observed frequency: (1) positive affect ($n = 14$), (2) calming ($n = 14$), (3) fun-interesting ($n = 11$), (4) safe-secure ($n = 7$), (5) vividness-realism ($n = 6$), (6) presence ($n = 6$), and (7) positive memories ($n = 5$). However, the first three themes were entirely redundant with the survey items of the mDES-PA, and so these will not be discussed further. In comparison, referring to the “safe-secure” theme, participants commented on the sense of feeling safety and security while completing the VR task, for example, stating that: “I really like bright things so the stars and sun make me feel safe. I used warm colors, which also makes me feel safe”; and “I drew some objects that are important to me that feel safe: a mug, a wine glass, I drew two lamps...”; and “I made a room, and usually I’m with my boyfriend, and he makes me feel really comfortable, and that’s where I feel safe.” Referring to the “vividness-realism” theme, participants commented on the vivid, realistic nature of the VR task, often associated with the immersive, interactive nature of the task, for example, stating that: “It felt more realistic... It felt more real”; and “It was immersive”; and “It almost felt real with all of the features.” Referring to the “presence” theme, participants commented on the sense in which the VR experience created an immersive, egocentric frame of reference, for example, “I was imagining myself in the room”; and “I feel like I’m actually in the space”; and “As I was making it and as it became more complete, I actually felt

like I was in a room.” Finally, referring to the “positive memories” theme, participants commented that the VR task invoked positive memories, for example, “The drawing is supposed to mimic this carpet that is in my grandparent’s house... A lot of my fond childhood memories happened there”; and “I created a beach... while I was doing it, I started to have good memories of travelling with my family years ago”; and “I drew my friend and I at a museum... I haven’t seen the friend in a while, and it reminded me of her, so that was really nice. It made me miss her.”

The mean number of themes identified in participants’ comments was 2.31 ($SD = 1.26$). Two participants’ comments were coded to exhibit five or more themes, thus being approximately two standard deviations above the mean. These participants’ comments are noted in full in order to share some of the qualitatively richer phenomenological descriptions received from participants regarding the ways in which they responded to this VR unguided imagery task. Specifically, the first participant, whose response was coded to have six themes, commented:

“I used the brushes and colors to create patterns I think are interesting and triggers my creativity. It’s not a “place” but a scene I feel comfort in and can explore myself. It’s almost like a different dimension. I created a tunnel that almost teleports you to another place. There is a sense of mystery and sense of unknown. There is a sun that symbolizes happiness and warmth. There are stars and bubbles that remind me of my childhood.”

Unguided Imagery – Mean Positive Affect

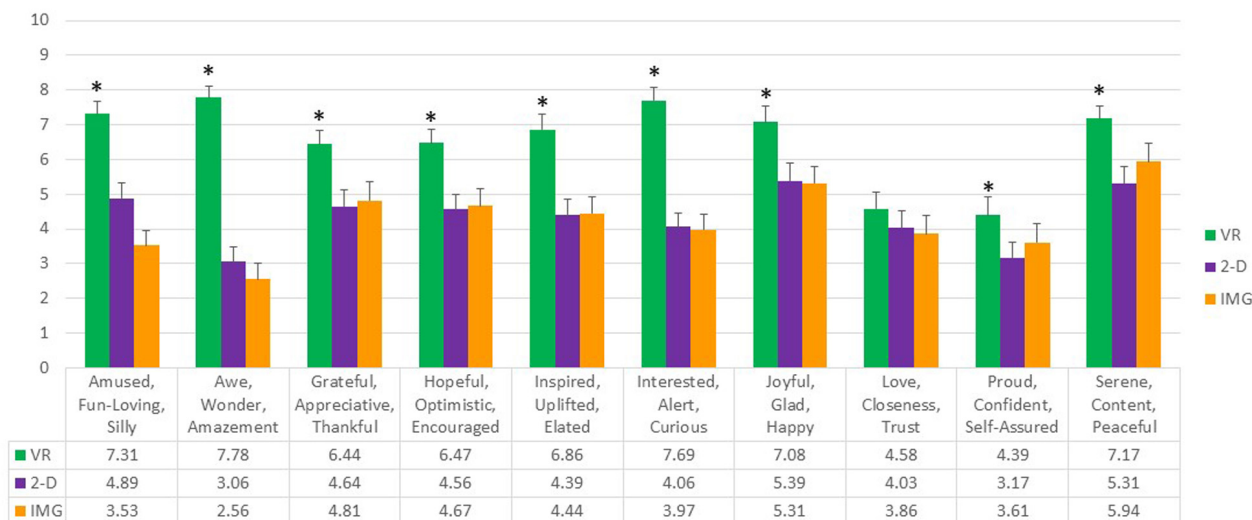


FIGURE 3 | Bars illustrate the mean ratings obtained on a 0- to 10-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. Asterisks denote the 9 of 10 ratings in which the mean rating for the VR condition significantly exceeded the mean rating for both of the 2-D and IMG conditions. Any other statistically significant pairwise comparisons are described in the text. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

Further, the second participant, whose response was coded to have ‘five themes, commented:

“That was, in one word, awesome. I loved the freedom of space around me, because it gave me more to work with than a 2-D space, I felt more free, it’s shocking to see how you can change the environment. The amount of tools available allowed me to explore and that was fun and freeing. I think it made me feel better than the first activity because it made me more excited to draw myself into the safe place and felt more at ease.”

STUDY 2: GUIDED AUTOBIOGRAPHICAL RECALL

Research shows that narrative therapy can also produce positive clinical outcomes, for example, reducing symptoms of depression compared to wait list over long-term follow-up (e.g., Lopes et al., 2014a,b) and reducing PTSD among adult and child refugees, asylum seekers, survivors of mass violence and torture, and earthquake survivors (e.g., Robjant and Fazel, 2010; McPherson, 2012; Zang et al., 2013). The conceptual framework underlying narrative therapy (White and Epston, 1989) and narrative exposure therapy (Neuner et al., 2002) is to view the collection of life events that a person has experienced as a library of personal stories and to recognize that a certain number of these stories may be significant determinants of identity, commonly known in the PTSD literature as “self-defining memories” (e.g.,

Conway and Pleydell-Pearce, 2000; Sutherland and Bryant, 2005; Singer et al., 2013). Through imagination and episodic recall, however, narrative therapy involves “revisiting” such memories in order to reflect on the meanings people ascribed to their life experiences and to potentially make new meanings where appropriate as a psychotherapeutic means. Within narrative therapy, doing so, especially when highly negative appraisals and attributions can be “rewritten” more adaptively, is considered a practice of “reauthoring identity” that can bring about therapeutic change.

Further, narrative exposure therapy, as a particularly structured delivery of narrative therapy, includes creation of a narrative of all of the client’s stressful life events in chronological order, modifying and elaborating the list until the traumatic events they have experienced are embedded within the context of an autobiography (Neuner et al., 2002). This approach therefore emphasizes the relevance of assessing trauma history from a developmental life course perspective inclusive of events from childhood and adulthood. Moreover, this otherwise private autobiography may further stand as a form of public testimony to traumas that occurred on a population scale, for example, among traumatized refugees from low-income and war-torn countries and other victims of severe human rights violations (Neuner et al., 2002).

Although usually implemented as imaginative or talk therapy, narrative exposure therapy can also be administered in other formats, for example, as writing therapy, and there

Unguided Imagery – Mean Negative Affect

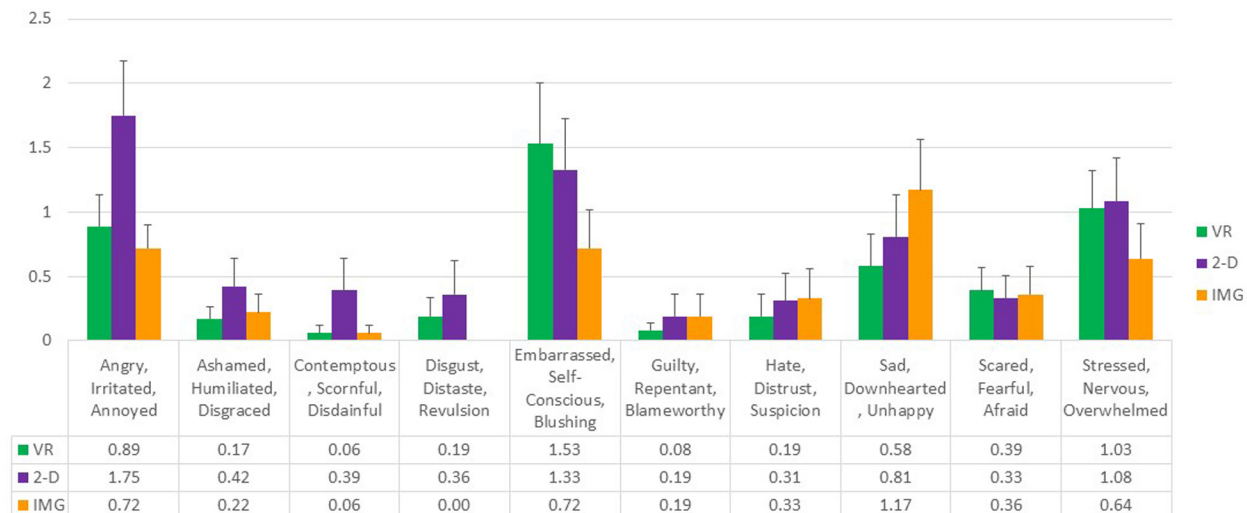


FIGURE 4 | Bars illustrate the mean ratings obtained on a 0- to 10-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. In the absence of a significant ANOVA, no pairwise comparisons were conducted but rather all are assumed to be nonsignificant. See text for further description. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

is accumulating evidence for its efficacy and acceptability as a treatment delivered in various formats (e.g., van Emmerik et al., 2013). However, to our knowledge, no prior studies have investigated affective responses to immersive, visual processing of autobiographical stimuli in persons with PTSD, for example, as perceived by viewing 360° (spherical) photographs of autobiographical stimuli through an HMD. With this in mind, we conceived that a safe “revisiting” of important location-based landmarks relevant to personal history and identity (e.g., childhood and adult home, school) could occasion meaningful episodic recall, self-reflection, and associated affective responses as a brief structured psychological intervention consistent with the narrative therapy approach. In Study 2, we therefore compared affective responses to traditional uncued recall and visualization of a person’s childhood and adult home and school (IMG format) to visually cued recall of the same environments when administered in 2-D versus VR formats.

Study 2 Methods

Participants

The sample comprised 48 (28 females) undergraduate university students. Half of the participants ($n = 24$, 50%) reported that they had experienced at least one type of ACE (i.e., before the age of 18 years) (mean = 1.56, SD = 1.99, min. = 0, max. = 7); approximately two in every three participants ($n = 33$, 69%) had experienced at least one type of traumatic life event as an adult as measured by the LEC-5 (mean = 1.90, SD = 1.90, min. = 0,

max. = 7), and all participants had experienced at least one stressful life event in the past year as measured by the LES (mean = 12.23, SD = 6.11, min. = 1, max. = 30). One in every four participants (25%) scored above the recommended cutoff of 33 for probable *DSM-5* PTSD diagnosis on the PCL-5 ($n = 12$), and the overall sample PCL-5 descriptive statistics was as follows: mean = 22.50, SD = 15.13. Among the 12 participants who met probable *DSM-5* PTSD diagnosis on the PCL-5, four (33%) also met probable diagnosis of D-PTSD. Multivariate effects comparing responses to the baseline questionnaires between groups were nonsignificant but trending ($p = 0.062$), causing a hazard that the groups might not be equivalent at baseline despite randomization. Follow-up univariate analyses suggested that, unfortunately, despite randomization to groups, those who completed the VR intervention first reported overall greater PTSD symptoms, dissociative experiences (TRASC), anxiety, and depression symptoms at baseline ($p < 0.05$).

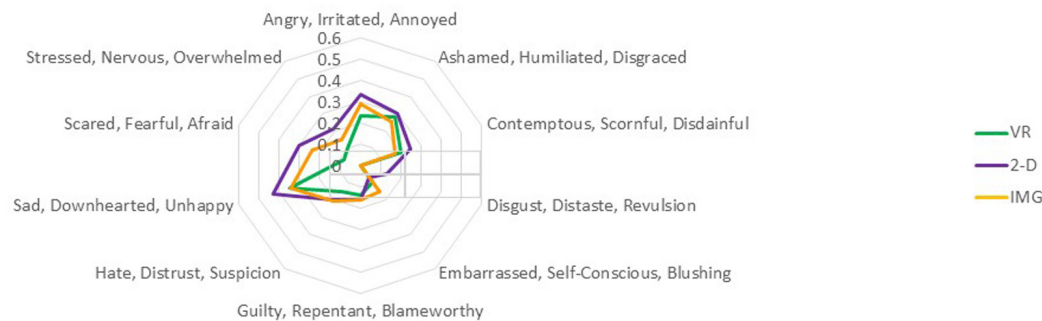
Task Formats and Instructions

The VR software application Google Earth VR was utilized in order to administer the VR FORMAT of the exercise⁵, whereas the 2-D computer FORMAT of the exercise used the more familiar standard (non-VR) desktop version of the same software⁶. All task formats were completed in seated position in a standard office roller-swivel chair. In the VR application,

⁵<https://arvr.google.com/earth/>

⁶<https://www.google.com/earth/>

Unguided Imagery – Correlations between PTSD Symptoms and Negative Affect



	Angry, Irritated, Annoyed	Ashamed, Humiliated, Disgraced	Contemptuous, Scornful, Disdainful	Disgust, Distaste, Revulsion	Embarrassed, Self-Conscious, Blushing	Guilty, Repentant, Blameworthy	Hate, Distrust, Suspicion	Sad, Downhearted, Unhappy	Scared, Fearful, Afraid	Stressed, Nervous, Overwhelmed
VR	.23	*.28	.20	.00	.10	.14	.15	*.35	.08	.10
2-D	*.33	*.30	.25	.13	.07	.16	.20	*.43	*.30	.21
IMG	*.29	.25	.17	.00	.15	.16	.21	*.34	.24	.15

FIGURE 5 | The radar figure further depicts the pattern of the correlations noted in the table below between PTSD symptoms (measured by the PCL-5), on the one hand, and the various negative affect ratings (measured by the mDES), on the other. Asterisks denote the 8 of 30 ratings in which the correlation is statistically significant at $p < 0.05$ (1-tailed). See text for further description. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

while wearing the HMD, users utilize the VR hand controllers to navigate a computer graphical rendering of the earth's surface, with the "street view" functionality further providing the viewing of 360° spherical photographs of certain locations typically taken from a roadside position and ordered by the global positioning system (GPS). Participants were asked to wear the HMD and were introduced to the application through an approximately 5-min tutorial on how to use the controllers provided by the VR Google Earth application itself, including how to search for locations, how to orient themselves in street view, and how to maneuver through the locations. The tutorial also served as a way to orient and habituate the participants to the experience of VR. Similar instructions were provided with regard to use of the non-VR version of the Google Earth application, although many participants were already familiar with the use of this software.

Besides the instructions given, in randomized order, participants were asked to locate their childhood and adult homes and places of schooling in the various computerized formats using either the search functionality by address if known or by navigating by visual memory if not known, or simply recalled how each place looks and imagined "seeing" themselves in each place in their mind's eye in the noncomputerized IMG format of the task. In the computerized formats, the locations were explored in street view if available until the participant was satisfied, including having the opportunity to navigate within nearby GPS coordinates within the VR format using the "blink

teleport" functionality within the VR version of the application. Experientially this was akin to "walking" up and down various streets using the hand controllers, while behaviorally this involved looking around the virtual environment using head movements and swiveling in their roller chairs. Once participants were satisfied with each experience, the researcher transcribed participants' responses to the open-ended questions and rating surveys that were administered. Although responses were collected separately to the childhood and adult locations, results are presented as averaged across these responses to adhere to the research design used in Study 1.

Study 2 Results and Discussion

First, referring to the 10 items assessed by the satisfaction and credibility questionnaire, at the multivariate level, referring to within-group effects, the main effect of FORMAT was again highly statistically significant, $F(20,27) = 12.44$, $p < 0.001$, $\eta^2 = 0.90$, whereas the effect of ORDER was not. However, it should also be noted that the interaction between ORDER and FORMAT trended toward significance, $F(20,27) = 1.88$, $p = 0.06$, $\eta^2 = 0.58$. At the univariate level, the within-group main effect of FORMAT was statistically significant for all satisfaction and credibility ratings except in the case of "distressing" ($p = 0.17$) and "easy to complete" ($p = .22$). Concerning follow-up paired t tests of the main effect, participants were more satisfied in response to the VR exercise in comparison to both the 2-D computer

Unguided Imagery – Average Negative Affect among Persons with Probable PTSD

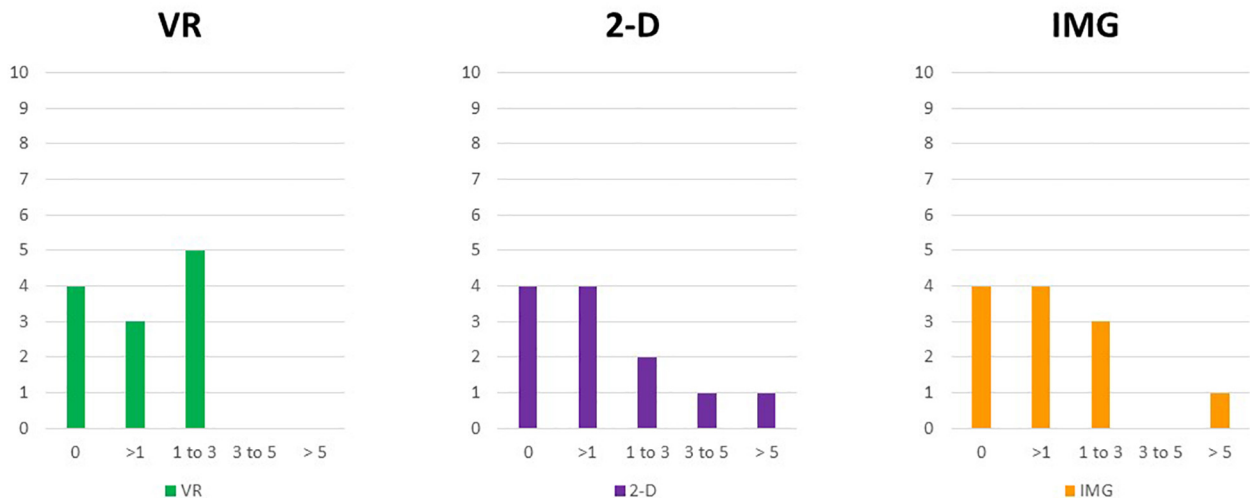


FIGURE 6 | Bars illustrate the number of participants in the sample with probable PTSD (i.e., the subsample scoring above 33 on the PCL-5) whose average score across the 10 negative affect ratings on the MDES exceeded the values indicated on the x axis. It can be seen that very few scored above even a relatively low value of 3 on the 0- to 10-point scale for any of the task formats: VR (green), 2-D (purple), and IMG (orange). See text for further description. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

and noncomputer exercise for all ratings. Moreover, obtained effect sizes for these paired comparisons involving the VR format were large in most instances (i.e., $d' > 0.80$); see **Supplementary Material** for listing of effect sizes for all pairwise comparisons. By comparison, the noncomputer format of the exercise was regarded as a more “credible way to improve self-regulation and enhance well-being” ($p = 0.02$) and as more “credible as an intervention for mental health problems” ($p < 0.01$) when compared with the 2-D computer format, whereas the reverse was true regarding the rating of “informative” ($p = 0.03$); several other ratings evidenced trend-level significance ($p < 0.10$). Results are shown in **Figure 7**. By contrast, no univariate effects were statistically significant for the interaction between FORMAT and ORDER, and so no follow-up paired t tests were conducted. We therefore conclude that the narrative exercise produced the greatest perceived satisfaction and credibility ratings as an intervention when completed within the immersive format of VR as compared to standard laptop screen format or using imagery and recall alone.

Referring to the 10 positive affective states measured by the mDES-PA survey, at the multivariate level, the main effect of exercise FORMAT was also highly statistically significant, $F(20,27) = 7.00$, $p < 0.001$, $\eta^2 = 0.84$, whereas the effects of ORDER and the interaction between ORDER and FORMAT were not. At the univariate level, the within-group main effect of FORMAT was statistically significant for all positive emotions without exception. All follow-up paired t tests further

indicated that participants experienced greater positive emotion in response to the VR exercise in comparison to the 2-D computer exercise. Additionally, follow-up paired t tests indicated that participants experienced greater positive emotion in response to the VR exercise in comparison to the noncomputer exercise with the exception of “grateful, appreciative, thankful” ($p = 0.15$) and “love, closeness, trust” ($p = 0.06$). Note further that obtained effect sizes for these paired comparisons involving the VR format were also large in the majority of instances (i.e., $d' > 0.80$); see **Supplementary Material**. Finally, the 2-D computer exercise was associated with more “awe, wonder, amazement” when compared with the noncomputer IMG format of this exercise ($p = 0.01$), whereas all other comparisons were nonsignificant. Results are depicted in **Figure 8**. We therefore conclude that again the narrative exercise produced the greatest positive affect when completed within the immersive format of VR as compared to completing the same exercise using a standard laptop screen or using visual imagery and episodic recall alone.

Finally, referring to the 10 negative affective states measured by the mDES-NA survey, at the multivariate level, no between- or within-group main effects were statistically significant. Further, although the multivariate interaction between FORMAT and ORDER trended toward significance, $F(20,27) = 1.98$, $p = 0.05$, $\eta^2 = 0.59$, follow-up univariate tests were nonsignificant in all cases. To afford comparability with the findings reported for positive affect, **Figure 9** also displays results for self-reported negative affects. Note, however, again the difference in scaling,

Narrative – Mean Satisfaction and Credibility

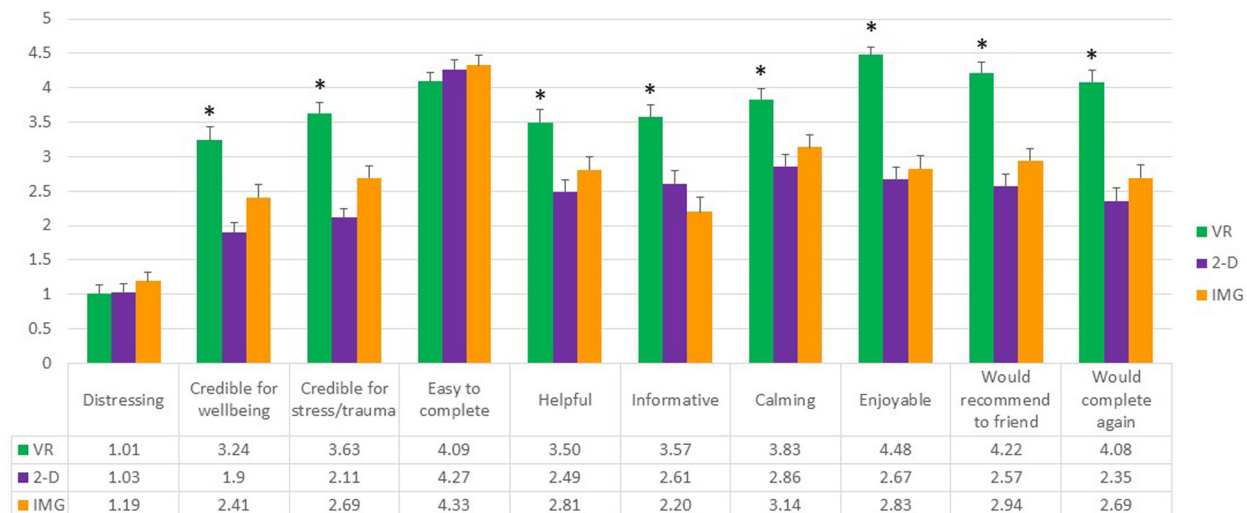


FIGURE 7 | Bars illustrate the mean ratings obtained on a 0- to 5-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. Asterisks denote the 8 of 10 ratings in which the mean rating for the VR condition significantly exceeded the mean rating for both of the 2-D and IMG conditions. Any other statistically significant pairwise comparisons are described in the text. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

suggesting that negative emotional responses to the narrative exercise in any format were rare or of minimal intensity.

That observation notwithstanding, concerning participant symptoms of PTSD, Pearson correlations again suggested that persons with higher PTSD symptoms reported greater negative affective states in response to the tasks for all negative emotions measured, responses that were highly consistent and did not differ appreciably across task formats (**Figure 10**, where the effect sizes average approximately $r \approx 0.35$). We therefore must again conclude that participants with probable PTSD are likely at increased risk of responding with increased negative affect to the narrative task irrespective of task format. Even still, supplementary analyses found that, even among the 12 participants who scored above the recommended cutoff of 33 for probable *DSM-5* PTSD diagnosis on the PCL-5, the majority again had an average mDES-NA score of less than one on the 0- to 10-point scale across the 10 emotional states surveyed, and only a single person had an average score of 5 or more on the 0- to 10-point scale for any format (**Figure 11**).

Regarding the thematic analysis of open-ended comments, in considering that participants responded to the task as a response to both their childhood and adulthood locations, we found that seven themes were observed at least 10 times (i.e., >10% of participant ratings), namely, (1) fun-interesting ($n = 55$), (2) memories of unstated valence ($n = 33$), (3) positive affect ($n = 25$), (4) vividness-realism ($n = 20$), (5) positive memories ($n = 19$), (6) nostalgia ($n = 16$), and (7) negative affect ($n = 11$). Again,

themes 1, 3, and 7 were wholly redundant with response to the mDES survey and so will not be discussed further. Referring to the “memories of unstated valence” theme, participants described the task as invoking episodic recall, but whether the memories were positive or negative could not be determined with certainty, in most cases seeming either neutral or only mildly positive. For example, participants described: “I saw the field where I used to play football and thought about all the times I walked to and from school in the evenings”; and “Campus—remembering my first day on campus, figuring out how to get around. Home—I thought about walking my dog—I walk him around there every day” and “I remembered specific events like moments of my life when I was there.” Regarding the previously described “vividness-realism” theme, examples to the narrative exercise included “It was weird how realistic it is... because when I think about it [referring to the IMG task] I know it’s supposed to be there but I can’t see—but the VR shows details and brings back more memories”; and “More immersed, can move around and interact—kind of explore areas where you had experiences as a child”; and “It was also immersive. I saw more than in the 2-D condition. It made me more in touch with those spaces. It felt more real.” Regarding the previously described “Positive Memories” theme, examples in response to the narrative exercise included “I guess because I was thinking about my childhood I remembered all the fun we had at school, with neighbors, with friends. Happy, missing it a little. Being thankful that I had a really good childhood there”; and “It was a little emotional to see where I remember being

Narrative – Mean Positive Affect

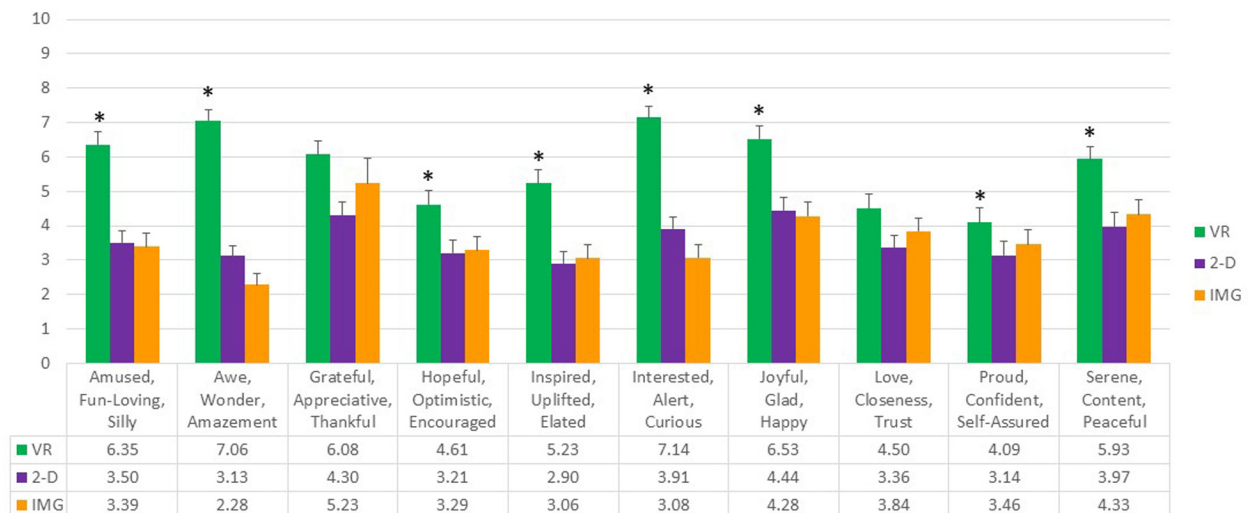


FIGURE 8 | Bars illustrate the mean ratings obtained on a 0- to 10-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. Asterisks denote the 8 of 10 ratings in which the mean rating for the VR condition significantly exceeded the mean rating for both of the 2-D and IMG conditions. Any other statistically significant pairwise comparisons are described in the text. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

Narrative – Mean Negative Affect

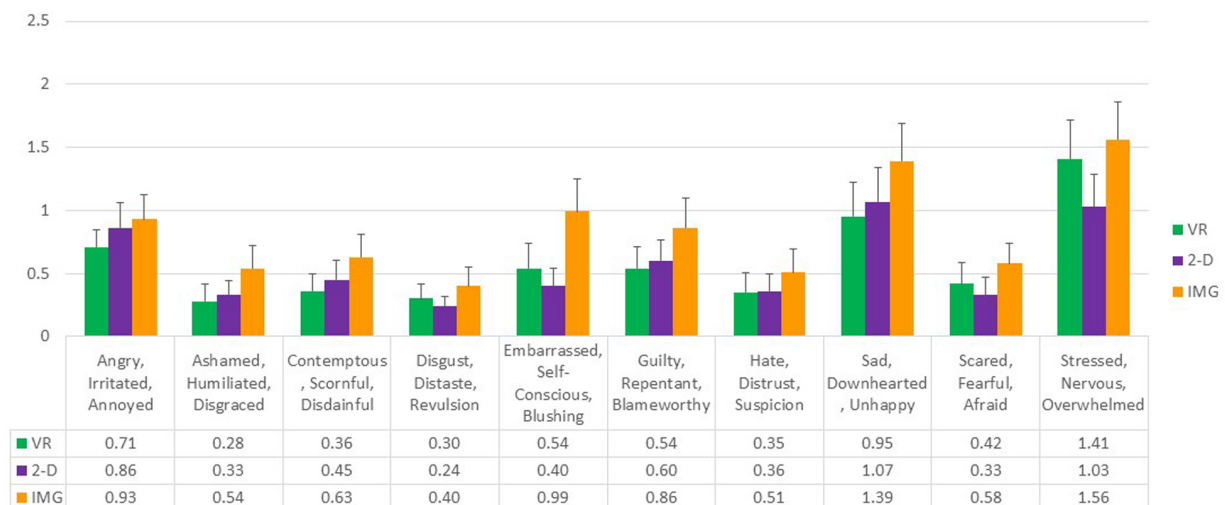


FIGURE 9 | Bars illustrate the mean ratings obtained on a 0- to 10-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. In the absence of a significant ANOVA, no pairwise comparisons were conducted, but rather all are assumed to be nonsignificant. See text for further description. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

Narrative – Correlations between PTSD Symptoms and Negative Affect

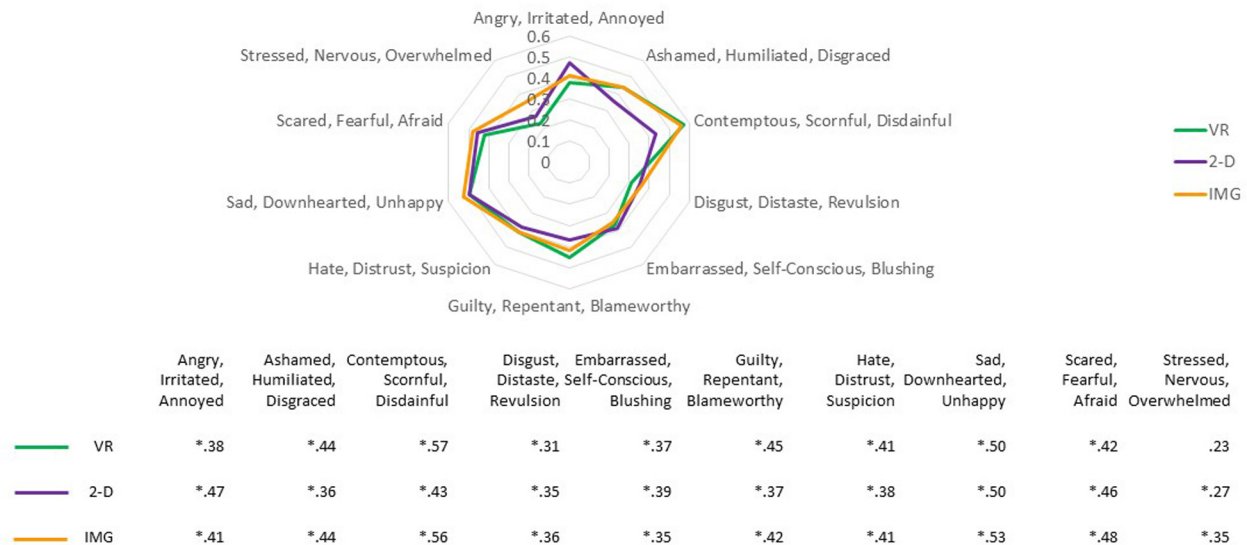


FIGURE 10 | The radar figure further depicts the pattern of the correlations noted in the table below between PTSD symptoms (measured by the PCL-5), on the one hand, and the various negative affect ratings (measured by the mDES), on the other. Asterisks denote the 29 of 30 ratings in which the correlation is statistically significant at $p < 0.05$ (1-tailed). See text for further description. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

young, naive, innocent; its heartwarming. When I saw the school, I was actually laughing inside because I thought about funny situations that have happened to me”; and “I really enjoyed it. I felt warm, and it brings back happy memories.” Finally, as a closely related theme, coded instances of the “Nostalgia” theme included “Saw my car which brought back memories of family and the longing”; and “Really interesting and nostalgic, and it brought back old memories”; and “When I saw my home it was nostalgic—I still live there sometimes. I saw my old car and some old features—saw my grandma there—reminded me of growing up.”

The mean number of themes identified in participants’ comments in response to the task when referring to adult locations was 2.30 (SD = 1.44), whereas for the child locations, this was 3.24 (SD = 1.77). Three participants’ comments were coded to exhibit seven or more themes, thus being approximately two standard deviations above either mean, indicative of some of the richer phenomenological descriptions we received. Specifically, one participant, whose response was coded to have seven themes, commented:

“Did a lot of talking while experiencing. The feeling is fleeting, but the memory or the emotion behind it was more intense. Remembered more specific things. My parents divorced right before we moved out of the house—so the house has more memories—nostalgic and happy—warm fuzzy feelings. The yellow warm color of the house might have induced warm

feelings. There were bad memories with the divorce, but I didn’t think of that as much. Compared to 2-D it felt warmer. Thought more about the divorce in imagination. 2-D was just like a picture but in VR it felt more personal. School—specific details and memories, would talk about life. The proportions of things were clearer and you realize that when you’re a kid everything looks big. It’s a sunny setting—I thought about the peaceful summer days. For the most part, a happy childhood.”

Another participant, whose comments were coded to exhibit eight themes, reported:

“I’ve never done VR so that was something new. Much clearer experience than looking at a screen. It’s like everything is right there, but everything is static. I was reminded of some things that didn’t come to mind when doing 2-D. Like when I biked it was scary because Toronto drivers are reckless. So having to be really careful. This was all on the road, and I was right there on that bike lane. Specific scenarios of drivers doing some really shady things and realizing I could have died right there. Overall seeing the architecture and everything was really spot on. Mostly thought about how dangerous it is biking in Toronto. Frustration because of those experiences, sometimes anger, when people break road rules. You quickly get over it, though. In general—definitely closer to what life was like over there. Some sense of appreciation—I was there. It’s a great school; campus is great. Appreciation for not just education but the community. Grateful. Sense of belonging with complete strangers. Thought about convocation—that was a great experience. More bittersweet. Sometimes we’re too critical about

Narrative – Average Negative Affect among Persons with Probable PTSD

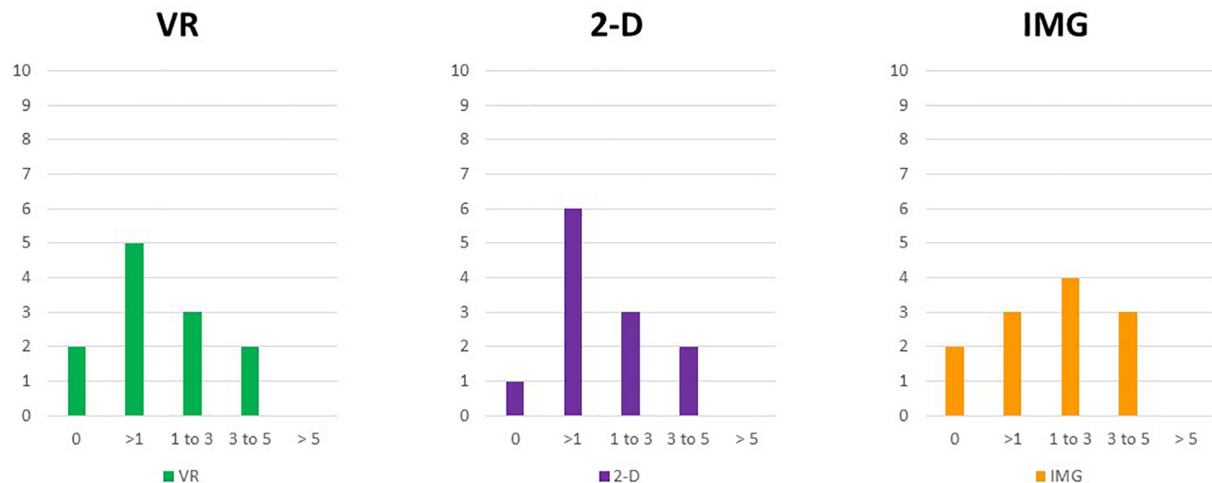


FIGURE 11 | Bars illustrate the number of participants in the sample with probable PTSD (i.e., the subsample scoring above 33 on the PCL-5) whose average score across the 10 negative affect ratings on the MDES exceeded the values indicated on the x axis. It can be seen that very few scored above even a relatively low value of 3 on the 0- to 10-point scale for any of the task formats: VR (green), 2-D (purple), and IMG (orange). See text for further description. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

ourselves, but at the same time I made it through, so there is that sense of happiness. You think of your friends who helped you out. You're all there."

Finally, the third participant, whose response was coded to have 10 themes, commented:

"Such an incredible feeling to be honest. The premise of what you guys are doing is really good. I study a lot about experience—there is a lot of intrinsic value—higher sense of self and worth. Music helps too, a really positive feeling. Like being really excited for the day and studying and getting an education. Home—spent a lot of time outside. Especially with birds. Loved studying things and remembering who I am. School—people telling you to do things, boring and isolated, brought back the stress that my mom put on me and teachers telling me how to be. The field—I also felt the way I was at home, discovering things, having friends, doing my own thing. School was more negative but still positive, and home was more supportive."

STUDY 3: GUIDED "WILDERNESS" IMAGERY

Coupled to standard individual and group-based psychotherapy, "wilderness therapy," otherwise known as "adventure therapy," involves the organized engagement in outdoor environmental experiences or "adventures" partly in order to provoke positive emotions and encourage social and family engagement and effective problem solving (e.g., Russell and Phillips-Miller, 2002).

Wilderness therapy is often conducted in residential settings with adolescents including those who have recently experienced traumatic stressors (e.g., Bettmann et al., 2011), and there is an increasing emphasis on delivering interventions within the framework of trauma-informed care (Norton et al., 2019). The wilderness-based activities available to participants variably include hiking, canoeing or kayaking, cross-country skiing, snow-shoeing, rock-climbing, and related activities (Tucker and Norton, 2013). Recent meta-analyses show that wilderness therapy has proven efficacy for improving psychosocial outcomes on a range of measures (Bettmann et al., 2016; Gillis et al., 2016). For example, trauma-exposed youth and their families who participated in a wilderness therapy experience as an adjunct to standard trauma-focused treatment reported greater reduction in depression, anxiety, anger, and PTSD symptoms and improved family function when compared with youth and families who received only the standard trauma-focused care (i.e., treatment as usual, excluding the outdoor environmental experiences). Together with the common factors that are intrinsic to wilderness therapy attributable to its inclusion of psychoeducation and individual and group psychotherapy (e.g., Russell et al., 2017), it is thought that positive psychosocial outcomes brought about by wilderness therapy will be at least partially mediated by the unique immersive, naturalistic outdoor experiences that are provided. For example, experiences conducted in outdoor environments such as forests and mountainous areas can provoke highly positive emotions such as the appreciation of beauty, wonder, and awe (e.g., Anderson et al., 2018).

Unfortunately, however, access to therapeutic experiences in wilderness settings will be limited to most urban persons, and given that wilderness therapy is a highly integrative intervention that comprised many elements, it is relatively difficult to study. By contrast, guided (script-driven) imagery of the experience of naturalistic environments is comparably straightforward to administer and could be a basis for bringing about positive emotions as well. Indeed Holmes et al. (2016) review findings that depression is associated with impoverished positive imagery, providing a rationale for practice of positive imagery as an intervention for depression. However, Holmes et al. also discuss that depression may result in the impoverishment of positive imagery vividness, potentially limiting the impact of mental imagery-based interventions alone.

As such, exploration of VR used to provide a vivid medium for perceptual immersion into realistic, naturalistic environments as a means of inducing positive emotions is necessary. Although we assume that the most effective therapeutic means for inducing positive affect and the awe-inducing appreciation of nature will be through *in vivo* experience of real-world natural environments, the present research evaluated whether positive emotions can also be engendered by immersing oneself in realistic computer graphical renderings of naturalistic environments in VR as compared with viewing the same environments in standard flat-screen (2-D) computer format and imagining the same kinds of scenes using mental imagery alone (IMG format).

Participants

The Study 3 sample comprised 48 (28 females) undergraduate university students. Approximately two of every five participants ($n = 21$, 44%) reported that they had experienced at least one type of ACE (i.e., before the age of 18 years) (mean = 1.08, SD = 1.62, min. = 0, max. = 7); approximately two of every three participants ($n = 31$, 65%) had experienced at least one type of traumatic life event as an adult as measured by the LEC-5 (mean = 1.04, SD = 1.03, min. = 0, max. = 4), and all participants had experienced at least one type of stressful life event in the past year as measured by the LES (mean = 8.75, SD = 4.14, min. = 1, max. = 19). Approximately one in every four participants (27%) scored above the recommended cutoff of 33 for probable DSM-5 PTSD diagnosis on the PCL-5 ($n = 13$), and the overall sample PCL-5 descriptive statistics were: mean = 24.36, SD = 15.02. Among the 13 participants who met probable DSM-5 PTSD diagnosis on the PCL-5, two (15%) also met probable diagnosis of D-PTSD as measured by a score of at least three on at least one of the two TRASC items described by Frewen et al. (2015). Multivariate effects comparing responses to the baseline questionnaires between groups were nonsignificant in all cases, implying that the groups can be assumed to be equivalent at baseline irrespective of the ORDER in which they were randomized to complete the exercises in.

Task Formats and Instructions

The VR software application “NatureTreks,” was utilized in order to administer the VR FORMAT of the exercise⁷. In

this application, while wearing the HMD, users utilize the VR hand controllers to navigate seasonal scenes in naturalistic environments, as well as to modify the environment in various ways (e.g., planting trees or flowers, causing it to rain or snow, changing the degree of sunlight). Three different scripts were narrated by the experimenter coinciding with the selection of three different environments, specifically, a trail walk in autumn, a spring meadow, and a hillside walk in snowy winter. Instructions given to participants were as follows: “During each session, I will be guiding you through the experience by reading a script. In this part of the exercise, we will be entering into an environment via our imagination, TV screen, or VR. By reading a script, I will guide you through the environment and we will explore and experience the ability to manipulate it... All the while, please pay attention to what it is like for you to complete this exercise, so that you can describe the memory of your experiences when it is over. Pay attention to thoughts, feelings, sensations, and anything else that comes up...” The full instructions and scripts that were read verbatim are included in the **Supplementary Material**. Further, video recordings of a user experience of the same scripted exercise was used for the 2-D computer FORMAT of the task while for the noncomputerized FORMAT of the exercise participants listened to and imagined each of the scripts with their eyes closed. In the case of the 2-D monitor format, we displayed the videos on a wide-screen (34" diagonal) curved monitor to increase the potential for immersion via that medium. The scripts describing each of the three different seasonal environments were randomized to the three different task formats across participants (e.g., one participant might have completed the trail walk in autumn in VR, the spring meadow walk in 2-D format, and the hillside snowy winter walk using mental imagery alone, this combination being different for another participant).

Study 3 Results and Discussion

First, referring to response to the 10 items of the satisfaction and credibility questionnaire, at the multivariate level, referring to within-group effects, the main effect of FORMAT was again highly statistically significant, $F(20,27) = 7.617$, $p < 0.001$, $\eta^2 = 0.849$, whereas the effect of ORDER or the interaction between ORDER and FORMAT were not. At the univariate level, the within-group main effect of TYPE was statistically significant for all satisfaction and credibility ratings except in the case of “distressing” ($p = 0.357$). All follow-up paired t tests indicated that participants were more satisfied in response to the VR exercise in comparison to the 2-D computer exercise, and the same was found when comparing the VR exercise to eyes-closed imagery except that these two task formats were not reported to differ regarding how “easy to complete” they were ($p = 0.627$). Additionally, obtained effect sizes for these paired comparisons involving the VR format were again large in most instances (i.e., $d' > 0.80$); see **Supplementary Material** for tabled effect sizes. Finally, eyes-closed mental imagery was regarded as less “easy to complete” ($p = 0.005$) but more “calming” ($p = 0.049$) when compared with eyes-open viewing of the scenes on the 2-D monitor. Results are shown in **Figure 12**.

⁷<https://naturetreksvr.com/>

Guided Imagery – Average Satisfaction and Credibility

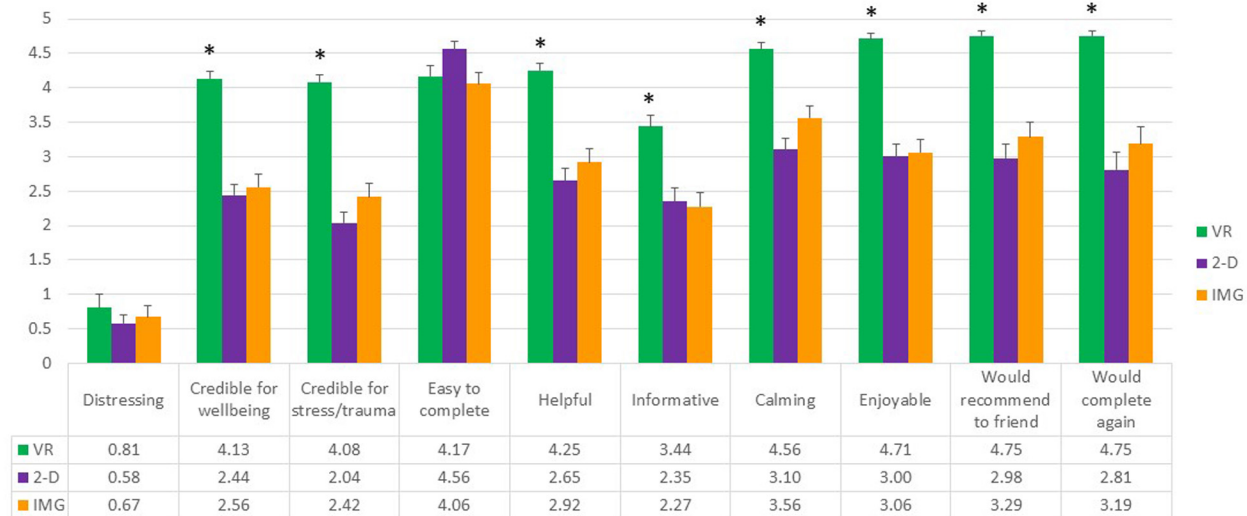


FIGURE 12 | Bars illustrate the mean ratings obtained on a 0- to 5-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. Asterisks denote the 8 of 10 ratings in which the mean rating for the VR condition significantly exceeded the mean rating for both of the 2-D and IMG conditions. Any other statistically significant pairwise comparisons are described in the text. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

Further, referring to the 10 positive affective states measured by the mDES-PA survey, at the multivariate level, the main effect of exercise FORMAT was again highly statistically significant, $F(20,27) = 8.90$, $p < 0.001$, $\eta^2 = 0.87$, whereas the effects of ORDER and the interaction between ORDER and FORMAT were not. At the univariate level, the within-group main effect of FORMAT was statistically significant for all positive emotions without exception. Moreover, all follow-up paired t tests indicated that participants experienced greater positive emotion in response to the VR exercise in comparison to both the 2-D computer exercise and noncomputer IMG exercise, whereas the latter two conditions differed only in response to two ratings, “hopeful, optimistic, encouraged” and “serene, content, peaceful,” whereby the eyes-closed imagery condition received the higher rating; results are depicted in **Figure 13**. Again, obtained effect sizes for these paired comparisons involving the VR format were also found to be large in most instances (i.e., $d' > 0.80$); see **Supplementary Material**. We therefore conclude that this guided imagery exercise produced the greatest positive affect when completed within the immersive format of VR as compared to completing it while viewing the scenes on a 2-D monitor or with one’s eyes closed via mental imagery alone.

Finally, referring to the 10 negative affective states measured by the mDES-NA survey, at the multivariate level, once again no within-group main effects or interactions were statistically significant. Moreover, whereas the between-group multivariate effect of ORDER was significant, $F(10,37) = 2.13$, $p < 0.05$,

$\eta^2 = 0.37$, all follow-up univariate tests were nonsignificant, and so no between-group comparisons were undertaken. To afford comparability with the findings reported for positive affect, **Figure 14** also displays results for self-reported negative affects, but again note the differences between these figures in vertical scaling. We are therefore again led to conclude that the guided imagery exercise produced little negative affect when completed in any format, and there were no significant differences in experienced negative affect between task formats.

Nevertheless, once again persons with increased PTSD symptoms tended to report greater negative affect in response to the task when completed in any of the three different formats for most of the different negative emotions surveyed; Pearson correlations are reported in **Figure 15** and average approximately $r \approx 0.30$. We therefore again conclude that participants with probable PTSD are likely at increased risk of responding with increased negative affect to the task regardless of the format in which it is administered. However, once again, supplementary analyses found that, even among the 13 participants who scored above the recommended cutoff of 33 for probable *DSM-5* PTSD diagnosis on the PCL-5, the majority again had an average mDES-NA score of less than one on the 0- to 10-point scale across the 10 emotional states surveyed, and only a single person had an average score of 5 or more on the 0- to 10-point scale for any format (**Figure 16**).

Regarding the thematic analysis of open-ended comments, we found that 14 themes were observed at least five times

Guided Imagery – Mean Positive Affect

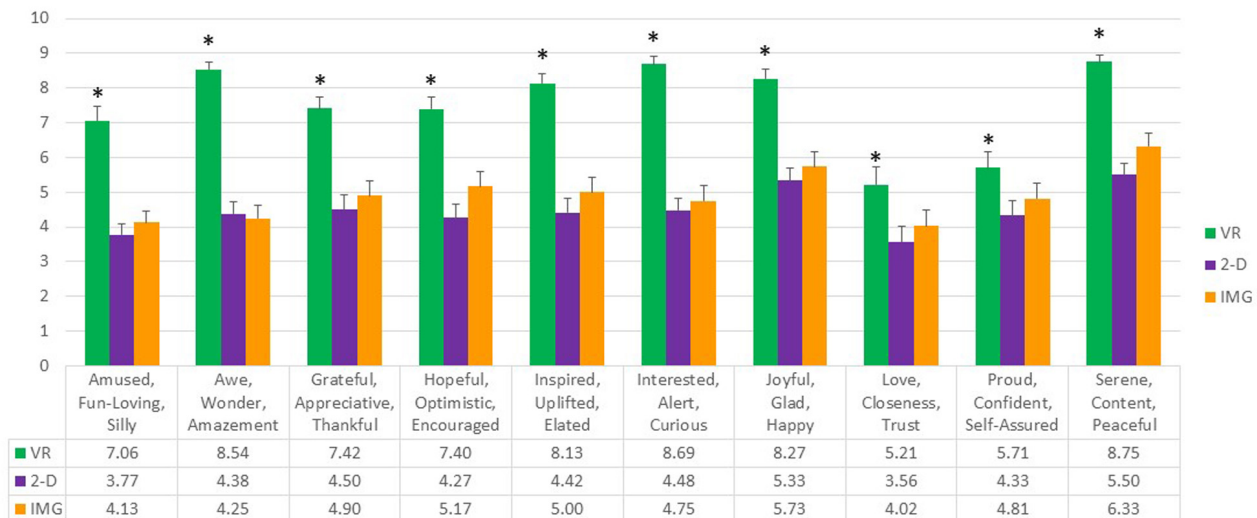


FIGURE 13 | Bars illustrate the mean ratings obtained on a 0- to 10-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. Asterisks denote the 10 of 10 ratings in which the mean rating for the VR condition significantly exceeded the mean rating for both of the 2-D and IMG conditions. Any other statistically significant pairwise comparisons are described in the text. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

(i.e., >10% of participant ratings). These themes were: (1) Calming ($n = 27$), (2), vividness–realism ($n = 27$), (3) Positive Affect ($n = 19$), (4) fun–interesting ($n = 20$), (5) nausea–dizziness ($n = 8$), (6) Auditory stimuli facilitated immersion ($n = 7$), (7) Visual stimuli facilitated immersion ($n = 6$), (8) Beautiful–Vibrant Scene ($n = 6$), (9) Respite–Escape ($n = 6$), (10) Active–Engaging ($n = 5$), (11) Novel–Unique ($n = 5$), (12) Sense of Control ($n = 5$), (13) Increased intensity of emotions ($n = 5$), and (14) Preferred VR ($n = 5$). Again, themes 1, 3, and 4 were conceived as redundant with response to the mDES survey and so are not discussed further. Moreover, given the increased number of themes identified, for the sake of brevity we will only describe those themes that were identified at least six rather than only five times and provide fewer examples for less frequently observed themes.

First, referring to the previously mentioned theme of “vividness–realism,” examples included “The experience was quite realistic. I felt like I was in a forest. I could observe nature’s beauty like the deer...”; and “Felt like I was in a completely different space. Lost a sense of everything in the room—wasn’t even in a room anymore—it was crazy. It was realistic. It really felt like standing there”; and “That one was definitely more immersive, I didn’t get distracted at all...”. Referring to the theme of experienced “nausea–dizziness,” however, several participants reported experiencing this, for example, “I felt dizzy in the beginning, kind of motion sickness.” This was often invoked when participants navigated the scenes using a smooth transition

between frames rather than the blink teleport functionality. Participants also frequently reported the multisensory aspects of the VR experience supported its immersive effects, referring both to audition and vision, for example, “The visuals were soothing. The music and sound effects were nice too.” Several participants also described the beauty and vibrancy of the scenes, for example, “The symbol at the end; it was radiant.” Finally, several participants described the experience as providing a brief respite or escape from life stressors, for example, “It was life changing, I never expected this to be happening. I was feeling overwhelmed, I am stressed because of final exams right now, so this relieved me of the stress and took me to another world” and “I could go escape in that for sure, if I ever wanted to go take a break and walk... That was a cool experience. Liberating, escaping.”

The mean number of themes identified in participants’ comments was 4.56 ($SD = 2.37$). Four participants’ comments that were coded as exhibiting nine or more themes, thus being approximately two standard deviations of the mean, are reported verbatim in order to describe some of the more qualitatively rich phenomenological descriptions reported in response to this guided wilderness imagery task within VR. Specifically, the first participant, whose response was coded to have nine themes, commented:

“It felt like it was actually happening in reality. Felt peaceful, it was soothing, and it was really close to nature; the group of deer felt real and the sound of ducks and water, it felt like I had some time

Guided Imagery – Average Negative Affect

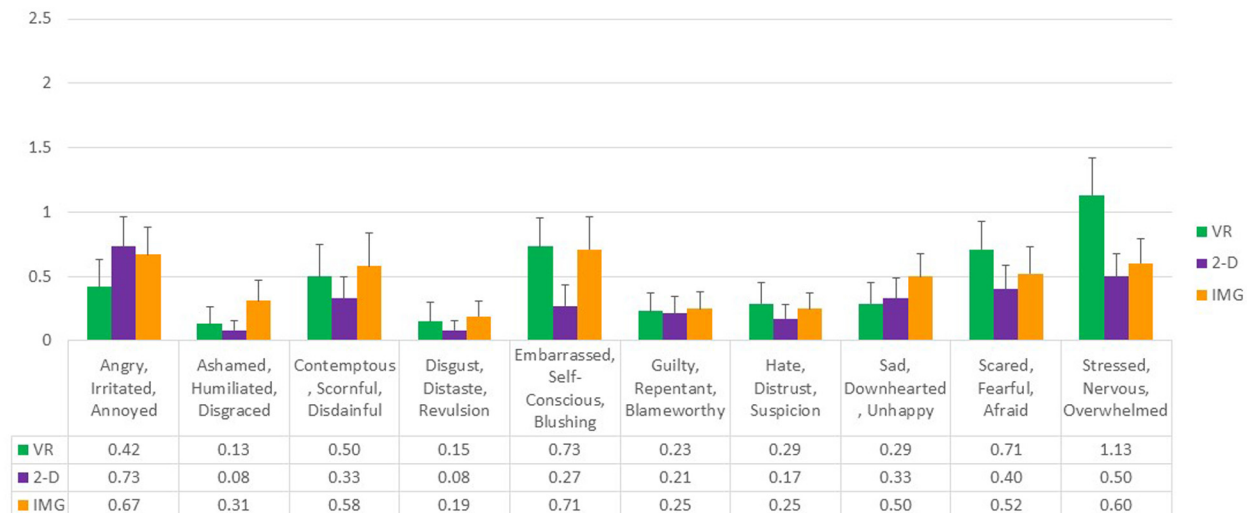


FIGURE 14 | Bars illustrate the mean ratings obtained on a 0- to 10-point scale for the VR (green), 2-D (purple), and IMG (orange) formats of the task, also written in the embedded table below. Error bars illustrate the standard error of measurement. In the absence of a significant ANOVA, no pairwise comparisons were conducted but rather all are assumed to be nonsignificant. See text for further description. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

to myself—“me time.” Watching the plants grow was realistic and hearing the rain—it actually felt like it was raining around me. And the aura and colored lights made me feel like I was in the center of a circle, and everything around me was magical.”

Another participant whose response was coded as including nine themes described the VR experience as follows:

“I felt like I was actually on a hike. It was really real, all the visuals and sounds. I forgot that I was wearing the headset for a bit, and I forgot what the room looked like. Usually when I go for hikes I usually see all these things, but I don’t usually get to interact with them like I did today, for example, I was able to climb the boulder, which I wouldn’t do in real life. And it made you happy. It was wowing.”

A third participant, whose response was coded to represent 10 themes, commented:

“You can actually look around like you were there. More realistic, all the light and sound, as if you’re actually hearing the sounds. Soothing and maybe want to stay in that place. Helped me forget about stressful things I’m going through. I want to stay in that place. Very realistic.”

Finally, the fourth participant, whose response was coded to contain 11 themes, commented:

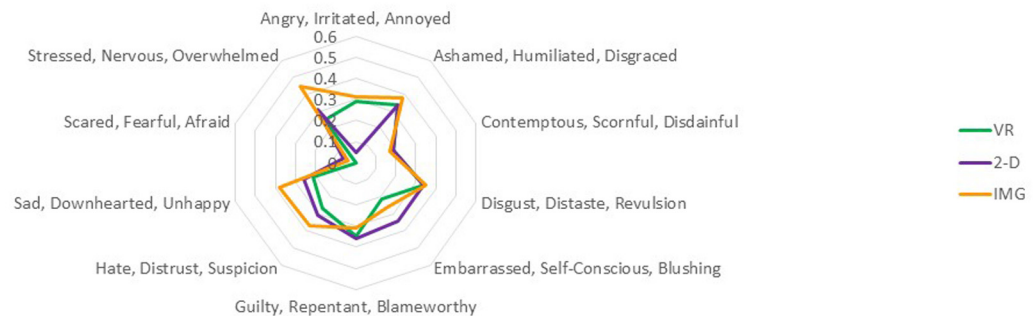
“It was stressful, but you feel release—especially the tree and flowers, they were so powerful and energetic and full of hope. The rain felt better and peaceful than before—raindrops—it was a very

quiet and peaceful scene where no one can disturb you; you can focus on your own. Such a wonderful place.”

GENERAL DISCUSSION

The three studies conducted herein provide a proof of concept of an integrative therapeutic approach to the application of VR to interventions for trauma- and stressor-related disorders and improvement of mental health and well-being more broadly that we have titled *virtual reality integrative therapy*. Across instances of three different but each standard psychotherapeutic interventions (unguided imagery, autobiographical recall, and guided imagery), participants reported the greatest perceived satisfaction and credibility and experienced the greatest positive affect in response to the intervention when delivered in the perceptual, egocentric format of VR as compared to the computerized format of a standard flat-screen monitor (2-D) and the usual noncomputerized and nonperceptual (IMG) format of psychotherapy as relying on the use of mental imagery and episodic recall alone. In so far as our chief results were replicated across the three different tasks we administered, VRIT can be understood from the integrative psychotherapeutic perspective of technical eclecticism (Zarbo et al., 2016). Specifically, the practice of VRIT can be understood as involving the selection of different VR interventions to suit the presenting problems of different clients partly based on client preference. This notion of VRIT therefore expands

Guided Imagery – Correlations between PTSD Symptoms and Negative Affect



	Angry, Irritated, Annoyed	Ashamed, Humiliated, Disgraced	Contemptuous, Scornful, Disdainful	Disgust, Distaste, Revulsion	Embarrassed, Self-Conscious, Blushing	Guilty, Repentant, Blameworthy	Hate, Distrust, Suspicion	Sad, Downhearted, Unhappy	Scared, Fearful, Afraid	Stressed, Nervous, Overwhelmed
VR	*.29	*.34	.19	*.34	.21	*.35	*.27	.21	.00	*.25
2-D	.05	*.34	.19	*.34	*.34	*.36	*.31	*.26	.06	*.31
IMG	*.31	*.38	.17	*.35	*.26	*.31	*.37	*.38	.04	*.45

FIGURE 15 | The radar figure further depicts the pattern of the correlations noted in the table below between PTSD symptoms (measured by the PCL-5), on the one hand, and the various negative affect ratings (measured by the mDES), on the other. Asterisks denote the 20 of 30 ratings in which the correlation is statistically significant at $p < 0.05$ (1-tailed). See text for further description. IMG, imagery; 2-D, two-dimensional; VR, virtual reality.

the scope of VR in mental healthcare beyond the practice of exposure therapy (VRET) to include applications better associated with other schools of psychotherapy (e.g., cognitive, psychodynamic, experiential) consistent with the previously cited early vision of Riva (2005). However, we also would like to suggest that the experiential approach embraces the notion of VRIT as conducted here in so far as we have collected affective and phenomenological responses to each intervention; consistent with this, the experiential approach to psychotherapy has itself been considered an instance of integrative therapy (e.g., Greenberg et al., 1998). It is also interesting to point out in the context of our results that, in contrast with the longer-term results of VRET that tend to show equivalence rather than superiority of VRET over non-VR exposure therapy (Gonçalves et al., 2012; Opriş et al., 2012; Wenrui et al., 2019), the current results showed that the VRIT interventions studied here were usually found to be superior to closely matched non-VR control conditions in producing positive affect and satisfaction–credibility as interventions for trauma- and stressor-related disorders as well as improving psychological well-being more broadly. In any case, from the perspective of VRIT as espoused herein, the three tasks we evaluated are considered only a sampling of the kinds of psychotherapeutic tasks to which VR could be applied, and we look forward to the creative design of other psychotherapeutic tasks for use within VR by other clinical researchers.

Comparing results obtained across our three studies and therefore between different kinds of psychotherapeutic tasks, whereas the VR format of all three interventions received high satisfaction and credibility ratings, positive affect ratings tended to be highest for the guided imagery task used in Study 3 followed by the unguided imagery task used in Study 1, while the correlation between negative affect and PTSD symptoms appeared to be highest in response to the narrative task used in Study 2 followed by the guided imagery task used in Study 3. Further, the qualitative themes most often present in participants' open-ended comments seemed also to vary across the three different psychotherapeutic tasks administered. These results suggest that different kinds of psychological interventions may vary in their expected benefits when delivered in VR. However, we emphasize that in the current research participants were *not* randomized to the three different tasks we assessed, but rather each task was examined in three separate and consecutively conducted studies. As a result, we cannot be sure that such observations relate to effects of the three different tasks we administered or only to unmeasured variables that may also differentiate and confound our participant groups. In the future, we recommend the comparative study of two or more interventions each delivered in VR and non-VR formats as a means of identifying what may be unique to the VR medium across different interventions, what may be unique to different kinds of psychological interventions across different (i.e., VR

Guided Imagery – Average Negative Affect among Persons with Probable PTSD

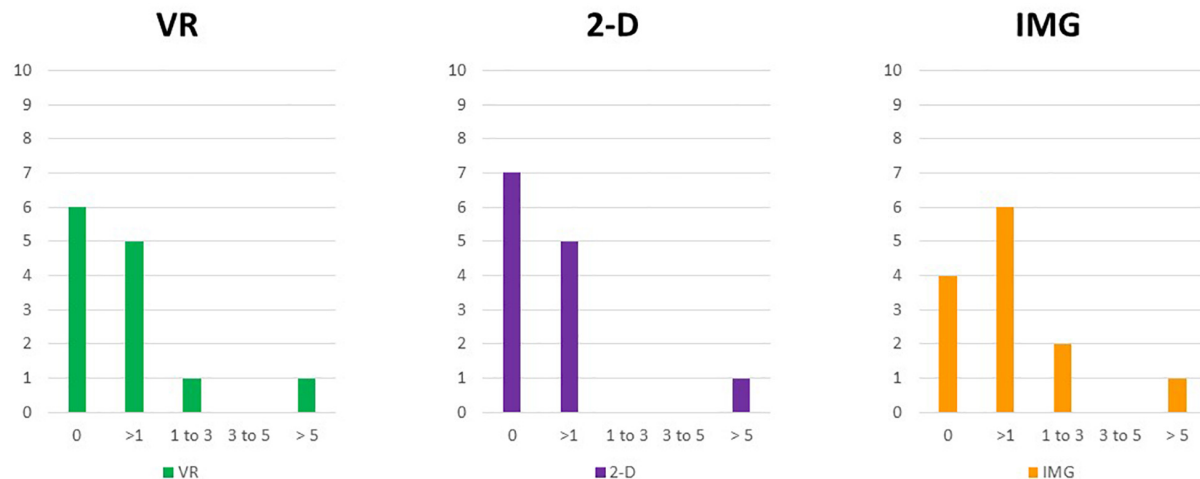


FIGURE 16 | Bars illustrate the number of participants in the sample with probable PTSD (i.e., the subsample scoring above 33 on the PCL-5) whose average score across the 10 negative affect ratings on the MDES exceeded the values indicated on the x axis. It can be seen that very few scored above even a relatively low value of 3 on the 0- to 10-point scale for any of the task formats: VR (green), 2-D (purple), and IMG (orange). See text for further description.

versus non-VR) administration formats, and finally what may be unique to the interactive combination of task by format. **Figure 14** provides a schematic of this research methodology in the form of a Venn diagram described as a “multitherapy, multiformat matrix” similar to the well-known approach to psychometric validation proffered by Campbell and Fiske (1959). Given in **Figure 17** is the example of comparing exposure therapy to mindfulness-based therapy, the latter of which is a therapeutic orientation our group has also applied to VR in a previous study (Mistry et al., manuscript submitted for publication). We emphasize that this schematic was *not* examined in the present studies due to lack of random assignment to task types; instead, this kind of analysis is suggested for future research.

Beyond collecting affective and credibility ratings on a numeric scale, we also conducted open-ended phenomenological interviews following each task that we submitted to thematic analysis. Beyond identifying emotional responses that overlapped those already assessed by the rating scales, these interviews also clarified other phenomenological responses that were experienced frequently to the VR format of each of the tasks we administered. In particular, partly informed by the qualitative feedback we received from our participants’ open-ended experiential response to our VR tasks, we are led to speculate that what may make VR a relatively unique and particularly impactful medium for delivering psychotherapeutic interventions relates to its effects on at least two phenomenological variables, that is, vividness and presence, relating to the perceptual (versus imagery-based) and egocentric (versus nonegocentric) frames of reference afforded by different intervention formats, respectively

Multi-Therapy, Multi-Format Matrix

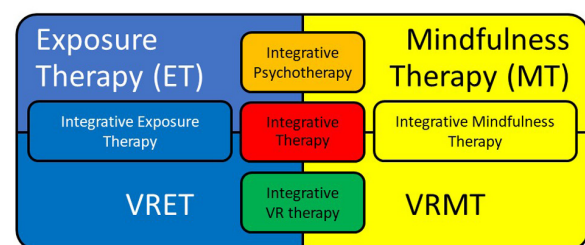
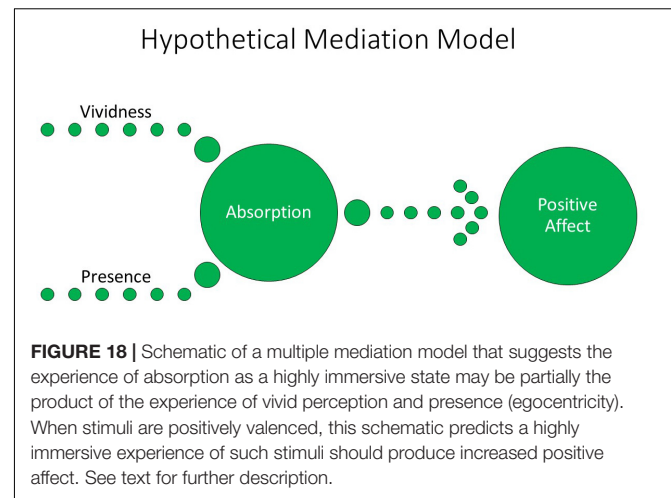


FIGURE 17 | This schematic of a Venn diagram illustrates commonalities and differences between two psychological interventions, namely, exposure therapy (in blue) versus mindfulness therapy (in yellow). Commonalities between the interventions when delivered without use of VR are illustrated as the concept of integrative psychotherapy (in orange), whereas commonalities between the interventions when delivered through VR are illustrated as the concept of integrative VR therapy (in green). Commonalities between each of the independent non-VR versus VR formats of each of the independent interventions are illustrated in their respective same-colored insets. Finally, the notion of integrative therapy as commonalities across the different interventions that are in turn across the different formats of delivery is illustrated at the center of the figure (in red). See text for further description. VR, virtual reality; VRET, virtual reality exposure therapy; VRMT, virtual reality mindfulness therapy.

(**Figure 1**). Particularly as compared to mental imagery without the aid of computers, VR may afford an increase in vividness as a perceptual modality as compared to mental imagery alone

especially among persons who are characteristically limited in vividness of mental imagery (e.g., May et al., 2013). Further, especially as compared to 2-D perception of stimuli on computer flat screens, VR affords an increase in the sense of “presence” as an egocentric frame of reference into the depicted environments (e.g., Lessiter et al., 2001). Further, it would seem that, together, vividness and the sense of presence may combine to create the highly immersive experience often characteristic of VR, which, when especially pronounced, might constitute an instance of the phenomenological state of absorption (e.g., Tellegen and Atkinson, 1974; Roche and McConkey, 1990). However, it is also important to point out that neither vividness nor presence appears necessary to produce the experience of absorption, where even playing Tetris in 2-D format can also be experienced as absorbing, even though such an activity would seem to produce neither vividness or presence, implying that the experience of absorption must also be capably experienced through mechanisms beyond vividness and presence alone. Future studies should evaluate whether baseline individual differences in each of these psychological variables moderate outcomes to interventions administered in VR versus non-VR formats, and whether experienced levels of each variable partially mediate differential outcomes for affective responses and experienced satisfaction and credibility between formats. Also partly guided by qualitative feedback we received from participant responses, we hypothesize as a multiple mediation model that VR, as compared to other intervention formats, may produce increased vividness and presence, which in turn may produce increased absorption as a partial mediator of the uniqueness of VR in leading to primary intervention outcomes such as for increasing positive affect and psychological well-being; **Figure 18** depicts this hypothesized process model, which could be evaluated in future studies. Moreover, both of the aforementioned primary phenomenological elements (vividness, presence) should be responsive to ongoing technical improvements in VR technology, for example, pixel resolution, field of view, and the use of multisensory stimuli. Unfortunately, a limitation of the present study is that we did not administer validated measures of experienced vividness, presence, or absorption that would have enabled evaluation of the proposed mediation model in the current study, and so this task must be left for future research.

Importantly, much research has investigated VR as an effective medium for engendering the psychological experience of awe, which may also be a mediator of the effects of VR for overall positive affect. For example, Chirico and colleagues demonstrated that VR depictions of natural environments (e.g., mountains, trees, the Earth) elicited significantly stronger self-reported feelings of awe when compared to neutral emotional conditions (Chirico et al., 2016, 2017a,b), and Quesnel and Riecke (2018) showed similar results for subjective reports that were validated against an objective physiological measure of awe, that is, goose bumps on the skin. The experience of “awe, wonder, amazement” was indeed one of the most pronounced positive affective responses to the VR tasks studied here, extending these prior findings. Nevertheless, we emphasize that VR effects in generating awe may be at least partly contingent on novelty effects among first-time users that may habituate and even



extinguish with repeated use. Indeed, based on the theory that provoking awe is thought to require experiencing a need for accommodation (e.g., Keltner and Haidt, 2003), repeated users of VR technology would be expected to be able to assimilate new VR experiences into episodic memory and therefore be less amenable to experiencing awe with repeated use. We therefore recommend that future researchers examine the awe-provocative effects of VR over repeated use and acknowledge that a limitation of the current study was its neglect of assessing prior experience with VR among our participants. In any case, the present conceptual framework, in its emphasis on producing high-intensity positive affective responses such as awe as well as other emotions, fits with the notion of VR as a potentially effective medium for engendering transformative experiences (Riva et al., 2016). We thus look forward to the design of VR experiences not only for engendering awe but also other equally profound alterations in consciousness and self-transcendence such as intense absorption, ecstasy (e.g., rapture, bliss), reverence (e.g., sacred, hallowed), loving-kindness and equanimity, and other nondual states (e.g., Yaden et al., 2017; Hanley et al., 2018) that were unfortunately not measured in the studies described here.

It is important to point out that persons with high PTSD symptoms reported more distress in response to all of the tasks administered in all of the formats we studied them, that is, also including in the VR format. Nevertheless, supplementary follow-up analyses showed that, even among those with high PTSD symptoms, self-reported distress in the present sample remained low in intensity on the 0- to 10-point scale we administered, with only a single participant reporting that they experienced distress with moderate intensity in response to any of the therapeutic tasks we evaluated. In any case, we recommend all VRIT tasks be administered using a trauma-informed care approach that emphasizes safety, trust, choice, collaboration, and empowerment (Harris and Fallot, 2001; Fallot and Harris, 2008; Classen and Clark, 2017).

The present research is described only as an initial proof-of-concept of VRIT due to several inherent limitations. First, our interventions were evaluated only during a single session; we did not assess participants' prior use and familiarity with

VR technology, and the long-term effects of these interventions when administered via VR are unknown. Moreover, participants in our studies were restricted with respect to age range and educational levels, and their traumatic and stressful life event history and psychological symptoms were only assessed by self-report rather than clinical interview. Further, thematic coding was not blinded to the format of the task in which the responses referred. Moreover, although no adverse events were noted in response to our procedures, it is a limitation that we did not screen for neurocognitive disorders that could be risk factors for participation in VR such as epilepsy and severe motion sickness and that we did not measure motion sickness as a response to the tasks we administered using a validated measure. These concerns will need to be addressed in future research studies that replicate and extend the present work. Further, cost-effectiveness analyses of administering these psychological interventions in differing formats should also be undertaken in the future. We may simply note that at present to administer any of the three interventions studied herein would require the use of a computer with a suitable graphics card (\approx US \$1,500), a suitable HMD (\approx US \$500), and the respective software applications (\approx US \$20).

We look forward to trials of other psychotherapeutic tasks within VR as may be developed by other clinicians and researchers. We hope that, through the integrative, eclectic notion of VRIT, psychotherapists may creatively explore the use of VR technology to deliver vivid, egocentric, and immersive therapeutic experiences that bring about clinically significant and transformative change in persons experiencing trauma- and stressor-related disorders and other mental health problems. Following Riva (2005), we also envision VR as increasingly part of the future of clinical psychology and think that it is critical that psychotherapists explore its clinical utility broadly.

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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 Western University Research Ethics Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

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

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Mental Health and Well-Being of University Students: A Bibliometric Mapping of the Literature

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The purpose of this study is to map the literature on mental health and well-being of university students using metadata extracted from 5,561 journal articles indexed in the Web of Science database for the period 1975–2020. More specifically, this study uses bibliometric procedures to describe and visually represent the available literature on mental health and well-being in university students in terms of the growth trajectory, productivity, social structure, intellectual structure, and conceptual structure of the field over 45 years. Key findings of the study are that research on mental health and well-being in university students: (a) has experienced a steady growth over the last decades, especially since 2010; (b) is disseminated in a wide range of journals, mainly in the fields of psychology, psychiatry, and education research; (c) is published by scholars with diverse geographical background, although more than half of the publications are produced in the United States; (d) lies on a fragmented research community composed by multiple research groups with little interactions between them; (e) is relatively interdisciplinary and emerges from the convergence of research conducted in the behavioral and biomedical sciences; (f) tends to emphasize pathogenic approaches to mental health (i.e., mental illness); and (g) has mainly addressed seven research topics over the last 45 years: positive mental health, mental disorders, substance abuse, counseling, stigma, stress, and mental health measurement. The findings are discussed, and the implications for the future development of the field are highlighted.

Keywords: mental health, mental illness, well-being, psychological distress, university students, higher education, bibliometric review, VOSViewer

INTRODUCTION

The entrance to the university marks a period of transition for young people. Through this transition, students face new challenges, such as making independent decisions about their lives and studies, adjusting to the academic demands of an ill-structured learning environment, and interacting with a diverse range of new people. In addition, many students must, often for the first time, leave their homes and distance themselves from their support networks (Cleary et al., 2011). These challenges can affect the mental health and well-being of higher education students. Indeed, there is evidence that a strain on mental health is placed on students once they start at the university, and although it decreases throughout their studies (Macaskill, 2013; Mey and Yin, 2015), it does

not return to pre-university levels (Cooke et al., 2006; Bewick et al., 2010). Also, the probabilities of experiencing common psychological problems, such as depression, anxiety, and stress, increase throughout adolescence and reach a peak in early adulthood around age 25 (Kessler et al., 2007) which makes university students a particularly vulnerable population.

The interest in mental health and well-being in university students has grown exponentially in the last decades. This is likely due to three interrelated challenges. First, although university students report levels of mental health similar to their non-university counterparts (Blanco et al., 2008), recent studies suggest an increase and severity of mental problems and help-seeking behaviors in university students around the world in the last decade (Wong et al., 2006; Hunt and Eisenberg, 2010; Verger et al., 2010; Auerbach et al., 2018; Lipson et al., 2019). Some researchers refer to these trends as an emerging “mental health crisis” in higher education (Kadison and DiGeronimo, 2004; Evans et al., 2018). Second, psychological distress in early adulthood is associated with adverse short-term outcomes, such as poor college attendance, performance, engagement, and completion (e.g., King et al., 2006; Antaramian, 2015), and others in the long term, such as dysfunctional relationship (Kerr and Capaldi, 2011), recurrent mental health problems, university dropout, lower rates of employment, and reduced personal income (Fergusson et al., 2007). Third, there is a widespread agreement that higher education institutions offer unique opportunities to promote the mental health and well-being of young adults as they provide a single integrated setting that encompasses academic, professional, and social activities, along with health services and other support services (Eisenberg et al., 2009; Hunt and Eisenberg, 2010). However, the majority of university students experiencing mental health problems and low levels of well-being are not receiving treatment (Blanco et al., 2008; Eisenberg et al., 2011; Lipson et al., 2019) and, while universities continue to expand, there is a growing concern that the services available to provide support to students are not developing at an equivalent rate (Davy et al., 2012).

In response to the increasing volume of research on the mental health and well-being of university students, there have been several attempts to synthesize the accumulating knowledge in the field and to provide an illustration of the theoretical core and structure of the field using traditional content analysis of the literature (e.g., Kessler et al., 2007; Gulliver et al., 2010; Hunt and Eisenberg, 2010; Sharp and Theiler, 2018). This study aims to extend the understanding of mental health in university students by providing a bird's eye view of the research conducted in this field in recent decades using a bibliometric approach. Bibliometric overviews provide an objective and systematic approach to discover knowledge flows and patterns in the structure of a field (Van Raan, 2014) reveal its scientific roots, identify emerging thematic areas and gaps in the literature (Skute et al., 2019) and, ultimately, contribute to moving the field forward. Accordingly, this study employs several bibliometric indicators to explore the evolution of the field based on publication and citation trends, key actors and venues contributing to the advancement of research on mental health and well-being of university students, and the structure

of the field in terms of patterns of scientific collaborations, disciplines underlying the foundations of the field, and recurrent research themes explored in the literature. This is important because, despite significant advances in the field, research on mental health and well-being remains a diverse and fragmented body of knowledge (Pellmar and Eisenberg, 2000; Bailey, 2012; Wittchen et al., 2014a). Indeed, mental health and well-being are nebulous concepts and their history and development are quite intricate, with a multitude of perspectives and contributions emerging from various disciplines and contexts (see section “Conceptualization of Mental Health, Mental Illness, and Well-Being: An Overview”). Therefore, mapping research on mental health and well-being in university students is essential to identify contributions and challenges to the development of the field, to help guide policy, research, and practice toward areas, domains, populations, and contexts that should be further explored, and to provide better care of students at higher education institutions (Naveed et al., 2017).

CONCEPTUALIZATION OF MENTAL HEALTH, MENTAL ILLNESS, AND WELL-BEING: AN OVERVIEW

This section provides an overview of the different perspectives adopted in the literature to conceptualize mental health, well-being, and other relevant constructs in order to identify the glossary of key terms that will be used in the search strategy to create a comprehensive corpus of documents on mental health and well-being in university students for this bibliometric review.

Perspectives on Mental Health and Mental Illness

There is no general agreement on the definition of mental health. For a long time, the term mental health has been used as a euphemism for mental illness (Manwell et al., 2015). However, mental health and mental illness are regarded as distinct constructs nowadays and two main perspectives differentiating between mental health and illness are available in the literature. The continuum approach considers that mental health and mental illness are the two opposite poles of a continuum. Thus, there are various degrees of health and illness between these poles, with most of us falling somewhere in between. The categorical approach, on the other hand, represents mental health and illness as a dichotomy. People who manifest mental illness symptoms would belong to that category and labeled correspondingly, while those absent of these symptoms can be considered as mentally healthy (Scheid and Brown, 2010).

Disciplinary Approaches to the Conceptualization of Mental Health/Illness

Conceptualizations of mental health/illness are largely dependent on the theoretical and paradigmatic foundations of the disciplines from which they emerge. In this context, the field has progressively evolved through the accumulation of

knowledge generated in a diverse range of disciplines in the biomedical, behavioral, and social sciences. Biomedical disciplines are grounded in the medical paradigm focused on disease and (ab)normality and often emphasize dichotomous conceptions of mental health/illness (Scheid and Brown, 2010). Research on mental health and well-being in this domain has been traditionally conducted from a psychiatric perspective, which aims to understand the dysfunctionality in the brain that leads to psychiatric symptoms and to also offer a pharmacological treatment to correct neuronal dysfunctions. Consequently, psychiatrists have historically considered mental health as a disease of the brain (e.g., depression), similar to any other physical disease, caused by genetic, biological, or neurological factors (Schwartz and Corcoran, 2010). While the prevalence of psychiatric approaches to mental health is currently incontestable, the development of other biomedical disciplines has tremendously contributed to the progression of the field in recent decades. For example, Insel and Wang (2010) argue that insights gained from genetics and neuroscience contribute to the reconceptualization of “the disorders of the mind as disorders of the brain and thereby transform the practice of psychiatry.” (1979). In addition to that, other disciplines such as behavioral medicine have made important contributions to the field, although it has recently argued that mental health and behavioral medicine should be as two separate fields (Dekker et al., 2017).

Within the behavioral sciences, the study of mental health focuses on the distinct psychological processes and mechanisms that prompt thoughts, feelings, and behaviors (Peterson, 2010). Clinical psychology has the longest tradition in the psychological study of mental health and tends to focus on the assessment and treatment of mental illness and disorders that can alleviate psychological distress or promote positive states of being (Haslam and Lusher, 2011). However, significant contributions to the field have also emerged from other branches of psychology less focused on psychopathology, including personality and social psychology, psychoanalysis, humanistic psychology, and cognitive psychology (Peterson, 2010). Despite the diversity of theories, principles, and methodological approaches to understanding mental health within the behavioral sciences, these disciplines acknowledge that mental health have a biological basis and reside in the social context, and tend to prioritize continuum approaches to mental health (Scheid and Brown, 2010).

Perspectives from the social sciences complement the biomedical and behavioral approaches by considering the influence of social and cultural environments in mental health/illness (Horwitz, 2010). For example, sociologists are interested in how social circumstances (e.g., level of support available) affect levels of mental health/illness and how social structures shape the understanding and response to mental health issues [see Compton and Shim (2015) for an overview of the social determinants of mental health]. Similarly, medical anthropologists attend to the mental health beliefs and practices that form the cultural repertory within and across populations (Foster, 1975). Beyond sociology and anthropology, social researchers in the fields of business and economics, family and ethnic studies, and educational research have also played

a key role in advancing research on mental health in different directions.

The Importance of the Context in Mental Health

Certainly, most notions of mental health/illness in the literature derive from prevailing psychiatric and psychological traditions developed in Western countries (Gopalkrishnan, 2018). However, cultural values and traditions do shape how mental health and mental illness are conceptualized across contexts (Vaillant, 2012). In this regard, Eshun and Gurung (2009) pointed out that “culture influences how individuals manifest symptoms, communicate their symptoms, cope with psychological challenges, and their willingness to seek treatment.” (4). Fernando (2019) argued that issues related to the ‘mind’ developed and are often interpreted very differently in non-Western and Low- and Middle-Income Countries (LMICs). For example, cultures explain the manifestation of certain feelings and behaviors based on a range of motives including biological, psychological, social, religious, spiritual, supernatural, and cosmic. Failure to acknowledge alternative non-Western approaches to mental health and mental illness has resulted in imbalances of knowledge exchange and the permeation of dominating Western narratives into LMICs (i.e., so-called medical imperialism) (Timimi, 2010; Summerfield, 2013). To address this issue, scholars have advocated for a greater willingness to embrace pluralism in the conceptualization of mental health and illness, which might help people to engage with particular forms of support that they deem to be appropriate for them, and to explore how knowledge and practices developed in LMICs can benefit those living in higher-income countries (i.e., knowledge “counterflow”) (see White et al., 2014).

Prioritizing Positive Mental Health: The Science of Well-Being

Despite the diversity of disciplinary and contextual approaches to mental health, current definitions of mental health have two things in common. First, mental health is considered from a *biopsychosocial* point of view that incorporates biological, psychological, and social factors. Second, mental health implies something beyond the absence of mental illness (e.g., Bhugra et al., 2013; Galderisi et al., 2015). An example is the definition by the World Health Organization which refers to mental health as “a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community” (World Health Organization, 2004). This definition contributed to substantial progress in research and practice in the field as it expanded the notion of mental health beyond the absence of mental illness and integrated the presence of positive features (Galderisi et al., 2015).

Research on positive mental health is relatively new but has grown rapidly in the last decades fueled by advocates of positive medicine and psychology, who have argued for a change of paradigm from medical and psychopathological-oriented models of mental health that focus on disorders and illness toward

more strength-based approaches, which pay more attention to what is right about people and positive attributes and assets (Kobau et al., 2011). In this regard, the term mental well-being has been progressively incorporated into the study of mental health to account for the positive aspects of mental health beyond the absence of negative factors. While there is not a universally accepted definition of well-being, two perspectives have dominated the discourses on well-being in the literature: subjective well-being (SBW) and psychological well-being (PWB). SBW is based on hedonic perspectives of pleasure and represents “people’s beliefs and feelings that they are living a desirable and rewarding life” (Diener, 2012). SBW is strongly linked with the idea of happiness and is typically understood as the personal experience of high levels of positive affect, low levels of negative affect, and high satisfaction with one’s life (Deci and Ryan, 2008). PWB is grounded in Aristotelian ideas about *eudaimonia*, i.e., self-realization, with the ultimate aim in life being to strive to realize one’s true potential (Ryff and Singer, 2008). PWB has been broadly defined as a state of positive psychological functioning and encompasses six dimensions: purpose in life (i.e., the extent to which respondents felt their lives had meaning, purpose, and direction); autonomy (i.e., whether they viewed themselves as living in accord with their own convictions); personal growth (i.e., the extent to which they were making use of their personal talents and potential); environmental mastery (i.e., how well they were managing their life situations); positive relationships (i.e., the depth of connection they had in ties with significant others); and self-acceptance (i.e., the knowledge and acceptance they had of themselves, including awareness of personal limitations) (Ryff, 1989).

Integrating Mental Health, Mental Illness, and Well-Being

The contribution of positive mental health frameworks to the advancement of the field has been undeniable. However, definitions that overemphasize positive emotions and productive functioning as key indicators of mental health have been recently challenged because of the potential they have to discriminate against individuals and groups that, for example, might not be able to work productively or function within the environment because of individual physical characteristics or contextual constraints (Galderisi et al., 2015). To address these issues, Keyes has successfully integrated the notions of mental illness, mental health, well-being, and other related terms in the literature into a conceptual framework that allows for a more comprehensive understanding of mental health (Keyes, 2005, 2007; Keyes and Michalec, 2010). The model argues that neither pathogenic approaches focusing on the negative (e.g., mental illness) nor salutogenic approaches focusing on the positive (e.g., well-being) can alone accurately describe the mental health of a person (Keyes and Michalec, 2010). Instead, the model proposes that mental illness and well-being represent two correlated but differentiated latent continua in defining mental health. More specifically, mental illness and well-being lie on two separate spectra, the first going from absent to present mental illness and the second

running from low to high well-being (Slade, 2010). The absence of mental illness, therefore, does not necessarily imply high levels of well-being. Correspondingly, low levels of well-being do not always indicate the presence of mental illness. Further, in this model, mental health is defined as not only the absence of mental illness, not the mere presence of high well-being. Complete mental health (i.e., flourishing) is a result of experiencing low mental illness and high levels of well-being. Incomplete mental health (i.e., languishing), on the other hand, refers to the absence of mental illness symptoms and low reported levels of well-being. Two other conditions are possible within this framework. Incomplete mental illness (i.e., struggling) refers to high levels of well-being accompanied by high mental illness symptoms. Lastly, complete mental illness (i.e., floundering) accounts for low levels of well-being and high mental illness symptoms (Keyes and Lopez, 2002).

THE PRESENT STUDY

In light of the complexity of the constructs of mental health and well-being and the multiple theoretical, disciplinary, and contextual approaches to their conceptualization, this study seeks to map out the terrain of international research and scholarship on mental health and university students for the period 1975–2020. More specifically, this study aims to provide new insights into the development and current state of mental health research in university students by mapping and visually representing the literature on mental health and well-being of university students over the last 45 years in terms of the growth trajectory, productivity, and social, intellectual, and conceptual structure of the field. First, the study describes the development of research mental health and well-being in university students examining the trends in publication and citation data between 1975 and 2020 (i.e., growth trajectory). Second, the study identifies the core journals and the research areas contributing most to the development of the field, as well as the key authors and countries leading the generation and dissemination of research on mental health and well-being in university populations (i.e., productivity). Third, the study outlines the networks of scientific collaboration between authors, and countries (i.e., social structure). Fourth, the scientific disciplines underlying the intellectual foundations of research on mental health and well-being in university settings (i.e., intellectual structure) are uncovered. Fifth, the study elucidates the topical foci (i.e., conceptual structure) of the research on the mental health and well-being of university students over the last 45 years.

MATERIALS AND METHODS

A bibliometric approach was used in this study to map the literature on mental health and well-being in university students over the last 45 years using metadata extracted from four indexes of the Web of Science (WoS): The Science Citation Index-Expanded (SCI-Expanded); the Social Sciences Citation Index (SSCI); the Arts & Humanities Citation Index (A&HCI); and

the Emerging Sources Citation Index (ESCI). Several reasons justified the selection of the WoS database in this study. First, the WoS remains as the standard and most widely used for bibliometric analysis (Meho and Yang, 2007). Second, the WoS is a multidisciplinary database and includes publications on mental health and well-being emerging from distinctive research areas and disciplines published in more than 20,000 journals (McVeigh, 2009). Using specialized databases such as PubMed would introduce biases into the search strategy favoring biomedical research disciplines. Still, it is important to note that interdisciplinary databases such as WoS and Scopus discriminate against publications in the Social Sciences and Humanities and publications in languages other than the English language (Mongeon and Paul-Hus, 2016), so the picture provided by WoS is still imperfect. Third, while other databases might provide wider coverage, WoS includes publication and citation information from 1900. For example, Scopus has complete citation information only from 1996 (Li et al., 2010). Moreover, Google Scholar provides results of inconsistent accuracy in terms of citations, and citation analyses in PubMed are not available (Falagas et al., 2008). Fourth, WoS has demonstrated better accuracy in its journal classification system compared to Scopus database (Wang and Waltman, 2016).

The methodological approach used in this study is presented in **Figure 1** and further elaborated in the following paragraphs.

Search Strategy

To create a comprehensive corpus of documents on the mental health and well-being of university students, three parallel searches were performed, which accounted for the multiple approaches and perspectives that have been used in the field, as identified in the Section “Conceptualization of Mental Health, Mental Illness, and Well-Being: An Overview.” All the searches were conducted in the last week of January 2020. The first search aimed at capturing research on *mental health broadly* and included one single keyword in the topic field: [“mental health”]. The second search was implemented to capture research focusing on *pathogenic* approaches to mental health. Key terms used in the literature to refer to the negative side of mental health, as well as the most frequent mental health problems experienced by university students, were introduced in this search in the title field: [“mental illness,” “mental disorder*,” “mental distress,” “psychological distress,” “psychopathology,” “depression,” “anxiety,” “stress,” “suicide,” “eating disorder*,” “substance use”]. In the third search, keywords reflecting *salutogenic* approaches to mental health were input. These included terms related to mental health from a positive mental health perspective (i.e., well-being). These key terms were added in the title field and included the following: [“well-being,” “wellbeing,” “wellness,” “life satisfaction,” “happiness,” “positive affect,” “purpose in life,” “personal growth,” “self-determination”].

To retrieve research relevant only to higher education students, another set of keywords was imputed in all three searches in the title field. These included: [“university,” “college,” “higher education,” “tertiary education,” “post-secondary education,” “postsecondary education,” “undergrad* student,” “grad* student,” “master’s student,” “doctoral student,” “Ph.D.

student”]. The Boolean operator *OR* was used between keywords in all the three searches to secure a higher number of relevant hits. Also, asterisks were used as wildcards to account for multiple variations in several keywords (e.g., disorder and disorder-s). All searches were limited to journal articles published between 1975 and 2020 (both inclusive). No restrictions on language were implemented in the search.

The search strategy retrieved a total of 6,356 hits ($n_{search1} = 2782$; $n_{search2} = 2814$, $n_{search3} = 760$). After the removal of duplicates, 5,561 research articles were finally selected and retained for the study. For each of the documents obtained in the search, the authors extracted metadata about the title of the paper, the year of publication, the journal, the number of citations, and the authors’ name, organization, and country. Also, the title, the abstract, the author’s keywords, and cited references were retrieved.

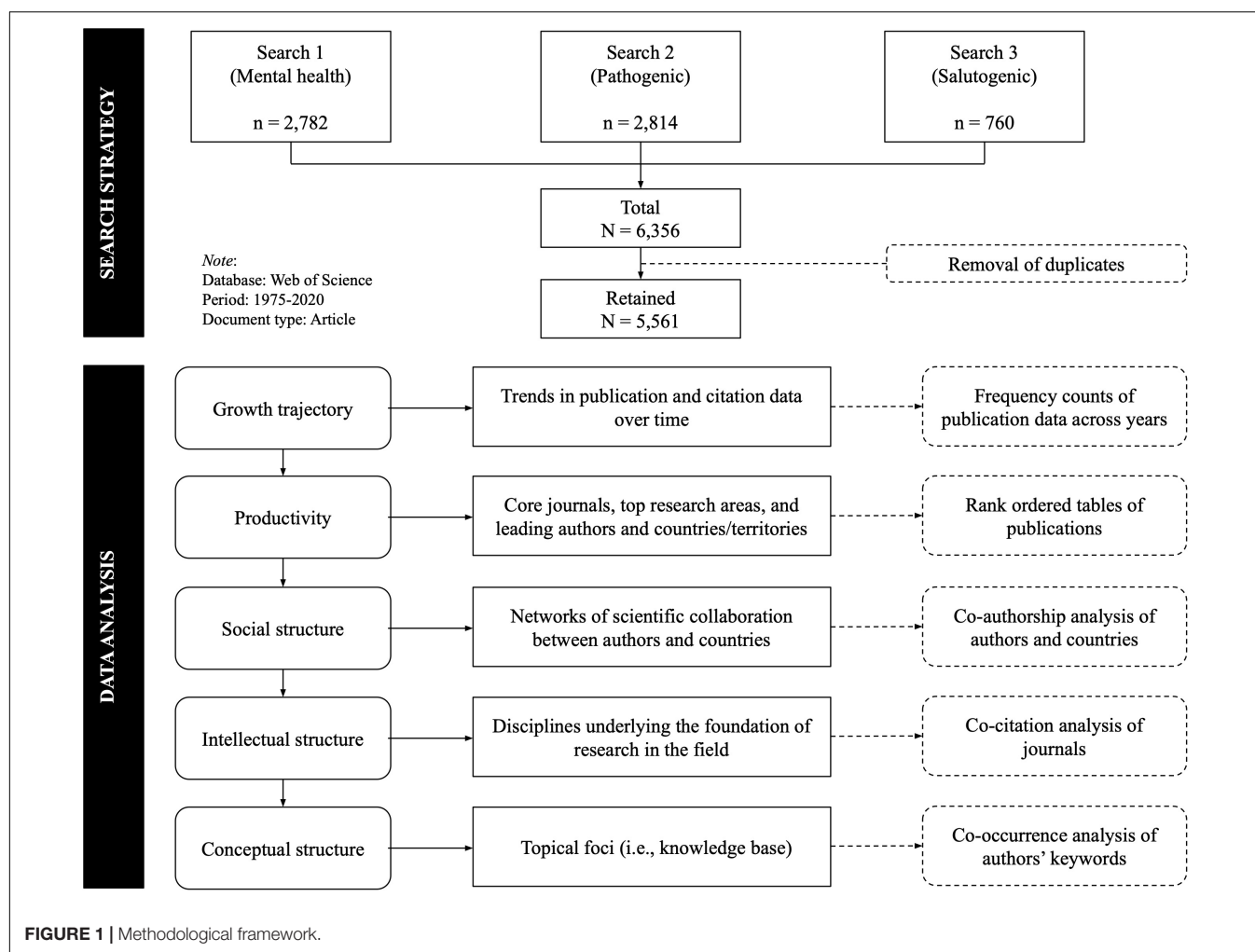
Data Analysis Procedures

The corpus of the literature was then analyzed using descriptive and bibliometric approaches to provide an overall picture of the evolution and current state of the research on mental health and wellbeing in university settings. Frequency counts of the number of publications and citations per year were obtained to describe the growth trajectory of research on the mental health and well-being of university students. Rank ordered tables were produced to describe the productivity of the field in terms of core journals and research areas, as well as leading scholars and countries contributing to the development of the field.

Bibliometric analyses in VOSViewer software were implemented to examine and visually represent the social, intellectual, and conceptual structure of the field. VOSViewer is a freely available computer software for viewing and constructing bibliometric maps¹. In VOSViewer, the units of analysis are journals, publications, citations, authors, or countries, depending on the focus of the analysis. The units of analysis are represented in the maps as circular nodes. The size of the node accounts for volume (e.g., number of publications in the dataset by an author) and the position represents the similarity with other nodes in the map. Closer nodes are more alike than nodes far apart from each other. The lines connecting nodes represent the relationship between nodes and their thickness indicates the strength of that relationship. Finally, the color of the node denotes the cluster to which each node has been allocated. Nodes are clustered together based on relatedness (Van Eck et al., 2010). The software uses a distance-based approach to constructing the bibliometric maps in three steps (Van Eck and Waltman, 2014). In the first step, the software normalizes the differences between nodes. In the second step, the software builds a two-dimensional map where the distance between the nodes reflects the similarity between these nodes. In the third step, VOSViewer groups closely related nodes into clusters (Van Eck and Waltman, 2014).

A series of co-authorship analyses were performed to examine the social structure of research on mental health and well-being in university students. In these analyses, the units of analysis were authors and countries/territories. Each node in

¹www.vosviewer.com



the map represents an author or a country/territory and the lines connecting them reflect the relationship between nodes. Clusters represent networks of scientific collaboration, which might be interpreted as groups of authors or countries frequently publishing together (e.g., research groups in the case of authors).

Co-citation analysis of journals was implemented to explore the intellectual structure of the field. Here, the units of analysis were journals in the dataset and the map reflects co-citation relationships between journals. Two journals are co-cited if there is a third journal citing these two. The more times a pair of journals are cited by other journals, the stronger their co-citation relationship will be. Frequently co-cited journals are assumed to share theoretical and semantical grounds. Therefore, in our study, clusters of frequently co-cited journals can be interpreted as disciplines underlying the foundations of research on mental health and well-being in university students.

Finally, a co-occurrence analysis of keywords was used to uncover the conceptual structure of the field. The units of analysis, in this case, were the authors' keywords. The more often two keywords appear in the same record, the stronger their co-occurrence relationship. Clusters of co-occurring keywords represent in this study the topical foci (i.e., knowledge base)

that have been addressed in the literature in mental health and well-being in university students in the last 45 years.

FINDINGS AND DISCUSSION

Growth Trajectory: Evolution of Publications and Citations in the Field

The developmental patterns of a particular field can be well demonstrated by trends in publications and citations. The 5,561 publications in the dataset have been cited 87,096 times, with an average of 15.6 citations per item. **Figure 2** shows the growth trajectory of publication data of research on mental health and well-being in university students from 1975 to January 2020. Overall, the trends demonstrate a gradual increase in the scholarly interest in the mental health of university students over the last 45 years that can be organized in three stages: an emergence stage, in which publications rose slowly (1975–2000); a fermentation stage, with a notable increase in publications in the field (2000–2010); and a take-off stage, during which the number of records published per year in the field has almost risen 10 times (2010–2020). The steady increase of publications

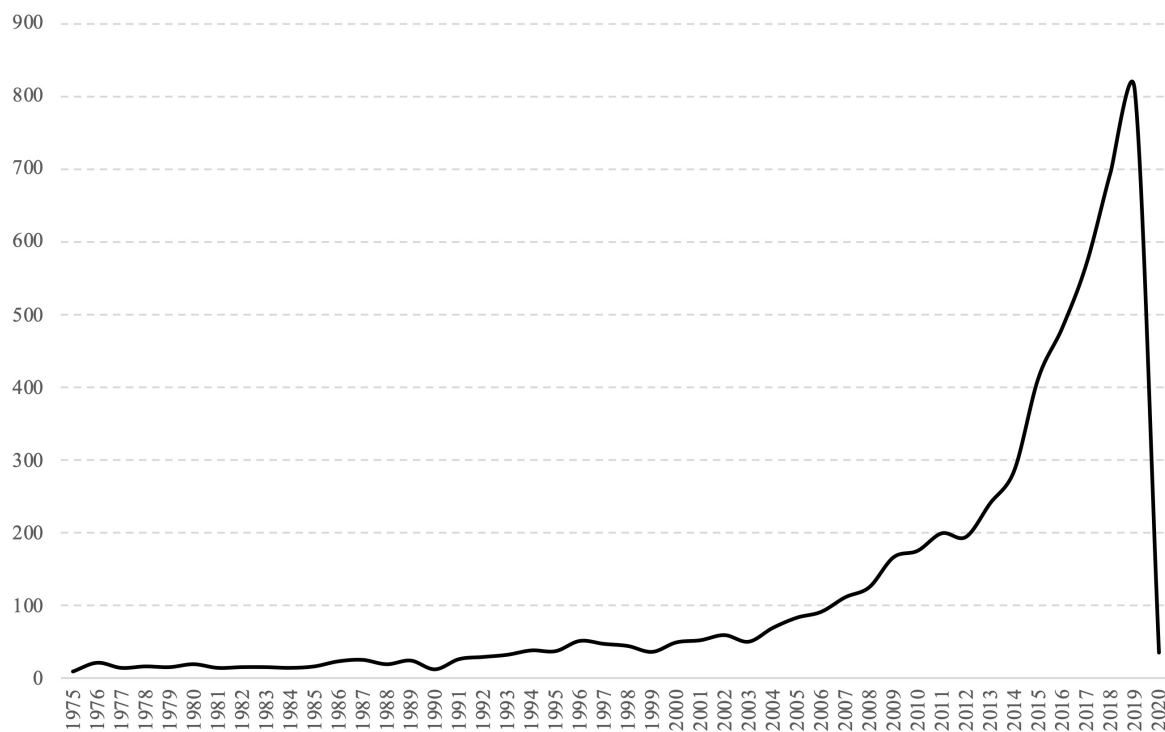


FIGURE 2 | Growth of research on mental health and well-being of university students.

in the last 15 years coincides with the first calls for attention on the increase and severity of mental problems and help-seeking behaviors of college students (Kadison and DiGeronimo, 2004; Evans et al., 2018), potentially indicating a growing interest in exploring the epidemiology of mental disorders and the role of universities in promoting the mental health and well-being of students. A similar pattern has also been observed in a recent bibliometric study examining global research on mental health both in absolute terms and as a proportion of all papers published in medicine and across disciplines, which certainly reflects an increase in the general interest in the field (Larivière et al., 2013).

Productivity I: Core Journals and Research Areas

In total, 1,560 journals published the 5,561 records included in the dataset. **Table 1** presents the ten core journals in the field. The *Journal of American College* stands out as the main publication venue in the field, accumulating around 5% of the publications in the dataset ($n = 270$). *Psychological Reports* and *Journal of College Student Development* also stand out, publishing 119 and 102 studies, respectively. The *Journal of Counseling Psychology* ranks fourth in the list with 83 records. Despite being an interdisciplinary and relatively young journal, *Plos One* appears in the top five journal publishing research on mental health and well-being in university students.

The top research areas contributing to the publication of research on the mental health and well-being of university students are presented in **Table 2**. Nearly half of the records

TABLE 1 | Core journals ranked by number of records.

Source titles	Records	% of 5561
Journal of American College	270	4.86
Psychological Reports	119	2.14
Journal of College Student Development	102	1.83
Journal of Counseling Psychology	83	1.49
Addictive Behaviors	60	1.08
Personality and Individual Differences	48	0.86
Social Behavior and Personality	45	0.81
Plos One	44	0.79
Journal of Affective Disorders	41	0.74
Journal of Clinical Psychology	40	0.72

in the dataset are published in *psychology* journals. Another influential research area in the field is *psychiatry*, which captures almost 20% of the publications. Journals on *education and educational research* also accumulate a considerable number of publications in the field (15%). Other relevant research areas in the field are connected with health and medicine, including *public environmental occupational health*, *substance abuse*, *general internal medicine*, *neurosciences neurology*, *health care sciences services*, and *nursing*. Finally, the field is also grounded, although to a lower extent, in the publications emerging from journals in the *social sciences*, *family studies*, and *social work* research.

All in all, the productivity analysis for journals and research areas showed that most research on mental health and well-being

TABLE 2 | Top research areas ranked by number of records.

Research areas	Records	% of 5561
Psychology	2,456	44.2
Psychiatry	1,017	18.3
Education Educational research	857	15.4
Public environmental occupational health	768	13.8
Substance abuse	268	4.8
Social sciences other topics	223	4.0
General internal medicine	203	3.6
Neurosciences neurology	167	3.0
Health care sciences services	160	2.9
Nursing	152	2.7
Family studies	128	2.3
Social work	116	2.0

in university students is disseminated in journals in the “psy disciplines” (i.e., psychology and psychiatry) (McAvoy, 2014), which is consistent with previous research on mental health in general populations (e.g., Haslam and Lusher, 2011). However, our findings demonstrated that the volume of research in psychology doubles that of research emerging from psychiatric journals. This contrasts with the findings by Haslam and Lusher (2011), who demonstrated that psychiatry journals had a greater influence on mental health research compared to clinical psychology journals and that psychiatry journals accumulate a higher volume of research and citations on mental health research. This is probably because our study includes publications emerging from all branches of psychology, unlike the study by Haslam and Lusher, which included only journals in the field of clinical psychology. Additionally, mental health services in higher education are typically provided by counseling centers led and staffed by non-medical professionals (e.g., psychologists, social workers, counselors, and family therapists) who tend to adopt developmental models of practice grounded in the behavioral sciences and focused on adjustment issues, vocational training, employment, and other personal needs rather than diagnosis and

symptom reduction, more common in the biomedical sciences (i.e., psychiatry) (LeViness et al., 2018; Mitchell et al., 2019).

Productivity II: Leading Authors and Countries/Territories

The 5,561 publications in the dataset were published by a total of 16,161 authors from 119 countries worldwide. **Table 3** shows the researchers with the highest number of publications in the field. D. Eisenberg appears as the most productive researcher, followed by K. Peltzer and S. Pengpid. Authors on the list come from diverse geographical backgrounds. Five of the authors work at three different American universities (University of Michigan, Harvard Medical School, and Boston University), two researchers work at KU Leuven University (Belgium), and two other authors are affiliated to the same two universities in Thailand and South Africa. Other prolific researchers are affiliated with higher education institutions in the Netherlands, Egypt, and Germany.

Countries and territories leading research on mental health and well-being of university students are presented in **Table 4**. The United States is the indisputable leader in this field, publishing more than half of the records in the dataset. This is nearly 10 times the number of publications produced in China, which occupies the second position in the ranking and accounts for nearly 6% of the volume of research in the dataset. Three predominantly English speaking countries/territories complete the top five of the ranking: Canada (265 records), Australia (254), and England (243). The rest of the countries in the list are situated in Europe (Spain, Germany, Turkey), Western Asia (Iran), Africa (South Africa), and East Asia (Japan), which demonstrates that research on college students' mental health and well-being is a matter of concern in different regions of the world, at least to some extent.

Overall, the productivity analysis for authors and countries indicated that the research of mental health and well-being of university students occurs in a variety of locations around the world, especially in developed countries, and in a very prominent way, in the United States. This is not surprising since it is in those countries where better infrastructures and more abundant

TABLE 3 | Leading authors ranked by number of records.

Authors	Organization	Country/territory	Records
Eisenberg, D	University of Michigan	United States	36
Peltzer, K	Mahidol University;	Thailand;	35
	University of Limpopo	South Africa	
Pengpid, S	Mahidol University;	Thailand;	33
	University of Limpopo	South Africa	
Brauffaerts, R	KU Leuven University	Belgium	30
Auerbach, RP	Harvard Medical School	United States	29
Kessler, RC	Harvard Medical School	United States	28
Cuijpers, P	Vrije University Amsterdam	Netherlands	25
Mortier, P	KU Leuven University	Belgium	23
Ebert, DD	Friedrich-Alexander University of Erlangen-Nürnberg	Germany	22
Green, JG	Boston University	United States	22
Abdel-Khalek, AM	University of Alexandria	Egypt	21
Chang, EC	University of Michigan	United States	21

TABLE 4 | Leading countries/territories ranked by number of records.

Countries/territories	Records	% of 5561
United States	2934	52.8
Peoples' Republic of China	329	5.9
Canada	265	4.8
Australia	254	4.6
England	243	4.4
Turkey	218	3.9
Spain	190	3.4
Iran	126	2.3
South Africa	122	2.3
Germany	120	2.2
Japan	117	2.1

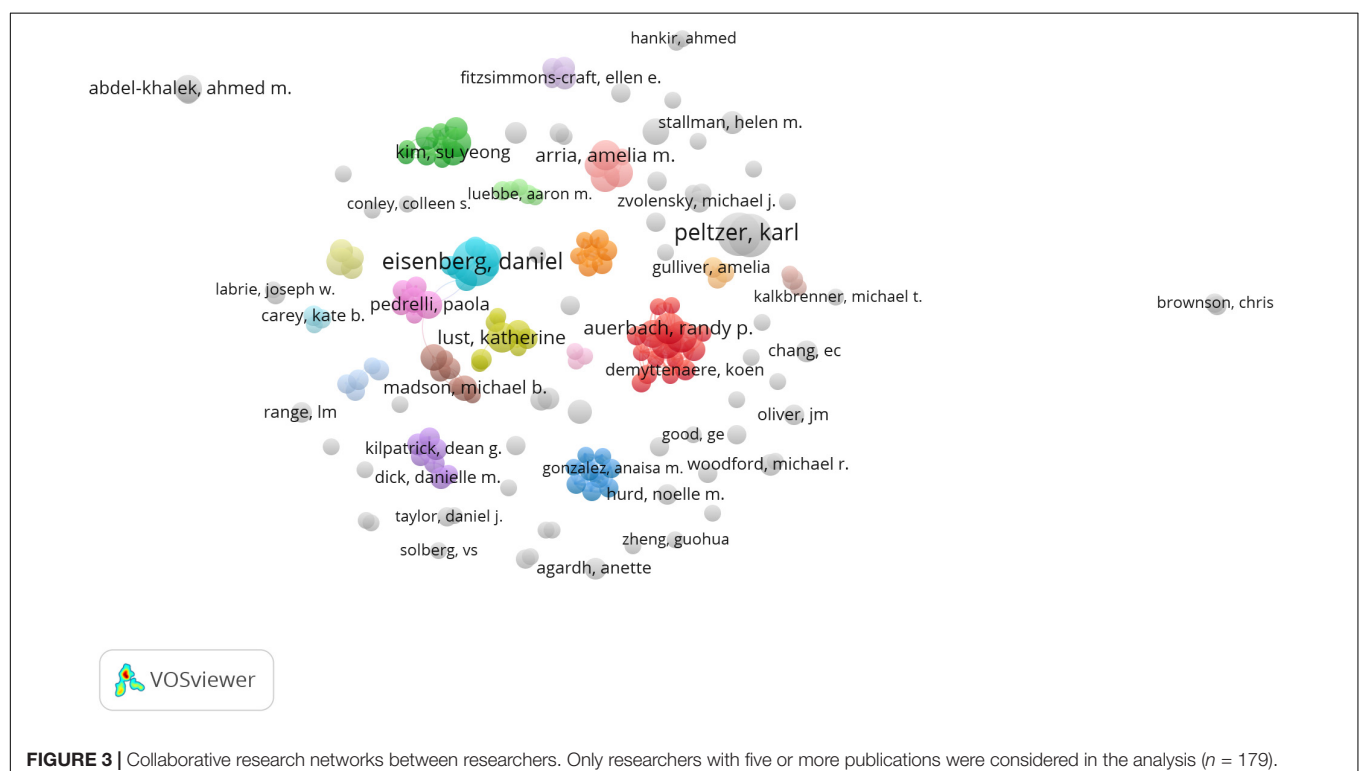
resources for research are available (Wong et al., 2006), and a more lasting tradition in the study of mental health, in general, exists (Gopalkrishnan, 2018). However, Larivière et al. (2013) found that the productivity of the United States on mental health research has dropped significantly and remained stable in other two English speaking countries (the United Kingdom and Canada) since 1980. On the contrary, the number of publications from European countries and the five major emerging national economies (Brazil, Russia, India, China, and South Africa), has experienced remarkable growth, and collectively account nearly for half of the publications in the field. Still, the predominance of knowledge generated in the developed world today, which tends to be grounded on psychiatric and psychological perspectives, might be eclipsing non-traditional views on mental health and

well-being that are popular in other regions of the world and, therefore, limiting the development of effective initiatives that align better with local norms, values, and needs in LMICs (Timimi, 2010; Summerfield, 2013).

Social Structure: Networks of Scientific Collaboration

Research collaboration is regarded as an indicator of quality research and a means to improve research productivity and academic impact (i.e., citations) (Kim, 2006; Abramo et al., 2009). In particular, international research collaboration is considered a key contributor to the social construction of science and the evolution of scientific disciplines (Coccia and Wang, 2016). There is recent evidence that national and international research collaborations have been accelerating in recent years (Gazni et al., 2012; Wagner et al., 2015), especially in applied fields such as medical and psychological disciplines (Coccia and Bozeman, 2016). In this study, co-authorship analyses were performed to find out patterns in the scientific collaboration between researchers and countries/territories on the mental health and well-being of university students.

Figure 3 demonstrates collaborative ties among authors who published at least 5 articles in the dataset ($n = 179$). The map shows the existence of multiple productive collaborative networks of five or more researchers contributing to the development of the field. The largest collaboration network (red cluster) represents an international research group composed of 15 scholars affiliated to universities in the United States, Belgium, and Netherlands. This cluster groups some of the leading scholars

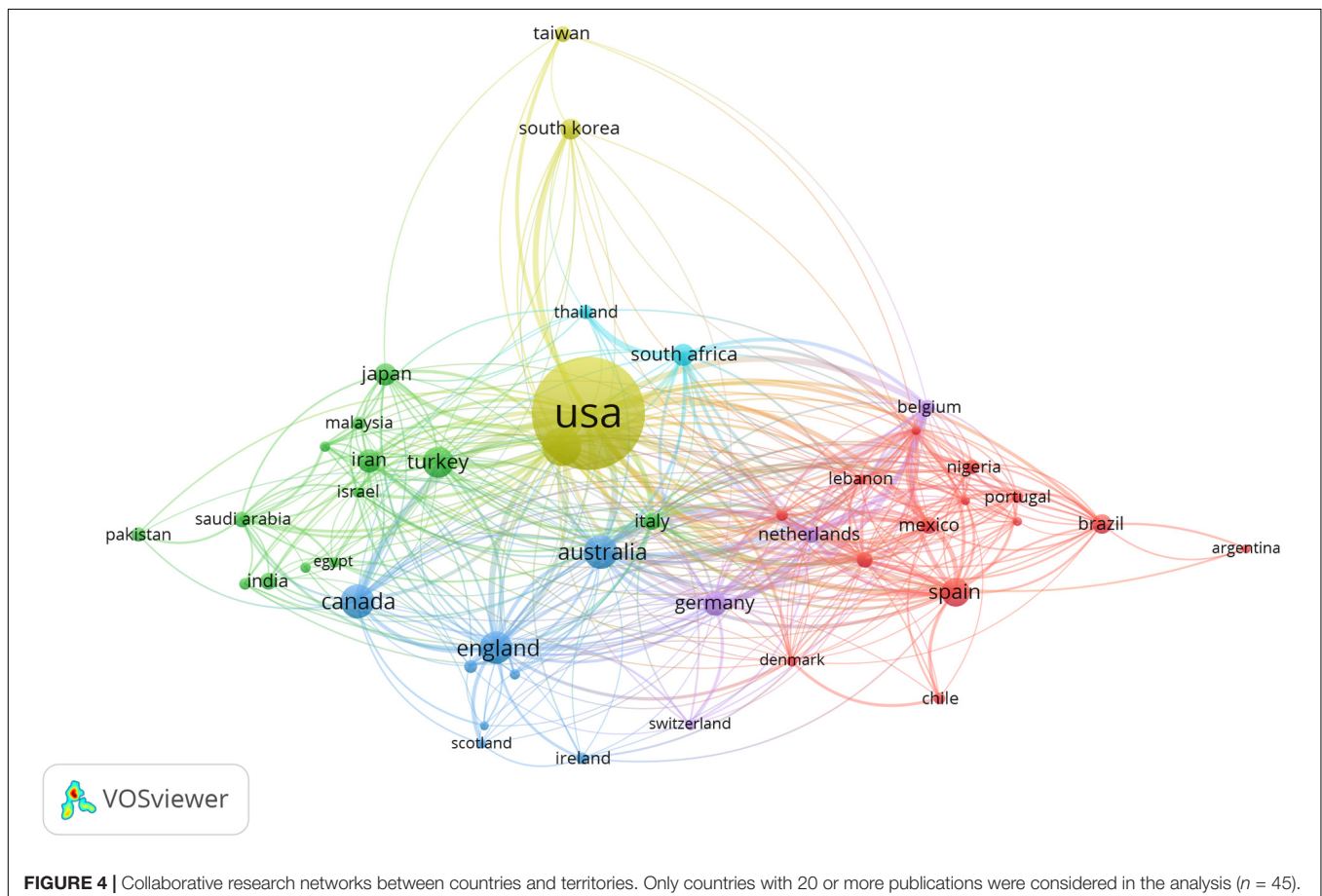


in the field, including R. P. Auerbach, R. Brauffaerts, R. C. Kessler, and P. Cuijpers. Moreover, researchers in this cluster lead The WHO World Mental Health International College Student (WMH-ICS) Initiative, a large scale international project aimed at promoting the mental health and well-being of college students around the world through generating epidemiological data of mental health issues in university students worldwide, designing web-based interventions for the prevention and promotion of mental health, and disseminating evidence-based interventions (Cuijpers et al., 2019). The second biggest cluster (green) represents an intra-national research network that includes 10 researchers from eight different higher education institutions in the United States. The dark blue cluster represents an institutional collaborative network, including nine researchers from the School of Public Health, Puerto Rico. Other prominent clusters in the map represent collaborative research networks between eight (olive color) and seven researchers (turquoise, violet, orange, and mellow mauve). This contrasts, however, with the limited collaboration that exists between clusters. Only four of the clusters on the map demonstrate some kind of scientific collaboration in the field (light blue, pink, brown, and yellow).

Cross-country collaboration networks in mental health and well-being of university students study are presented in **Figure 4**. Research collaborations between countries with 20 or more publications were considered in this analysis ($n = 45$). The

United States occupies the central position of the map and shares collaborative ties with all other countries/territories, forming a cluster together with China, South Korea, and Taiwan. Overall, the results suggest that international collaborations in the field are framed to a large extent by cultural, linguistic, and geographical proximity. For instance, the largest cluster (red) is formed by two European countries (Spain and Portugal) and other South American countries with whom they share historical and cultural backgrounds. Other European countries form the purple cluster. Similarly, the blue cluster clearly brings together predominantly English-speaking countries and territories, while the green cluster agglomerates a range of Asian countries.

Collectively, the results of our study suggest that research collaboration in the field of mental health and well-being in university students remains relatively scarce and localized to date. The social structure of the field at the author level could be described as an archipelago formed by a large number of islands (research groups) of different composition and size but with few bridges connecting them, which suggests a relatively fragmented research community. Moreover, while the existence of international collaborative networks was evident in the analysis, they seem to be formed within national borders, between researchers in neighboring countries/territories, or between countries that share cultural, linguistic, and historical heritages. This may be due to the important role that



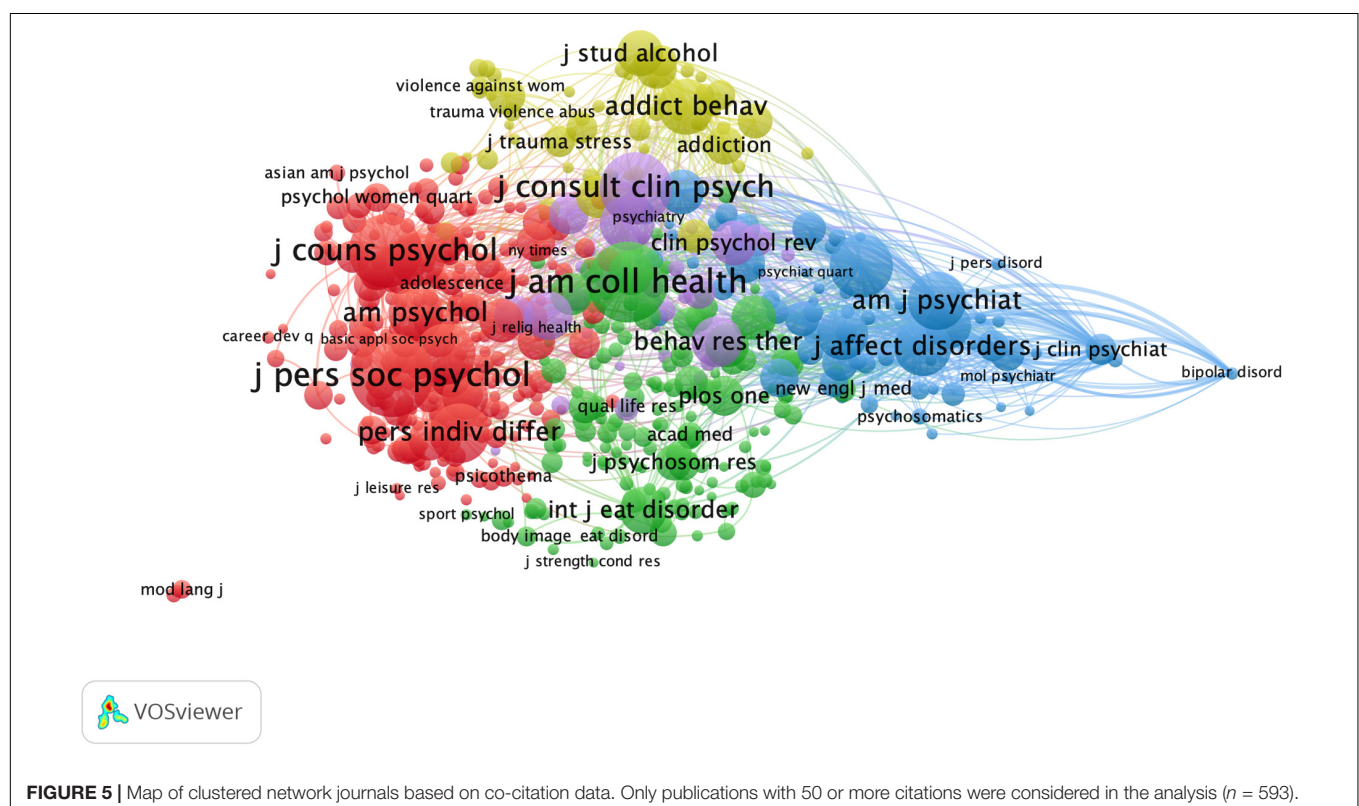
cultural and traditional values play in the conceptualization of mental health and well-being across contexts (Eshun and Gurung, 2009; Vaillant, 2012; Fernando, 2019). Also, language differences, divergent cross-national institutional and organizational traditions, and increased costs of extramural collaboration, have been found to complicate the formation and continuity of research partnerships in health research (Hooper et al., 2005; Freshwater et al., 2006). Nevertheless, limited within- and between-country research collaboration arguably poses challenges to the development of a field in terms of lost opportunities to challenge assumptions taken for granted and move toward fresh perspectives, push boundaries in methods and techniques, meet diverse groups of people from differing cultures and get immersed in those cultures, share information, resources, and skills, and address common mental health problems through the pooling of resources (Rolfe et al., 2004; Freshwater et al., 2006).

Intellectual Structure: Disciplines Underlying the Foundations of the Field

Interdisciplinarity is considered as a valuable approach to address the complex and multidimensional nature of health and well-being (Mabry et al., 2008). Buckton (2015) argues that the integration of medical, psychological, and social sciences have contributed to generate “new insights into theory, practice, and research in mental health and development.” (3). To examine the disciplines underlying research on the mental health and well-being of university students, a journal co-citation analysis

was performed. In this analysis, only journals with at least 50 citations were considered ($n = 593$). The nodes on the map represent journals and their size reflects the number of co-citation relationships with other journals. Colors account for journal clusters, which agglutinate journals with higher co-citation relationships and stronger semantic connectedness. Clusters were interpreted and labeled accounting for the WoS categorization of the journals with the highest co-citation links within each cluster. For example, if the *Journal of Personality and Social Psychology*, the *Journal of Counseling Psychology*, and *Personality and Individual Differences* clustered together, this group was interpreted as the personality, social, and counseling psychology cluster.

In general, the findings of this study suggest that research on mental health and well-being in university students is interdisciplinary, to a certain extent, and mainly emerges from the convergence of research conducted in the behavioral and biomedical sciences, as it has been suggested elsewhere (Schumann et al., 2014; Wittchen et al., 2014b). More specifically, the map shows that the research in the mental health and well-being of university students is constructed through the integration of knowledge generated in five interconnected disciplines (see Figure 5). To the left of the map, the red cluster integrates journals on *personal, social, and counseling psychology*. To the right, the blue cluster represents the contribution of *psychiatric journals* to research to the formation and development of the field. At the top, the yellow cluster groups journals on *substance abuse* and issues related to alcohol consumption, addiction, and interpersonal violence. At the bottom of the map,



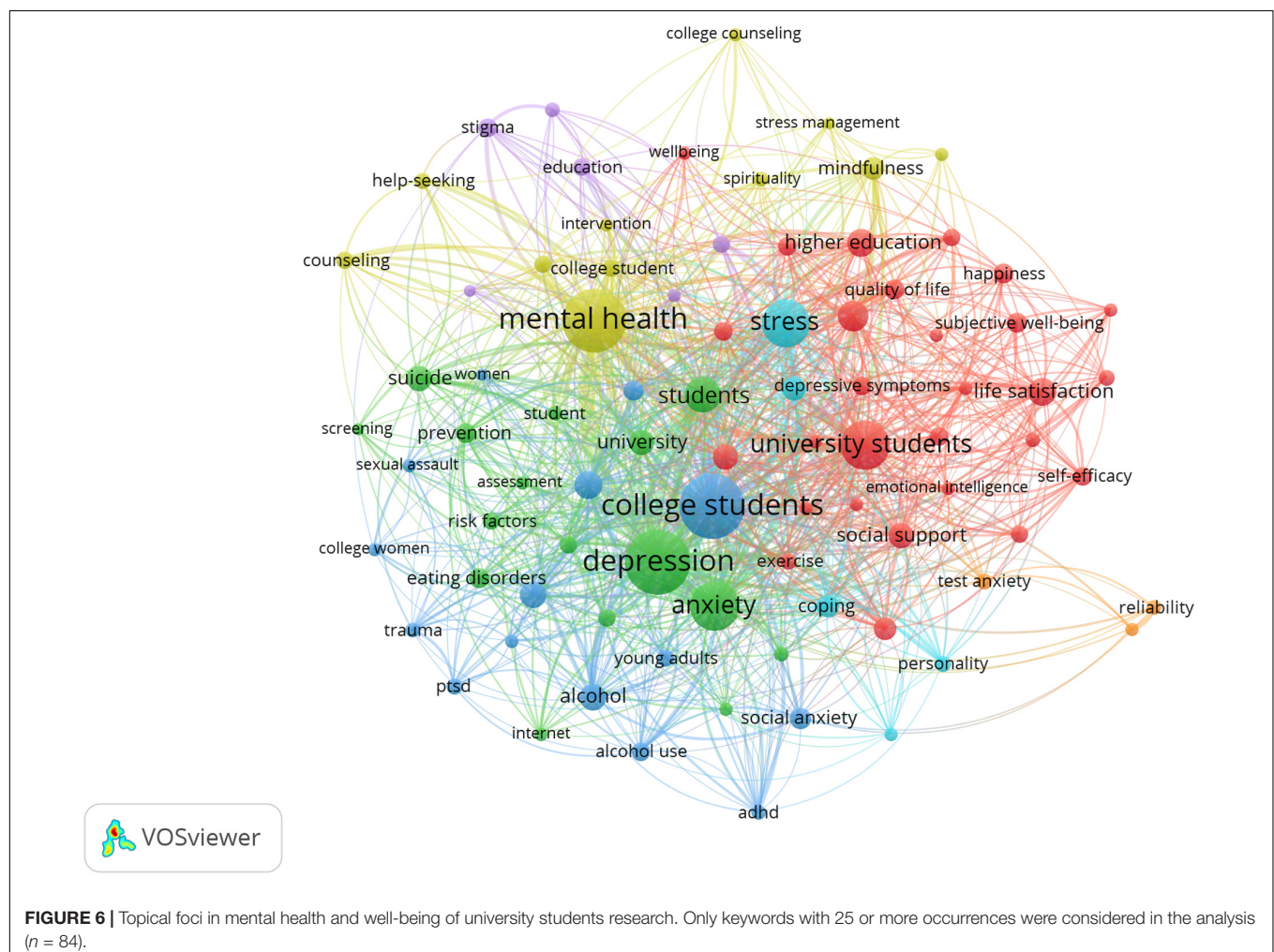
journals covering topics on eating behaviors, sleep, and other issues related to *physical health* converge on the green cluster. At the center of the map is the purple cluster, which includes journals in the area of *clinical psychology and behavioral therapy*.

More broadly, the findings suggest that biomedical sciences contribute to a large extent to the composition of the field. Psychiatric research emerged in our study as an obvious building block in the study of university students' mental health and well-being, which is not surprising considering the historical contributions of biomedical disciplines to mental health research (Schwartz and Corcoran, 2010). Within the behavioral sciences, personality and social psychology, which explores processes and mechanisms through which social phenomena influence mental health and well-being (Sánchez Moreno and Barrón López de Roda, 2003), appears as a key discipline underlying the foundations of the field. Surprisingly, clinical psychology journals occupy a central position in the map and demonstrate co-citation relationships with journals from all other clusters but make up the most dispersed network and account for a considerably lower volume of co-citation relationships in the field. This suggests that clinical psychology journals are more subordinate to journals in other disciplines in terms of citations flows, and ultimately, play

a less unique role in research on the mental health and well-being of university students, as suggested by Haslam and Lusher (2011). Interestingly, research arising from the social sciences (e.g., sociology and anthropology) does not seem to make a distinctive contribution to the intellectual structure of the field, which suggests that the influence of social contexts and cultures on university students' mental health and well-being (e.g., inequality, social norms, public policies, cultural beliefs, and values) is an underexplored research area. Still, the density of co-citation network relationships within and between clusters is particularly noteworthy, considering the lack of common language between disciplines, the absence of a shared philosophy of practice on mental health, and the tensions between medical, psychological, and social explanations of mental distress (Bailey, 2012).

Conceptual Structure: Topical Foci Addressed in the Literature Over the Last 45 Years

The topical foci of research on the mental health and well-being of university students during the 1975–January 2020 period are presented in **Figure 6**. The map offers a visual representation



of the co-occurrence analysis of author keywords of all the publications included in the dataset. Only the most frequently occurring keywords (25+ occurrences) were considered in the analysis ($n = 84$). Items that were not related to others and do not belong to the existing clusters were excluded. The size of the nodes indicates the occurrence of author keywords in the dataset and the thickness of edges represents the co-occurrence strength between pairs of keywords.

The most frequent keywords in the dataset, excluding students' descriptors (e.g., college students and university students), refer to common mental health challenges experienced by university students such as depression ($n = 612$), anxiety ($n = 353$), and stress ($n = 341$). Salutogenic-related keywords such as well-being and life satisfaction occurred less often ($n = 138$, $n = 113$, respectively), suggesting that pathogenic approaches to the exploration of mental health issues in higher education are more widespread. More broadly, seven general themes seem to summarize the topical foci of interest in the field of mental health and well-being of university students over the last 45 years. First, there has been a general interest in *positive mental health*, as denoted by frequently co-occurring key terms such as well-being, self-esteem, life satisfaction, social support, emotional intelligence, and happiness (red cluster). Second, *mental disorders* stand as another theme widely addressed in the literature, with a special emphasis on depression, anxiety, and to a lesser extent, suicide and suicidal ideation (green cluster). A third topical area in this field has been *substance abuse*, most predominantly alcohol consumption (blue cluster). The fourth theme reflects college *counseling for mental health*, including interventions and protective factors such as mindfulness, stress management, spirituality, and help-seeking (yellow cluster). Other topics reflected in the map are *mental illness stigma* (purple), *stress* (e.g., psychological distress and coping) (light blue), and *mental health measurement* (orange).

CONCLUSION

This study provides a comprehensive overview of the research on university students' mental health and well-being in the last 45 years using bibliometric indicators. In general, the results reveal interesting trends in the evolution of the field over the last four decades and promising scientific patterns toward a better understanding of the mental health and well-being of university students internationally. First, the interest in the mental health and well-being of university students has grown in the last decades and in a very significant way during the last 10 years, indicating that this area has not still reached its maturity period and will continue developing in the future. Second, research in the field is relatively interdisciplinary and emerges from the convergence of research conducted in several disciplines within the behavioral and biomedical sciences. Third, research in this field is produced by a community of productive researchers coming from several regions around the world, most notably in the United States, which secures a generation of scholars that will continue shaping the field in the years to come. Fourth, over the last 45 years, researchers have been able to address a multitude

of research topics in the field, including positive mental health, mental disorders, substance abuse, counseling, stigma, stress, and mental health measurement.

However, this study also identified some issues that could be hindering the development of the study of the mental health and well-being of university students. For example, the research available overrepresents theoretical and disciplinary approaches from the developed world. Additional studies on the field from developing economies and LMICs are needed to provide a more comprehensive picture and ensure a fair representation of the multiple perspectives available in the field. Such studies would inform administrators and practitioners on how to broaden and enrich available programs and initiatives to promote mental health and well-being in higher education contexts in order to offer alternative forms of support that university students find appropriate for their social and cultural values. Moreover, the research community contributing to the development of the field is relatively fragmented. There are multiple research groups but little research collaborations between them and, at the international level, these connections tend to be limited by geographic, cultural, and language proximity. In this context, more actions like the WMH-ICS Initiative could provide a partial solution to this problem by strengthening national and international research partnerships and facilitating knowledge exchange across regions. Also, special issues in the core journals in the field inviting cross-cultural studies on the topic could contribute to promoting research collaboration across regions and research in less represented countries. The field would also benefit from a greater volume of research from the social sciences and humanities exploring the influence of social, cultural, economic, and educational factors on the conceptualization, manifestation, and experience of mental health and well-being. Moreover, more studies emerging from disciplines such as sociology, anthropology, business, and education, would likely increase the permeability of positive mental health concepts into the field and contribute to the promotion of salutogenic approaches to the study of mental health and well-being of university students.

This study has several limitations. First, publications were retrieved only from the WoS database, which limits the generalizability of the findings. Second, WoS provides stronger coverage of Life Sciences, Biomedical Sciences, and Engineering, and includes a disproportionate number of publications in the English language (Mongeon and Paul-Hus, 2016). This could partially explain the low number of publications emerging from the Social Sciences, the Arts, and the Humanities, and research conducted in non-English speaking countries in the present study. Third, only journal articles were retrieved for analysis, excluding other relevant publications in the field such as reviews, book chapters, and conference proceedings. Future studies could replicate the findings of this study using alternative databases (e.g., Scopus and PubMed) or a combination of them, as well as different filters in the search strategy, to provide an alternative coverage of research conducted in the field. Nevertheless, we believe that the bibliometric approach used in this study offers novel insights about the development and current status of the field and some of the challenges that undermine its progression.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

DH-T and LI contributed to conception and design of the study, organized the database, and performed the statistical

analysis. DH-T, LI, and JS wrote the first draft of the manuscript. NL, AC, AA, YN, and AM wrote the sections of the manuscript.

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State and Trait Anxiety Among University Students: A Moderated Mediation Model of Negative Affectivity, Alexithymia, and Housing Conditions

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Objective: Starting university education is a crucial period for the mental health of students, who report higher levels of distress compared to the general population. This study sought to better understand the distress experienced by students by considering contextual facets (e.g., housing conditions) as well as stable clinical variables (e.g., negative affectivity, emotion regulation, and anxiety).

Methods: A total of 177 University students (71.2% females) aged 18-29 were administered the State-Trait Anxiety Inventory-Y, the Beck Depression Inventory-II, the Suicidal History Self-Rating Screening Scale, the Personality Inventory for DSM-5-Brief Form, and the Toronto Alexithymia Scale-20.

Results: University students showed concerning levels of distress, particularly concerning anxiety, and depression. We found that the relationship between negative affectivity and both state and trait anxiety was mediated by alexithymia but housing conditions did not act as a moderator for the indirect effect of negative affectivity on state or trait anxiety through alexithymia.

Conclusion: Undoubtedly, university lifestyle can be demanding, but experiencing distress is not inevitable nor inexplicable. The present study sought to gain insight into the anxiety experienced by Italian University students while taking into account the importance of personality and clinical characteristics that have previously been widely underestimated. We found that these characteristics can be of extreme importance for developing preventative and therapeutic interventions tailored to the clinical characteristics of students, as well taking into account their living environment.

Keywords: university students, emerging adulthood, distress, negative affectivity, emotion, anxiety, depression, housing conditions

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INTRODUCTION

University Students' Distress

Starting university is a challenging task for many young women and men in the transitional age between adolescence and adulthood, typically around 20 years of age. Not only do students face transformations connected to the emerging adulthood (Arnett, 2000; Arnett et al., 2014) such as emancipation, financial self-sufficiency, choices about career, and intimate relationships; they

also must deal with further tasks connected to entering higher education such as relocation, performance demands, changes in living conditions and lifestyles, and dealing with a social and educational context far from the ones experienced before (Settersten and Ray, 2010; Schulenberg and Schoon, 2012).

Starting university seems to constitute a crucial period for the mental health of students (Molina et al., 2012; Pedrelli et al., 2015; Auerbach et al., 2016; Harris, 2019), who consistently report higher levels of distress compared to the general population (Stallman, 2010; Dachew et al., 2015; James et al., 2017; Tariku et al., 2017; Mboya et al., 2020). Previous research shows that 19.2–32% of university students reports mental health problems and subsyndromal symptoms (Stallman, 2010; Abdolhossini and Shikhmohamadi, 2012; Auerbach et al., 2016). Moreover, 17.3–41.1% of them reports psychiatric distress (Macaskill, 2013; Oksanen et al., 2017; Poorolajal et al., 2017). These data must be taken into account because the mental health of students has major implications for campus health services and mental health policymaking (Viñas et al., 2004).

Previous research has indicated high levels of depression, anxiety, and risk of suicide in students (see Ibrahim et al., 2013; Beiter et al., 2015; Larcombe et al., 2016; Rotenstein et al., 2016; Oyekcin et al., 2017; Poorolajal et al., 2017; Tran et al., 2017; Villatte et al., 2017; Tang et al., 2018).

Students' Distress and Housing Conditions

A major issue to take into account while considering the distress experienced by university students is that of housing conditions and the related daily routines. Indeed, housing has been identified as one of the main domains relating to individual well-being (van Praag et al., 2003; Sotgiu et al., 2011). In particular, housing overcrowding has negative associations with perceived housing quality, suggesting that the living space available for each occupant and the ability to control it play a fundamental role in subjective well-being (Caffaro et al., 2018).

University students living away from home or not owning the room they were living in showed higher psychological distress than students living at home or owning their room, regardless of their parental financial support (Stroebe et al., 2002; Vershuur et al., 2004; Flett et al., 2009; Watson et al., 2016). While separation from home does not necessarily have a negative impact, it may be a risk factor for vulnerable people who might experience an increase in depressive or anxiety symptoms and have a negative effect on their overall health (Thurber and Walton, 2012; Stroebe et al., 2015; Biasi et al., 2018).

Affectivity, Emotion Regulation, and Anxiety

In exploring university students' distress, we have to consider contextual facets such as housing conditions. As clinicians, we cannot underestimate the extent to which individuals who show high levels of negative affectivity generally manifest elevated levels of distress, anxiety, dissatisfaction, and a tendency toward focusing on the unpleasant aspects of themselves, other

people, the world/life, and the future (Gross and Jazaieri, 2014; Jeronimus et al., 2014).

Affective experience can change across time and situations, but individuals tend toward some degree of stability. In particular, negative affectivity is a personality dimension (American Psychiatric Association, 2013) that develops early in life, although it can also be shaped by further experiences (Watson and Naragon-Gainey, 2014). It can be defined as the proneness to experience negative emotional states, and to activate defensive motivational systems (Craske, 2003). This leads to the tendency to frequently experience negative affective states (e.g., fear, sadness, anger, and guilt), to withdraw from potentially risky situations, and to react intensely to stress (Naragon-Gainey et al., 2018). Even if there is a certain association between negative affectivity and anxiety, these two constructs are not completely overlapping. Indeed, anxiety is an emotion characterized by an unpleasant state of inner turmoil, often accompanied by nervous behavior, somatic complaints, and rumination (Seligman et al., 2000). Anxiety is a feeling of uneasiness and worry, usually generalized and unfocused as an overreaction to a situation that is only subjectively seen as menacing (Bouras and Holt, 2007). Anxiety is often accompanied by muscular tension, restlessness, fatigue, and difficulties in concentration (American Psychiatric Association, 2013). Negative affectivity is the temperamental factor most commonly associated with anxiety and other emotional disorders (Lonigan and Phillips, 2001; Muris and Ollendick, 2005; Nigg, 2006). However, many individuals with heightened negative affectivity do not exhibit high levels of anxiety or develop anxiety disorders. Such findings have led researchers to examine the potential factors that mediate or moderate the relationship between affectivity and anxiety (Tortella-Feliu et al., 2010).

Emotion regulation and, more specifically, alexithymia are the constructs most frequently cited as playing a mediating role in the relationship between negative affectivity and anxiety. Indeed, research suggests that negative affectivity increases alexithymia (Bonnet et al., 2012; Gaher et al., 2015; Suslow and Donges, 2017). Even if affects and related personality dimensions have a pivotal impact on psychological distress, when we consider such links between affect and psychopathology, we also have to take into account the emotion regulation strategies that individuals activate to manage the feelings they are experiencing and to deal with distress (Sheppes et al., 2015). As suggested by Bagby et al. (1994), alexithymia can be described as a difficulty in identifying and describing feelings, as well as in distinguishing feelings from the bodily sensations of emotional arousal. Alexithymic individuals also exhibit constricted imaginative processes and externally oriented thinking (Taylor, 2000). They are often assailed by widespread negative affect, social evasion and poor emotional relationships with other people. From a wider clinical perspective, there is strong evidence that emotion regulation is closely related to most, if not all, anxious and depressive disorders. A positive association between emotional regulation and anxiety has been found, in particular between alexithymia (most notably difficulties identifying and describing feelings) and anxiety (Devine et al., 1999; Craske, 2003). The link between alexithymia and psychological distress has already been explored in university students, most notably relating to the symptoms of

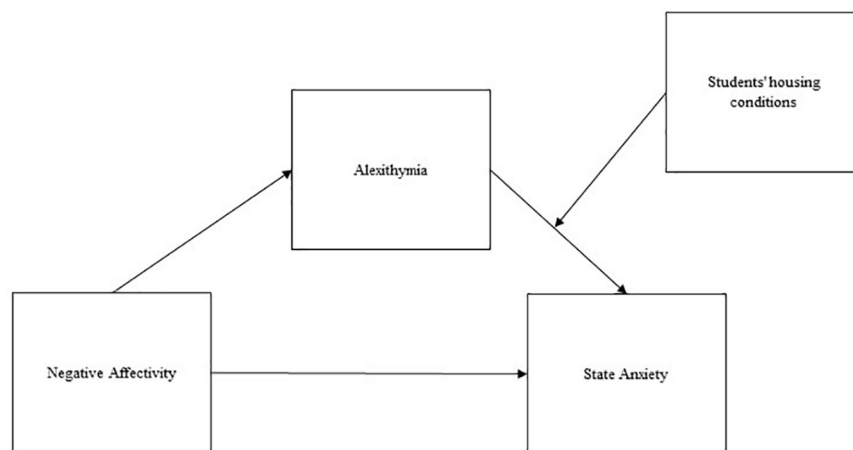


FIGURE 1 | Diagram for the hypothesized moderated mediation model: state anxiety.

depression and neuroticism (Morera et al., 2005; Liang and West, 2011), self-injurious behaviors (Paivio and McCulloch, 2004), and interpersonal problems (Vanheule et al., 2007).

Present Study

As far as we know, no study to date has investigated the relationship between negative affectivity, emotion regulation, and students' state and trait anxiety while taking into account their housing conditions.

We hypothesized that: (1) university students show high levels of distress, specifically anxiety (1a), depression (1b), and suicidal risk (1c); (2) students' state and trait anxiety is connected with other clinical features such as negative affectivity (2a) and alexithymia (2b), but also with contextual facets such as housing conditions (2c). We also hypothesized that alexithymia mediates the relationship between negative affectivity and anxiety. Previous research has already suggested this mediation effect, but as far as we know the model has not yet been tested on university students. In addition, since housing conditions have already been linked to anxiety by previous research, we decided to include them in our model as a moderator. Indeed, literature shows how alexithymia and negative affectivity are rarely, or only minimally, influenced by contextual variables (Mroczek and Kolarz, 1998; Luminet et al., 2007). Thus, our final hypothesis (3) was that the relationship between negative affectivity and anxiety is mediated by alexithymia, while housing conditions act as a moderator for the indirect effect of negative affectivity on anxiety through alexithymia. Our moderated mediation models tested are represented in **Figure 1** (for state anxiety) and **Figure 2** (for trait anxiety).

MATERIALS AND METHODS

Study Design and Participants

The present research was a descriptive, cross-sectional study. It was part of a wider study investigating psychological distress and

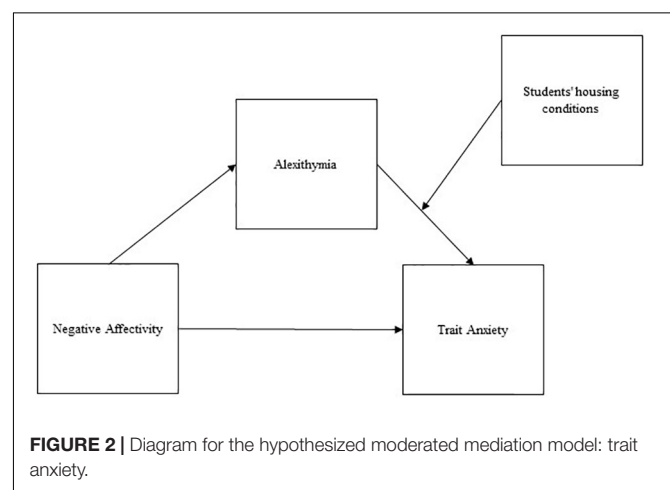


FIGURE 2 | Diagram for the hypothesized moderated mediation model: trait anxiety.

housing conditions among University of Turin (UniTo) students. The wider project included purposive sampling (Corbetta, 2015a,b) based on four housing conditions: students living with their family of origin, commuter students, non-resident students living in a university residence, and non-resident students not living in a residence. For each housing condition, the sampling target was to include an equal number of students attending courses pertaining to the three European Research Council (ERC) research domains: Social Sciences and Humanities (SH), Physical sciences and Engineering (PE), and Life Sciences (LS). This project is still ongoing. In the current research, we considered students' housing conditions by dividing them into two groups: resident students (students living with their family of origin and commuter students) and non-resident students (regardless of whether they lived in a university residence). Since the recruitment for the wider project is not yet concluded, for the present project we could not include an equal number of students for each of the three ERC research domains.

Students were recruited between October 2018 and December 2019.

Inclusion criteria were being students aged between 18 and 29 years (emerging adults) and attending UniTo Courses.

Exclusion criteria were having poor knowledge of the Italian language, being aged more than 29 years old and attending another tertiary education institution.

The enrollment was conducted through cooperation with professors, student representatives, departmental councils, and Heads of Departments. We reached 28 (41.8%) out of the 67 bachelor's degree courses and three (33.3%) out of the nine single-cycle master's degree courses available in UniTo. We emailed 128 professors, and 46 (35.93%) gave their availability to host a research presentation in their class. We had positive responses from 32 (25.0%) SH professors, 11 (8.60%) PE professors, and only three (7.03%) LS professors. Eight hundred and sixty-nine students declared their willingness to participate in the study. Among these, only 177 (20.36%) students agreed to be tested.

TABLE 1 | Socio-demographic characteristics of the sample.

	n	%	
Gender			
Males	51	28.8	
Females	126	71.2	
	M	SD	Range
Age	21.54	2.14	18–29
	n	%	
Marital status			
Not married	176	99.4	
Other	1	0.6	
Geographic origin			
Northern Italy	130	73.4	
Middle Italy	11	6.2	
Southern Italy	24	13.6	
Islands	9	5.1	
ND	3	1.7	
Occupation			
Unemployed	116	65.5	
Occasional worker	49	27.7	
Employee	11	6.2	
ND	1	0.6	
Erc domains			
SH	103	58.2	
PE	56	31.6	
LS	18	10.2	
Housing conditions			
Resident students	88	49.7	
Non-resident students	89	50.3	
Family income level			
Low	35	19.8	
Medium	113	63.9	
High	29	16.4	

Outcome Measures

The complete study included the administration of a questionnaire aimed at investigating socio-demographic characteristics and a pool of self-report questionnaires validated for the Italian population. In the present research, we consider only socio-demographic data and the scores obtained from the State-Trait Anxiety Inventory-Y (STAI-Y; Spielberger et al., 1983; Pedrabissi and Santinello, 1996), the Beck Depression Inventory-II (BDI-II; Beck et al., 1996; Ghisi et al., 2006), the Suicidal History Self-Rating Screening Scale (SHSS; Innamorati et al., 2011), the Personality Inventory for DSM-5-Brief Form (PID-5-BF; Fossati et al., 2013; Krueger et al., 2013), and the Toronto Alexithymia Scale-20 (TAS-20; Bagby et al., 1994; Bressi et al., 1996).

The administration was conducted at the university in the presence of a psychologist or a trained post-graduate psychology student. The average time of completion was 39.80 ± 9.86 min (range 20–77 min).

The STAI-Y is a 40-item self-report inventory aimed at assessing two types of anxiety symptoms: state anxiety (i.e., how a person in the current situation responds to perceived threat) and trait anxiety (i.e., the stable tendency to attend, experience, and report negative emotions such as fears, worries, and anxiety across many situations). Each of these dimensions comprises 20 non-overlapping trait facets. Participants are asked to rate how accurately each of the items describe them on a five-point scale (ranging from 1 = “almost never” to 4 = “almost always”). As suggested by previous research (e.g., Hart and McMahon, 2006; El Sawy, 2012), we used a cut-off of 40 to evaluate the presence or absence of state and trait anxiety. STAI-Y original version demonstrates good internal consistency (Cronbach's $\alpha = 0.90$) and test-retest reliability ($r = 0.70$, $p < 0.001$). For the Italian version, both state and trait scales demonstrate good internal consistency (Cronbach's $\alpha = 0.93$ and 0.88 , respectively) and test-retest reliability ($r = 0.49$ and 0.82 , respectively).

The BDI-II is a 21-item self-report questionnaire in which each item corresponds to a specific category of depressive symptoms and attitudes. Participants are asked to choose between four options for each item ranging from 0 to 3 (0 = “I do not feel sad”; 3 = “I am so sad or unhappy that I can't stand it”). Higher total scores indicate more severe depressive symptoms. Scores from 14 to 19 indicate mild depression, scores from 20 to 28 indicate moderate depression, and scores from 29 to 63 indicate severe depression. BDI-II demonstrates good internal consistency and test-retest reliability both in the original version (Cronbach's $\alpha = 0.91$; $r = 0.93$, $p < 0.001$), and in the Italian sample (Cronbach's $\alpha = 0.90$; $r = 0.85$; $p < 0.001$).

The SHSS is a 16-item measure assessing thoughts of death, suicidal ideation, and behavior. Participants are asked to answer eight yes/no questions concerning the last 12 months and eight yes/no questions concerning their lifetime except for the last 12 months. Higher total scores indicate more severe suicidal ideation, and scores > 8 indicate a risk for suicidal behavior. The SHSS was specifically developed and validated for Italian samples and demonstrates good internal consistency (Cronbach's $\alpha = 0.80$).

The TAS-20 is a 20-item self-reported measure of alexithymia. It has a three-factor structure: Difficulty in Identifying Feelings (DIF), Difficulty in Describing Feelings (DDF), and Externally Oriented Thinking (EOT). A TAS-20 total score ≥ 61 is considered indicative of alexithymia, whereas scores between 51 and 60 indicate borderline alexithymia. Participants are asked to rate how accurately each of the items describe them on a five-point scale (ranging from 1 = “completely disagree” to 5 = “completely agree”). TAS-20 demonstrates good internal consistency and test-retest reliability both in the original version (Cronbach's alpha = 0.81; $r = 0.77$, $p < 0.001$), and in the Italian validation (Cronbach's alpha = 0.82; $r = 0.86$; $p < 0.001$).

The PID-5-BF is a 25-item dimensional self-report measure assessing five broad pathological personality traits: Negative Affectivity (NA), Detachment (DE), Antagonism (A), Disinhibition (DI), and Psychoticism (P). Each of these five higher-order dimensions comprises five non-overlapping trait facets. Participants are asked to rate how accurately each item describes them on a four-point scale (ranging from 0 = “very false or often false” to 3 = “very true or often true”). The PID-5 demonstrates good internal consistency in Italian samples, with Cronbach's alpha values > 0.93 for all domain scales.

Statistical Analyses

Data analyses were conducted using the Statistical Package for the Social Sciences (SPSS; IBM Corp., Armonk, NY, United States) version 26. We calculated descriptive statistics and χ^2 -tests to get a preliminary description of the sociodemographic and clinical characteristics of the sample. Then we conducted Spearman, point-biserial, and Pearson correlations to get an initial overview of the variables to be included in our moderated mediation model. All tests were two-tailed, and we set the statistical significance threshold at $p \leq 0.05$. Finally, we conducted two moderated mediation analyses (one for State Anxiety and one for Trait Anxiety) using the PROCESS macro for SPSS (version 3.4.1; Hayes, 2018) using model 14. The direct and indirect effects were estimated using the Preacher and Hayes (2004) bias-corrected non-parametric bootstrapping techniques with 5,000 bootstrap samples. We used the mean center for the construction of products. As suggested by prior research (Settanni et al., 2018; Jin et al., 2019), the existence

of mediation and moderated mediation effects were further evaluated using 95% bias-corrected confidence intervals (CIs). If the CIs did not contain zero, these effects were considered statistically significant.

RESULTS

Sociodemographic and Clinical Characteristics of the Sample

As shown in Table 1, our final sample consisted of 177 UniTo students (71.2% females) with a mean age of 21.54 ($SD = 2.14$). Regarding demographic data, 99.4% of the students were not married, 130 students came from Northern Italy (73.4%), 11 from Middle Italy (6.2%), and 33 from Southern Italy or the Islands (8.7%). In total, 65.5% of the sample were unemployed, 63.9% of them had a medium family income level, and 50.3% were non-resident students. As reported in Table 2, the sample was evenly distributed among ERC domains and housing conditions ($\chi^2 = 1.042$; $p = 0.594$), and among family income level and housing conditions ($\chi^2 = 0.07$; $p = 0.967$).

Concerning psychological distress (Table 3), UniTo students showed state ($M = 40.67$; $SD = 12.35$) and trait ($M = 45.28$; $SD = 11.63$) anxiety. More specifically, 44.1% showed state anxiety, 61.6% showed trait anxiety, and 40.1% showed both. Both state and trait anxiety were normally distributed with a skewness of 0.66 ($SE = 0.18$) and 0.33 ($SE = 0.18$), respectively, and a kurtosis of -0.17 ($SE = 0.36$) and -0.61 ($SE = 0.36$), respectively. Our sample also showed minimal depressive symptoms ($M = 12.4$; $SD = 10.17$) with moderate to severe depression in 20.4% of cases. Depression was not normally distributed, with a skewness of 1.26 ($SE = 0.18$) and a kurtosis of 1.28 ($SE = 0.36$). SHSS shows a not-at-risk mean value ($M = 1.94$; $SD = 2.89$). However, 3.4% of the sample were at risk for suicidal behaviors. Suicidal risk was not normally distributed, with a skewness of 1.67 ($SE = 0.18$) and a kurtosis of 2.19 ($SE = 0.36$).

Regarding the other clinical characteristics of the sample (Table 3), students' mean scores suggest an overall absence of alexithymia ($M = 47.93$, $SD = 12.49$). However, 15.8% showed alexithymia, and 31.1% had borderline scores. Alexithymia was normally distributed, with a skewness of 0.12 ($SE = 0.18$)

TABLE 2 | χ^2 -tests.

	Resident students ($n = 88$)		Non-resident students ($n = 89$)		χ^2	p
	n	%	n	%		
ERC domains					1.042	0.594
SH	50	56.8	53	59.6		
PE	27	30.7	29	32.6		
LS	11	12.5	7	7.9		
Family income level					0.070	0.967
Low	17	19.3	18	20.2		
Medium	56	63.6	57	64.0		
High	15	17.0	14	15.7		

TABLE 3 | Clinical characteristics of the sample.

	<i>M</i>	<i>SD</i>	Range	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
STAI-Y state	40.67	12.35	20–76	0.66	0.18	−0.17	0.36
STAI-Y trait	45.28	11.63	23–73	0.33	0.18	−0.61	0.36
SHSS TOT	1.94	2.89	0–13	1.67	0.18	2.19	0.36
BDI-II TOT	12.4	10.17	0–47	1.26	0.18	1.28	0.36
TAS-20 TOT	47.93	12.49	21–85	0.12	0.18	−0.39	0.36
PID-5-BF-NA	1.38	0.63	0–3.2	0.10	0.18	−0.14	0.36
PID-5-BF-DE	0.75	0.57	0–2.4	0.60	0.18	−0.46	0.36
PID-5-BF-A	0.52	0.44	0–2.0	1.04	0.18	1.14	0.36
PID-5-BF-DI	0.85	0.5	0–2.4	0.49	0.18	0.12	0.36
PID-5-BF-P	0.75	0.67	0–3.0	0.93	0.18	0.48	0.36
PID-5-BF-TOT	0.88	0.47	0.12–0.46	2.89	0.18	21.47	0.36
n		%					
STAI-Y STATE LIV							
No state anxiety	99	55.9					
State anxiety	78	44.1					
STAI-Y TRAIT LIV							
No trait anxiety	68	38.4					
Trait anxiety	109	61.6					
BDI-II LIV							
Minimal depression	114	64.4					
Mild depression	27	15.3					
Moderate depression	21	11.9					
Severe depression	15	8.5					
SHSS RISK							
No	171	96.6					
Yes	6	3.4					
TAS-20 LIV							
Alexithymia	28	15.8					
Borderline alexithymia	55	31.1					
No alexithymia	94	53.1					

Trait anxiety					
		No trait anxiety		Trait anxiety	
		n	% tot	n	% tot
State anxiety	No state anxiety	61	34.5	38	21.5
	State anxiety	7	4.0	71	40.1

and a kurtosis of -0.39 ($SE = 0.36$). The level of personality impairment was mild ($M = 0.88$; $SD = 0.47$). Students were characterized by mild levels of negative affectivity ($M = 1.38$; $SD = 0.63$), psychoticism ($M = 0.75$; $SD = 0.67$), detachment ($M = 0.75$; $SD = 0.57$), disinhibition ($M = 0.85$; $SD = 0.67$), and antagonism ($M = 0.52$; $SD = 0.44$). The level of personality distress was not normally distributed, with a skewness of 2.89 ($SE = 0.18$) and a kurtosis of 21.47 ($SE = 0.36$), as well as antagonism, with a skewness of 1.04 ($SE = 0.18$) and a kurtosis of 1.14 ($SE = 0.36$). However, negative affectivity, detachment, disinhibition and psychoticism, with a skewness of 0.10 ($SE = 0.18$), 0.60 ($SE = 0.18$), 0.49 ($SE = 0.18$), and 0.93

($SE = 0.18$), respectively, and a kurtosis of -0.14 ($SE = 0.36$), -0.46 ($SE = 0.18$), 0.12 ($SE = 0.18$), and 0.48 ($SE = 0.36$), respectively.

Preliminary Analyses for the Moderated Mediation Model

As expected (see Table 4), negative affectivity correlated positively with alexithymia ($r = 0.432$; $p < 0.001$), state anxiety ($r = 0.505$; $p < 0.001$), and trait anxiety ($r = 0.675$; $p < 0.001$). At the same time, alexithymia showed a positive and significant correlation with state anxiety ($r = 0.414$; $p < 0.001$) and trait anxiety ($r = 0.563$; $p < 0.001$). In terms of the hypothesized

TABLE 4 | Pearson, point-biserial, and Spearman correlations.

	TAS-20 TOT	STAI-Y state	STAI-Y trait	PID AN	Age	Gender	Housing conditions
Pearson's correlations							
STAI-Y State	0.414**						
STAI-Y Trait	0.563**	0.727**					
PID AN	0.432**	0.505**	0.675**				
Age	−0.344**	−0.135	−0.208**	−0.227**			
Point-biserial correlations							
Gender	−0.038	0.090	0.139	0.188*	−0.160*		
Housing conditions	−0.116	−0.014	−0.036	−0.154*	0.131	−0.084	
Spearman's correlations							
Family income level	0.011	0.008	−0.036	−0.067	0.186*	0.005	−0.018

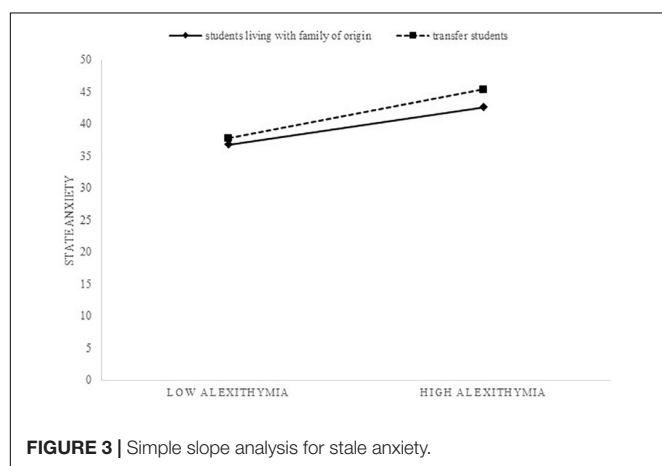
** $p < 0.01$, * $p < 0.05$.

TABLE 5 | Moderated mediation model analysis: first step.

Outcome variables	Independent variables	β	SE	t	p	95%CI
TAS-20-TOT						
	Constant	27.13	9.23	2.94	0.004	[8.91;45.35]
	PID_AN_M	7.96	1.35	5.92	<0.001	[5.31;10.62]
	Gender	−4.32	1.83	−2.36	0.019	[−7.92;−0.71]
	Age	−1.63	0.39	−4.15	<0.001	[−2.40;−0.85]

TABLE 6 | Moderated mediation model analysis: state anxiety.

Outcome variables	Independent variables	β	SE	t	p	95%CI
STAI-Y state	Constant	23.85	9.22	2.59	0.010	[5.65;42.05]
	PID_AN_M	80.2	1.44	5.57		[5.17;10.86]
	TAS-20 TOT	0.26	0.07	3.49		[5.18;10.86]
	Housing conditions	1.88	1.60	1.18	0.240	[−1.27;5.04]
	Int_1	0.07	0.13	0.54	0.593	[−0.184;0.320]
	Gender	0.92	1.82	0.51	0.61	[−2.67;4.50]
	Age	0.24	0.40	0.60	0.549	[−0.55;1.03]



covariates, negative affectivity correlated positively with gender ($r = 0.188$; $p = 0.012$) and negatively with age ($r = -0.227$; $p = 0.002$), alexithymia correlated negatively with age ($r = -0.344$; $p < 0.001$), and family income level positively correlated

only with age ($r = 0.186$; $p = 0.013$). Thus, in our final moderated mediation model, we decided to include only age and gender as covariates. Unexpectedly, housing conditions showed a significant correlation only with negative affectivity ($r = -0.154$; $p = 0.041$).

Moderated Mediation Analysis

The first regression analysis showed a significant positive effect of negative affectivity on alexithymia ($\beta = 7.96$, $SE = 1.35$, $p < 0.001$). We also found a negative and significant effect of gender ($\beta = -4.32$, $SE = 1.83$, $p = 0.019$) and age ($\beta = -1.63$, $SE = 0.39$, $p < 0.001$) on alexithymia. Altogether, the predictors explained 27% of the variance observed in alexithymia scores [$F(3, 173) = 21.75$, $p < 0.001$; see **Table 5**].

State Anxiety

As shown in **Table 6**, the second regression analysis showed a positive and significant effect of negative affectivity on state anxiety ($\beta = 8.02$, $SE = 1.44$, $p < 0.001$) and of alexithymia on state anxiety ($\beta = 0.26$, $SE = 0.07$, $p < 0.001$). However, student housing conditions was not a significant predictor of state anxiety

TABLE 7 | Direct and indirect effects of study variables: state anxiety.

	β	SE	95%CI
Direct effect of negative affectivity on state anxiety			
	8.02	1.4	[5.18;10.86]
	β	Bootstrap SE	Bootstrap 95%CI
Conditional indirect effects of negative affectivity on state anxiety via alexithymia at different housing conditions			
Resident students	1.78	0.93	[0.02;3.71]
Non-resident students	2.33	0.93	[0.81;4.46]
Index of moderated mediation			
	0.55	1.1	[1.48; 2.91]

($\beta = 1.88$, $SE = 1.60$, $p = 0.240$). Concerning the covariates, neither gender ($\beta = 0.92$, $SE = 1.81$, $p = 0.614$) nor age ($\beta = 0.24$, $SE = 0.40$, $p = 0.549$) were significant predictors of state anxiety. The indirect effect of alexithymia on state anxiety was not significant ($\beta = 0.07$, $SE = 0.13$, $p = 0.593$). Overall, the predictors explained 31% of the variance observed in state anxiety [$F(6, 170) = 12.84$, $p < 0.001$]. The inclusion of the interaction between alexithymia and housing conditions in the regression model led to a change in $R^2 = 0.001$ [$F(1, 170) = 0.29$, $p = 0.593$].

The simple slope analysis (see **Figure 3**) of the interaction model showed a significant positive relationship between alexithymia and state anxiety for both resident ($\beta = 0.22$, $SE = 0.10$, $p = 0.028$) and non-resident students ($\beta = 0.29$, $SE = 0.10$, $p = 0.002$). For resident students, the moderated mediation model was significant ($\beta = 1.78$, bootstrap $SE = 0.93$, bootstrap 95% CI = 0.02; 3.71) as well as for non-resident students ($\beta = 2.33$, bootstrap $SE = 0.93$, bootstrap 95% CI = 0.81; 4.46). Overall, the moderated mediation model was not significant ($\beta = 0.55$, bootstrap $SE = 1.11$, bootstrap 95% CI = -1.48; 2.91; see **Table 7**).

Trait Anxiety

As shown in **Table 8**, the second regression analysis shows a positive and significant effect of negative affectivity on trait anxiety ($\beta = 9.84$, $SE = 1.08$, $p < 0.001$) and alexithymia on trait anxiety ($\beta = 0.34$, $SE = 0.06$, $p < 0.001$). On the contrary, student housing conditions was not a significant predictor of trait anxiety ($\beta = 2.07$, $SE = 1.20$, $p = 0.086$). Concerning our covariates, neither gender ($\beta = 1.90$, $SE = 1.36$, $p = 0.166$) nor age ($\beta = 0.21$, $SE = 0.30$, $p = 0.488$) were significant predictors

of trait anxiety. The indirect effect of alexithymia on trait anxiety was not significant ($\beta = -0.14$, $SE = 0.10$, $p = 0.149$). Overall, the predictors explained 56% of the variance observed in trait anxiety [$F(6, 170) = 36.58$, $p < 0.001$]. The inclusion of the interaction between alexithymia and housing conditions in the regression model led to a change in $R^2 = 0.006$ [$F(1, 170) = 2.10$, $p = 0.149$].

The simple slope analysis (see **Figure 4**) of the interaction model showed a significant positive relationship between alexithymia and trait anxiety for both resident ($\beta = 0.41$, $SE = 0.08$, $p < 0.001$) and non-resident students ($\beta = 0.27$, $SE = 0.07$, $p < 0.001$). For students living with their family of origin, the model was significant ($\beta = 3.26$, bootstrap $SE = 0.77$, bootstrap 95% CI = 1.88; 4.90) as well as for non-resident students ($\beta = 2.15$, bootstrap $SE = 0.72$, bootstrap 95% CI = 0.98; 3.79). Overall, the moderated mediation model was not significant ($\beta = -1.11$, bootstrap $SE = 0.78$, bootstrap 95% CI = -2.61; 0.53; see **Table 9**).

DISCUSSION

This study investigated university students' distress, and in particular considered the potential relationship between negative affectivity, emotion regulation, and students' anxiety, taking into account their housing conditions.

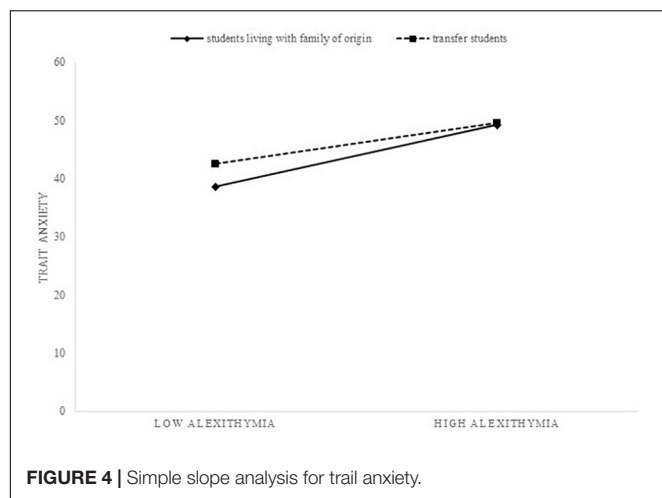
Consistent with previous studies from other European universities (Oksanen et al., 2017; Shankland et al., 2018; Çebi and Demir, 2019; Piumatti et al., 2019; Véron et al., 2019), UniTo students showed concerning levels of distress, confirming our first hypothesis.

In particular, UniTo students showed higher levels of both trait and state anxiety (hypothesis 1a) compared with adult workers and high school students in the Italian normative sample (Pedrabissi and Santinello, 1996). However, to our knowledge there are no normative Italian data on emerging adults. The percentages of students showing state anxiety, trait anxiety, or both are higher than those detected in other studies, although they relied on clinical data (Tran et al., 2017) or other self-report questionnaires (Ozen et al., 2010; Wörfel et al., 2016; Oyekcin et al., 2017).

Concerning depression (hypothesis 1b), our sample showed minimal depressive symptoms, as has other university student samples (Chen et al., 2013; Chun et al., 2013; Reyes-Rodríguez et al., 2013; Villatte et al., 2017). Consistent with previous literature, the prevalence of moderate and severe

TABLE 8 | Moderated mediation model analysis: trait anxiety.

Outcome variables	Independent variables	β	SE	T	p	95%CI
STAI-Y trait	Constant	25.79	6.92	3.73	<0.001	[12.14;39.44]
	PID_AN_M	9.84	1.08	9.12	<0.001	[7.71;11.97]
	TAS-20 TOT	0.34	0.06	6.12	<0.001	[0.23;0.45]
	Housing conditions	2.07	1.20	1.73	0.086	[-0.29;4.43]
	Int_1	-0.14	0.10	-1.45	0.149	[-0.33;0.05]
	Gender	1.90	1.36	1.39	0.166	[-0.79;4.58]
	Age	0.21	0.30	0.70	0.488	[-0.38;0.80]



depression among students is remarkable (Chen et al., 2013; Villatte et al., 2017).

Regarding the prevalence of both anxiety and depression, it would be interesting to replicate this study in other Italian universities and to evaluate the evolution of symptoms over time, since previous research suggests that their prevalence differs in different class years (Wörfel et al., 2016).

Regarding suicide (hypothesis 1c), our data indicate a lower suicidal risk than that detected in previous studies on university students, although this discrepancy could be attributable to the different outcome measures (Chesin and Jeglic, 2012; Oyekcin et al., 2017; Poorolajal et al., 2017; Torres et al., 2017). However, we cannot underestimate the risk for suicidal behaviors in 3.4% of the sample.

Regarding the other clinical characteristics of the sample, consistent with the literature, our data indicated a prevalence of no severe personality disorders in the student sample (Duroy et al., 2018; Abdi and Pak, 2019). Concerning alexithymia, as expected, students' mean scores also suggest no alexithymia, although a notable percentage of students showed alexithymic or borderline scores, indicating some difficulties in the emotion regulation process (Fang et al., 2019; Loftis et al., 2019).

Moving on to our second hypothesis, consistent with the literature (Picardi et al., 2005; Hofman et al., 2019), students' state and trait anxiety were positively connected with other clinical variables – negative affectivity (hypothesis 2a) and alexithymia (hypothesis 2b). Concerning the hypothesized covariates, consistent with the literature, negative affectivity was higher in females and younger students (Ortuno-Sierra et al., 2019; Elhai et al., 2020), while alexithymia was higher in younger students (Mattila et al., 2006; Moriguchi et al., 2007).

Contrary to the existing literature (Scimeca et al., 2014; Hamaideh, 2018), no association was found between alexithymia and gender. Unexpectedly, family income level was correlated only with age (Song and Kim, 2020). Thus, in our final moderated mediation model, we included only age and gender as covariates.

In relation to the contextual variables (i.e., housing conditions; hypothesis 2b), contrary to previous research, we did not find a significant correlation with student anxiety (Stroebe et al., 2015;

TABLE 9 | Direct and indirect effects of study variables: trait anxiety.

	β	SE	95%CI
Direct effect of negative affectivity on trait anxiety			
	9.84	1.08	[7.71;11.97]
	β	Bootstrap SE	Bootstrap 95%CI
Conditional indirect effects of negative affectivity on trait anxiety via alexithymia at different housing conditions			
Resident students	3.26	0.77	[1.88;4.90]
Non-resident students	2.15	0.72	[0.98;3.79]
Index of moderated mediation			
	-1.11	0.78	[-2.61;0.53]

Biasi et al., 2018). However, although housing conditions did not seem to be associated with alexithymia and anxiety, we proceeded with testing our moderated mediation model to explore whether they had an impact on the association or whether the connection between negative affectivity, alexithymia, and anxiety differed in the two housing conditions.

Concerning our moderated mediation models, in line with our third hypothesis, we found a significant positive effect of negative affectivity on alexithymia while controlling for age and gender. This is in line with previous research indicating that greater levels of negative affectivity are associated with greater alexithymia (Suslow and Donges, 2017) and suggesting that the manner in which emotions are experienced determines, to some extent, the ability to regulate emotions and the degree to which one attempts to control and avoid them (Lynch et al., 2001; Suveg et al., 2009).

Concerning anxiety, the findings supported our hypothesis that alexithymia mediates the association between negative affectivity and both state and trait anxiety while controlling for age and gender. Such findings are compatible with prior research indicating that negative affectivity is positively associated with emotion regulation strategies (Naragon-Gainey et al., 2018; Malesza, 2019) and that emotion regulation strategies can help with modulating anxiety (Craske, 2003; Lonigan and Vasey, 2009). The current study brings these facets together, demonstrating the pathway from negative affectivity to state and trait anxiety via alexithymia. However, the results did not confirm our hypothesis that students' housing conditions have a significant impact on anxiety. For both resident and non-resident students, students with lower alexithymia are characterized by lower anxiety.

Further research is needed to explore whether housing conditions are a significant factor relating to student anxiety in UniTo students and also in other Italian samples. Moreover, it would be interesting to explore whether differences can be observed if we consider not only resident vs. non-resident students but more specific housing conditions such as those of students living with their family of origin, commuter students, non-resident students in university residences, and other non-resident students.

In a time when educational systems all over the world have recently increased their concern for the mental health and

emotional well-being of university students (Cvetkovski et al., 2018), our results suggest the importance of stable clinical variables in students' distress and of not only focusing on contextual facets of their daily lives.

Undoubtedly, university lifestyle can be demanding, but experiencing distress is not inevitable nor inexplicable. Previous research has tried to identify factors associated with university students' distress, aiming at using them to inform prevention and clinical interventions. However, as noted by Sharp and Theiler (2018), although socio-demographic, contextual, and academic variables have been widely explored, suggesting the need for interventions addressed to at-risk students, the importance of students' personality and clinical characteristics has been underestimated. Nevertheless, these characteristics can be of extreme importance both in targeting interventions and in training health professionals who administer those interventions. Moreover, institutional practices and governmental policies that can influence the student experience need to be considered and deserve further consideration (Byrd and McKinney, 2012).

Limitations and Future Directions

This study has some critical limitations. First of all, the generalizability of the results is limited by our small, Italian-only sample from only one university. Second, the cross-sectional design does not allow for causal inferences. For this reason, we should be cautious in interpreting the present findings as supporting the existence of predictive links between the studied variables. Further longitudinal studies are needed to explore the development of university students' distress over time and its association with other clinical and social variables. Moreover, psychological variables were assessed through self-report measures and, as such, further studies should also consider clinical and observational data.

Clinical Implications

Despite these limitations, the present study is the first attempt to obtain insight into Italian University students' distress, focusing on state and trait anxiety and their connections with both clinical facets (i.e., negative affectivity and emotional regulation) and contextual facets (i.e., student housing conditions). The difficulties university students face are a matter of public concern. Thus, our results can be useful for both professional and clinical or educational institutions since it is well known that students experiencing higher psychological distress show a higher risk of academic failures and drop-out (Jaisoorya et al., 2017;

Ishii et al., 2018). Such evidence strongly suggests the need to adopt an integrated approach toward university students to alleviate their psychological distress, and to improve the development of preventative and therapeutic interventions tailored to the clinical characteristics of students, as well as taking their living environment into account.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The study was reviewed and approved by the Institutional Review Board (IRB) of the University of Turin (prot. n. 162317 of the 4/19/2018). All participants were given a complete description of the study and gave informed written consent before entering the study. All research procedures were conducted in accordance with the ethical standards of the committees responsible for human experimentation (institutional and national) and with the Helsinki Declaration of 1975 (as revised in 2000). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

IF contributed to the study design, the analysis and interpretation of data, the drafting and critical revision of the manuscript. MS contributed to the analysis and interpretation of data and drafting the manuscript. AG contributed to the interpretation of data, making an important clinical, and intellectual contribution. All authors approved the final version of the manuscript to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work were appropriately investigated and resolved.

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Impostors Dare to Compare: Associations Between the Impostor Phenomenon, Gender Typing, and Social Comparison Orientation in University Students

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Entering university is often associated with new surroundings and challenges, which can cause distress and might result in poor mental health. A phenomenon that was shown to be linked to low self-esteem, higher stress levels, anxiety, and depression in university students is the impostor phenomenon. Impostorism is defined as a conviction to be unintelligent despite one's academic success and was found to be closely associated with psychological femininity in previous studies. Research has also shown that people who experience higher stress levels, self-doubts, and a low self-esteem tend to engage in social comparison processes more often. Therefore, the present study aimed to explore the relationship between gender typing and impostor feelings and to investigate a possible influence of social comparison orientation on the aforementioned association. For this purpose, 278 university students (73.7% women) completed an online questionnaire. Gender typing was measured using an instrument assessing positive and negative aspects of masculinity and femininity to overcome conceptual limitations of previous studies. For social comparison processes, the general tendency to engage in social comparisons was measured. Of the participants, 8.6% experienced few, 40.3% moderate, 38.5% frequent, and 12.6% intense impostor feelings, which indicates that the impostor phenomenon is highly prevalent in university students. One of the key findings of this study concerns the association between gender typing and the impostor phenomenon. We found a moderate negative relationship between the impostor phenomenon and positive masculinity but no association with negative masculinity. In contrast, impostorism was strongly correlated with negative aspects of femininity but not at all with positive aspects of femininity. The relationship between negative femininity and impostorism was further found to be partially mediated by social comparison orientation. Social comparison orientation, however, was not found to mediate the association between positive masculinity and impostorism. This result

indicates that individuals who identify with negative aspects of femininity tend to compare themselves to others more often, which is associated with stronger impostor feelings. Based on the results, we discuss possible interventions to reduce psychological distress among university students.

Keywords: impostor phenomenon, gender typing, femininity, masculinity, social comparison, undergraduate students, university

INTRODUCTION

University is a place where one has to perform and where one's academic achievement is constantly evaluated. Because of this, many students can feel pressured and consequently experience high stress levels, which can have detrimental effects on their health. As highlighted in the review by Sharp and Theiler (2018), psychological distress is a huge issue among university students worldwide and is more prevalent in university students than in the general population. Moreover, psychological stress among university students was found to be linked to problematic health behaviors, like binge drinking, heavy cigarette smoking, and self-harm. A phenomenon that is especially relevant for explaining psychological distress in university students is the impostor phenomenon.

Clance and Imes (1978), two psychotherapists who worked with high-achieving women in academia, first coined the term "impostor phenomenon" (IP) after having noticed that many of their clients experienced massive self-doubts and lived in constant fear of being exposed as intellectual impostors. The clinical symptoms that accompany the IP are "generalized anxiety, lack of self-confidence, depression, and frustration related to inability to meet self-imposed standards of achievement" (Clance and Imes, 1978, p. 242). Moreover, emotional instability, perfectionism, negative self-evaluation (Rohrmann et al., 2016), and low conscientiousness (Bernard et al., 2002) are linked to the IP. Most importantly, the IP is characterized by dysfunctional thinking patterns and attributional styles: Individuals suffering from impostor feelings are convinced to be unintelligent despite their intellectual achievements, a belief that can be explained by an inability to internalize success (Sonnak and Towell, 2001; Bernard et al., 2002). More specifically, IP sufferers explain their accomplishments by external factors, such as luck, charm, or temporary variable internal factors, e.g., excessive effort (Clance and Imes, 1978). Consequently, they experience a persistent fear that others might eventually realize that they are actually frauds and start to see them as what they really are inadequate and not intelligent enough (Leary et al., 2000). According to Clance and Imes (1978), this thinking pattern is maintained by the impostor phenomenon cycle, which is initiated when being confronted with a new task. Usually, the reaction to a new task is to either start (over)preparing immediately or to procrastinate and do the work last minute. In case of having completed the task successfully, the former strategy triggers IP sufferers to believe that they need to overexert in comparison to others (Clance et al., 1995) and that their success is only due to disproportionate effort (Leonhardt et al., 2017). The latter strategy, however, leads

them to believe that they have fooled others (Clance et al., 1995), that they are not able to meet their own standards (Leonhardt et al., 2017), and that their success is due to luck (Clance and Imes, 1978). Thus, people with impostor feelings form a strong association between strain, negative emotions, and success (Clance et al., 1995). As the university context is characterized by a culture of permanent evaluation, and students frequently face new and unfamiliar tasks (Jöstl et al., 2012), it is not surprising that the IP is highly prevalent among university students. More specifically, 40–50% of students experience frequent impostor feelings (Thompson et al., 1998, 2000; Sonnak and Towell, 2001; Patzak et al., 2017).

Initially, the IP was assumed to be a distinctively female experience. Clance and Imes (1978) explained the high prevalence of IP in successful women in academia by the persisting societal gender stereotype of women not being competent or even brilliant (Broverman et al., 1972; Bian et al., 2017). They concluded that their clients had internalized this stereotype and thus, in order to protect their femininity, needed to attribute their success to external causes or temporary internal qualities instead of inherent ability. Since then, many studies have examined the link between gender and the IP. The results, however, have been equivocal. While some studies did not find any gender differences in the IP among college and university students (Cowman and Ferrari, 2002; Cokley et al., 2013), others found that women suffer more from impostor feelings than men do (King and Cooley, 1995; Kumar and Jagacinski, 2006; McGregor et al., 2008; Cokley et al., 2018). In all of these studies, gender differences were investigated by simply comparing the IP scores of women to those of men while not considering gender typing. The term gender typing (or sex typing) refers to the extent to which an individual identifies with stereotypically masculine and feminine characteristics (Kagan, 1964). Since the development of the Bem Sex-Role Inventory (Bem, 1974), femininity and masculinity are considered two independent dimensions, the former being an expressive orientation and the latter being an instrumental orientation. As gender typing is considered to be more influential than gender itself with regard to psychological functioning (Bem, 1974), it provides a high informative value for psychological phenomena like the IP. Therefore, in recent years, some studies investigating gender differences in the IP also examined the effect of gender typing (September et al., 2001; Patzak et al., 2017). However, the findings have been equivocal, too. While Patzak et al. (2017) found femininity to be related to higher IP scores and masculinity to be related to lower IP scores, September et al. (2001) found both masculinity and femininity to be associated with lower IP scores, the

former with a larger effect size than the latter. Berger and Krahé (2013) revised and expanded Bem's frequently used sex-role inventory—consisting of desirable attributes only—by including negative attributes which are seen as typical for men and women. This expansion was based on the reasonable argument that a person's self-concept does not solely consist of positive traits. Therefore, considering only positive qualities in the assessment of gender typing might be too narrow. The newly developed questionnaire (PN-SRI, Berger and Krahé, 2013) considers four dimensions—positive femininity, negative femininity, positive masculinity, and negative masculinity—and thus enables a more comprehensive assessment of gender typing than previous instruments. So far, no studies have investigated the relationship between the IP and positive and negative facets of femininity and masculinity. In order to gain a better and more comprehensive understanding of the relationship between the IP and gender typing, the first aim of the present study is to examine this association.

Research Question 1: How do positive and negative facets of gender typing relate to the IP?

As some attributes constituting negative femininity (e.g., self-doubting or anxious) bear analogy to the symptoms IP sufferers experience (e.g., generalized anxiety or lack of self-confidence; Clance and Imes, 1978), we expect a positive relationship between negative femininity and the IP. In line with Patzak et al. (2017) and September et al. (2001), we also expect a negative association of positive masculinity and the IP. Regarding positive femininity, there are equivocal findings—one study found a small positive relationship with the IP (Patzak et al., 2017) while another study found a small negative association (September et al., 2001). For negative masculinity, no empirical findings exist, yet. Therefore, regarding the associations of the IP and negative masculinity as well as positive femininity, there is no base for proposing clear hypotheses.

In line with the impostor cycle, a recent study has shown that the working style of impostors, i.e., procrastination or over-preparation, can result in greater strain and higher stress levels (Rohrmann et al., 2016). The high stress levels people suffering from the IP experience might also lead to a higher tendency to engage in social comparison processes. Festinger (1954) coined the term “social comparison” and stated that individuals are always looking for information about themselves and, therefore, experience an innate drive for self-evaluation. In general, people preferably use objective information for self-evaluation. However, if no objective information is available, a shift of focus occurs, and the needed information is gathered by comparing one's opinions and abilities to those of others. Even though it is still believed that social comparison is an important source of information about the self (Schneider and Schupp, 2014), additional motives for social comparison processes were identified, namely, self-improvement and self-enhancement (Gibbons and Buunk, 1999). Gibbons and Buunk (1999) modified the social comparison theory by introducing the concept of social comparison orientation (SCO) based on the assumption that individuals differ in the extent and the frequency in which they engage in social comparison processes. According to Gibbons and Buunk (1999), people with a high

SCO engage in comparison processes more often and tend to be more empathetic and self-conscious, i.e., are “particularly aware of themselves” (Buunk and Gibbons, 2006, p. 18). They also revealed that SCO correlates with low self-esteem and neuroticism (Buunk and Gibbons, 2006). Moreover, Ybema and Buunk (1995) highlighted that social comparisons are facilitated by stress. One can summarize that individuals engage more often in social comparisons when they have self-doubts and a low self-esteem and are stressed (Festinger, 1954; Taylor et al., 1990; Ybema and Buunk, 1995). As the IP can be predicted by low self-esteem (Sonnack and Towell, 2001) and is usually accompanied by symptoms, such as higher stress levels, emotional instability (Rohrmann et al., 2016), and a lack of self-confidence (Clance and Imes, 1978), one can assume that people suffering from impostor feelings also tend to compare themselves more often, i.e., have a stronger social comparison orientation. This assumption is also supported by Pauline Clance's description of a typical IP sufferer as comparing “herself to others, emphasizing their strengths and her own deficits, while minimizing weakness in others and power in herself” (Clance et al., 1995, p. 80). So far, only one study investigated the relationship between the IP and SCO. In this study, Chayer and Bouffard (2010) examined differences in SCO and their relation to the IP among 10- to 12-year-old students. Overall, the results revealed a medium correlation between SCO and the IP. In addition, Gibbons and Buunk (1999) found women to report higher levels of SCO than men. As gender typing is closely linked to gender (Wood and Eagly, 2009) and seems to be more influential than gender regarding psychological functioning (Bem, 1974), the gender difference in SCO might be explained by differences in gender typing. Moreover, some traits constituting negative femininity, e.g., self-doubts and anxiety, were already shown to facilitate social comparison processes (Festinger, 1954). Based on this, a relationship between gender typing, SCO, and the IP seems plausible. However, to our knowledge, no studies have yet investigated the relationship between these constructs. In the present study, we therefore aim to explore this possible interrelation.

Research Question 2: Is the relationship between gender typing and the IP mediated by SCO?

Gender typing is assumed to be associated not only with the IP but also with SCO as women were found to report a higher tendency to engage in social comparison (Gibbons and Buunk, 1999). Building on findings among schoolchildren (Chayer and Bouffard, 2010), SCO is expected to be related to the IP also among university students. Taken together, we assume SCO to be a mediating factor of the proposed association between gender typing and the IP in the sense that positive masculinity is associated with a lower tendency to engage in social comparisons, which is associated with lower IP scores, while negative femininity is related to higher SCO and in turn to higher IP scores.

As no study so far has investigated the associations of the IP, gender typing, and SCO among adults, the present study aimed at exploring this interrelatedness. More specifically, in a first step, we aimed at exploring how positive and negative aspects of femininity and masculinity are associated with feelings of fraudulence. Secondly, an understanding of whether SCO

mediates the assumed relationship between gender typing and the IP was aimed at.

MATERIALS AND METHODS

Participants and Procedure

The participants of the present study were recruited via groups related to universities, studies, or subjects on the social media platform Facebook. The study invitation informed possible participants about the topic of the study being social processes in everyday university life. Moreover, it stated that completing it would take approximately 15 min and that participants had a chance to win a 20€ voucher. The final sample consisted of $n = 278$ university students from Austria (82.7%) and Germany (15.1%). 2.2% of the participants indicated to study at other universities than the aforementioned. Two participants noted that this was due to them spending a semester abroad. Most of the participants were bachelor students (74.5%), followed by master students (14.4%), diploma students (10.1%), and Ph.D. students (1.1%). 73.7% of the participants were women. The age ranged from 18 to 51 years ($M = 23.42$, $SD = 4.42$). 94.6% of the participants were between 18 and 30 years of age. All data was collected via soscisurvey.de—a website for creating online questionnaires (Leiner, 2019). The mean duration of the study was $M = 9.65$ min ($SD = 3.78$). Before completing the questionnaire, the participants were asked to give their informed consent and were reminded of the voluntary nature of their participation. All scales, as well as all items, were presented in randomized order to eliminate order bias.

Measures

Impostor Feelings

The German version of the Clance Impostor Phenomenon Scale (GCIPS; Klinkhammer and Saul-Soprún, 2009) was used to measure the impostor phenomenon. The GCIPS consists of 20 statements (e.g., “I rarely do a project or task as well as I’d like to do it,” “I have often succeeded on a test or task even though I was afraid that I would not do well before I undertook the task.”). Participants were asked to indicate the degree of agreement on a 5-point Likert scale ranging from 1 (*not at all true*) to 5 (*very true*). Higher scores indicate higher levels of the impostor phenomenon. The internal consistency of the GCIPS was Cronbach’s $\alpha = 0.90$.

Gender Typing

To assess participants’ gender typing, the Positive–Negative Sex-Role Inventory (PN-SRI; Berger and Krahé, 2013) was used. The PN-SRI is composed of four subscales: the positive masculinity subscale (MAS+, e.g., “I am rational”), the negative masculinity subscale (MAS-, e.g., “I am harsh”), the positive femininity subscale (FEM+, e.g., “I am empathic”), and the negative femininity subscale (FEM-, e.g., “I am anxious”). Each of the subscales consists of six items, leading to a total of 24 items. The participants were asked to rate how characteristic each attribute is for them on a 6-point Likert scale ranging

from 1 (*not at all true*) to 6 (*completely true*). The scores are calculated for each subscale. Each score indicates to what extent one ascribes oneself desirable or undesirable qualities that are considered stereotypically masculine or feminine. The internal consistencies of the four subscales were determined using Cronbach’s α : $\alpha_{MAS+} = 0.80$, $\alpha_{MAS-} = 0.82$, $\alpha_{FEM+} = 0.87$, and $\alpha_{FEM-} = 0.77$.

Social Comparison Orientation

The tendency to engage in social comparisons, i.e., the social comparison orientation, was assessed using the German short version of the Iowa–Netherlands Comparison Orientation Measure (INCOM; Schneider and Schupp, 2014). It consists of six items in total. Three items deal with comparing one’s abilities (e.g., “I always pay a lot of attention to how I do things compared with how others do things.”) and three with comparing one’s opinions (e.g., “I often try to find out what others think who face similar problems as I face.”). Respondents were asked to indicate their level of agreement on a 5-point Likert scale ranging from 1 (*I disagree strongly*) to 5 (*I agree strongly*). Higher scores indicate a higher tendency to engage in social comparisons. As suggested by Schneider and Schupp (2014), an overall score of the scale was computed due to high correlations between the latent constructs ($r = 0.64$, $p < 0.001$). Cronbach’s α for the German short version of the INCOM was 0.78.

Data Analysis

In the first step, a regression model (Darlington and Hayes, 2016) was estimated to investigate relationships between positive and negative facets of gender typing and impostor feelings (Research Question 1). In the second step, we estimated a mediation model (MacKinnon and Tofghi, 2013) in order to investigate relationships between positive and negative facets of gender typing and social comparison orientation, the relationship between social comparison orientation and impostor feelings, and the indirect effects of positive and negative facets of masculinity and femininity on impostor feelings via social comparison orientation (Research Question 2).

Statistical analyses were conducted using Mplus version 8.3 (Muthén and Muthén, 1998). Model parameters were estimated using maximum likelihood method. Statistical significance of the direct and indirect effects was tested using bias-corrected bootstrapping confidence intervals based on 10,000 bootstrap draws.

RESULTS

Descriptive Statistics and Preliminary Analyses

Correlation coefficients, means, and standard deviations for all variables are shown in **Table 1**. According to the cutoff scores recommended by Klinkhammer and Saul-Soprún (2009), 8.6% of the participants experienced few, 40.3% moderate, 38.5% frequent, and 12.6% intense impostor feelings. The overall sum score of the intensity of experienced impostor feeling was 61.20 ($SD = 15.18$), and the overall

TABLE 1 | Descriptive statistics and preliminary analyses: bivariate correlations, means, and standard deviations.

Variable	1	2	3	4	5	6
1. Positive masculinity	–	–	–	–	–	–
2. Negative masculinity	0.12	–	–	–	–	–
3. Positive femininity	–0.03	–0.28	–	–	–	–
4. Negative femininity	–0.26	0.09	0.08	–	–	–
5. Social comparison orientation	–0.07	0.02	0.10	0.45	–	–
6. Impostor feelings	–0.27	0.04	0.02	0.67	0.45	–
<i>M</i>	4.38	2.20	4.68	3.46	3.61	3.06
<i>SD</i>	0.85	0.90	0.88	1.02	0.81	0.76

N = 278. Gender-typing scores range from 1 to 6, with higher values indicating stronger self-ascription of characteristics; Social Comparison Orientation Judgments range from 1 to 5, with higher scores indicating a stronger tendency to engage in social comparison processes. Impostor feelings scores range from 1 to 5, with higher scores indicating higher levels of impostor feelings. Statistically significant results at $\alpha = 0.05$ are in boldface.

mean score was 3.06 (*SD* = 0.76). The results show that impostor feelings are negatively correlated with positive masculinity ($r = -0.27$) and positively correlated with negative femininity ($r = 0.67$) and social comparison orientation ($r = 0.45$). No statistically significant correlations were found for impostor feelings with negative masculinity and positive femininity. Social comparison orientation was positively correlated with negative femininity ($r = 0.45$). No statistically significant correlations were found for social comparison orientation with positive masculinity, negative masculinity, and positive femininity.

Gender Typing and IP

The results of the regression model indicate a negative relationship between positive masculinity and impostor feelings ($\hat{\beta} = -0.09$, 95% CI $[-0.17, 0.00]$) and a positive relationship between negative femininity and impostor feelings ($\hat{\beta} = 0.49$, 95% CI $[0.42, 0.56]$) while statistically controlling for all other facets of femininity and masculinity (Research Question 1). Negative masculinity and positive femininity, however, are not related to impostor feelings. The regression model explained 46.3% of the variance in impostor feelings (see Table 2).

Gender Typing, SCO, and Impostor Feelings

The mediation model shows a positive relationship between negative femininity and social comparison orientation ($\hat{\beta} = 0.37$, 95% CI $[0.27, 0.46]$) while statistically controlling for all other facets of gender typing. All other facets of gender typing are not related to social comparison orientation. As expected, the results reveal a positive relationship between social comparison orientation and impostor feelings ($\hat{\beta} = 0.19$, 95% CI $[0.09, 0.28]$). As a result, an indirect effect was found for negative femininity on impostor feelings via social comparison orientation ($\hat{\beta} = 0.07$, 95% CI $[0.03, 0.12]$) while statistically controlling for all other effects (Research Question 2). Indirect effects for all other components of gender typing were statistically not significant. The direct effect of negative

femininity on impostor feelings controlling for the indirect effect was statistically significant ($\hat{\beta} = 0.42$, 95% CI $[0.35, 0.50]$) indicating a partial mediation effect. The mediation model explained 20.7% of the variance in social comparison orientation and 49.4% of the variance in impostor feelings (see Table 3 and Figure 1).

DISCUSSION

The present study aimed at gaining insights into the interplay of the IP, gender typing, and SCO. In the past, each of the aforementioned constructs has been studied intensely separately. However, previous studies have not investigated their interrelationship, yet. Aligning with prior research, the current study confirms that impostor feelings are highly prevalent among university students as only 8.6% of the participants experienced

TABLE 2 | Regression model results: relationship between positive and negative facets of masculinity and femininity and impostor feelings.

Model	Est. (SE)	95% CI	Std. Est.
Positive masculinity	–0.09 (0.04)	$[-0.17, 0.00]$	–0.10
Negative masculinity	–0.02 (0.04)	$[-0.10, 0.06]$	–0.03
Positive femininity	–0.04 (0.04)	$[-0.12, 0.04]$	–0.05
Negative femininity	0.49 (0.04)	$[0.42, 0.56]$	0.65

N = 278; $R^2 = 0.46$; 95% CI = 95% confidence interval. Statistically significant results at $\alpha = 0.05$ are in boldface.

TABLE 3 | Mediation model results: relationship between positive and negative facets of masculinity and femininity and impostor feelings mediated by social comparison orientation.

Independent variable	Mediating variable	Dependent variable	Est. (SE)	95% CI	Std. Est.
Individual components of the indirect effect					
MAS+	SCO	–	0.05 (0.06)	$[-0.06, 0.17]$	0.05
MAS-	SCO	–	–0.02 (–0.05)	$[-0.12, 0.09]$	–0.02
FEM+	SCO	–	0.05 (0.05)	$[-0.04, 0.16]$	0.06
FEM-	SCO	–	0.37 (0.05)	$[0.27, 0.46]$	0.46
–	SCO	IP	0.19 (0.05)	$[0.09, 0.28]$	0.20
Indirect effect					
MAS+	SCO	IP	0.01 (0.01)	$[-0.01, 0.04]$	0.01
MAS-	SCO	IP	0.00 (0.01)	$[-0.03, 0.02]$	0.00
FEM+	SCO	IP	0.01 (0.01)	$[-0.01, 0.03]$	0.01
FEM-	SCO	IP	0.07 (0.02)	$[0.03, 0.12]$	0.09
Direct effect controlling for the indirect effect					
MAS+	–	IP	–0.09 (0.04)	$[-0.18, -0.02]$	–0.11
MAS-	–	IP	–0.02 (0.04)	$[-0.10, 0.06]$	–0.02
FEM+	–	IP	–0.05 (0.04)	$[-0.13, 0.03]$	–0.06
FEM-	–	IP	0.42 (0.05)	$[0.35, 0.50]$	0.56

N = 278; $R^2_{SCO} = 0.21$; $R^2_{IP} = 0.49$; MAS+ = positive masculinity; MAS- = negative masculinity; FEM+ = positive femininity; FEM- = negative femininity; SCO = social comparison orientation; IP = impostor feelings; Est. = unstandardized parameter estimate; SE = standard error; 95% CI = 95% bias-corrected bootstrap confidence interval; std. est. = standardized estimate. Statistically significant results at $\alpha = 0.05$ are in boldface.

few impostor feelings while 51.1% experienced frequent or intense impostor feelings. This becomes even more apparent when looking at the overall mean score of the IP, which indicates that on average our sample experienced frequent impostor feelings (Klinkhammer and Saul-Soprun, 2009). This finding is relevant for research on distress among university students since the IP might explain many aspects that have been studied in this context: perfectionism, anxiousness, unfavorable goal orientations, or dysfunctional attribution types. Thus, constructs related to impostor feelings might be productive starting points of interventions for distress in a student population. Therefore, future research investigating distress in a university context should consider the experience of impostor feelings as a possible explanation.

Our first research question concerned the association of gender typing and the IP. Although gender differences in the IP often have been reported, only few studies have investigated the role of gender typing for impostorism (September et al., 2001; Patzak et al., 2017). Gender typing is conceptualized as being more informative than gender with regard to explaining psychological phenomena (Bem, 1974) and studies investigating its relationship to the IP found that impostor feelings are better

explained by gender typing than gender itself (Patzak et al., 2017). More specifically, it was found that people with low masculinity are likely to experience impostor feelings whereas people with high masculinity are not. Previous studies assessed gender typing using instruments that only considered positive facets of masculinity and femininity. However, notions of femininity and masculinity are based not only on positive traits but also on negative ones (Berger and Krahé, 2013). Therefore, in this study, we reexamined the established relationship between gender typing and the IP using an instrument that measures positive and negative aspects of gender typing. In line with Patzak et al. (2017), we found gender typing to explain more than 46% of the variance in impostor feelings. Moreover, like previous studies (September et al., 2001; Patzak et al., 2017), we found a moderate negative relationship between positive masculinity and impostorism indicating that the more students attribute positive aspects of masculinity (e.g., practical, rational) to themselves, the less they suffer from the IP. In contrast, negative masculinity (e.g., arrogant, inconsiderate) was not found to be associated with impostor feelings. As expected, the results indicated a strong positive relationship between negative femininity (e.g., anxious, disoriented) and impostor

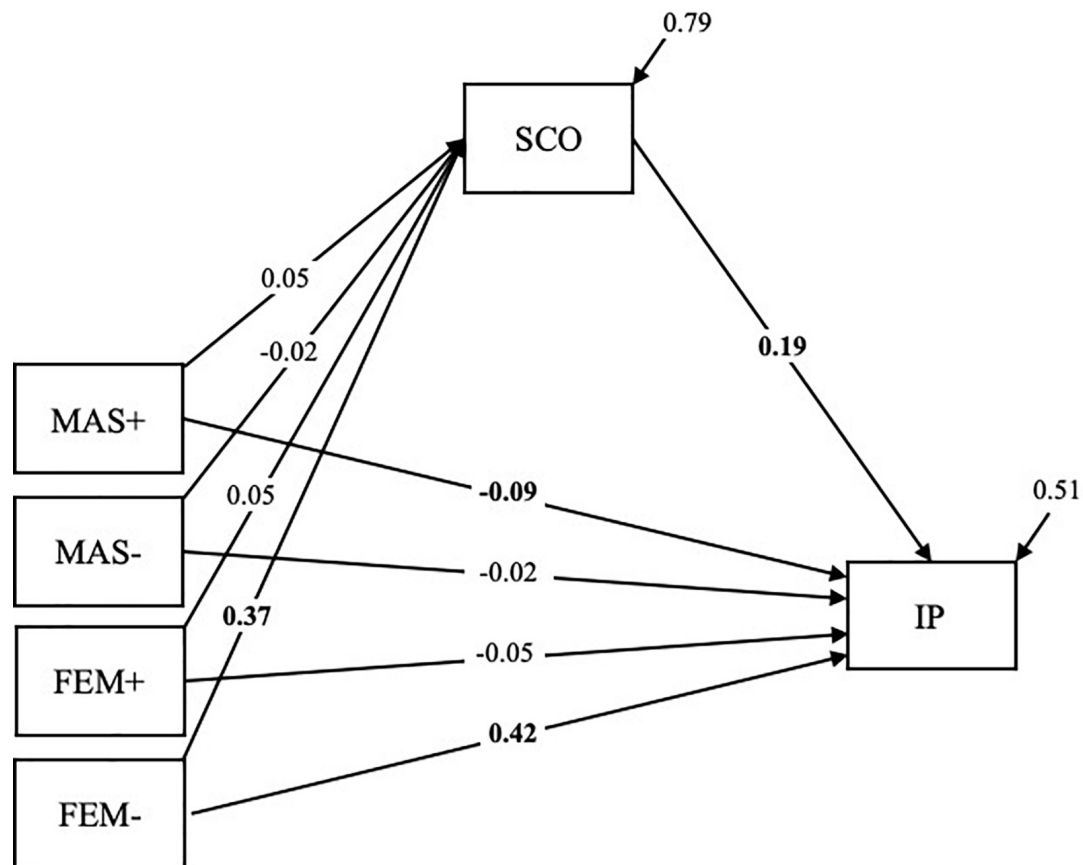


FIGURE 1 | Relationship between positive and negative facets of masculinity and femininity and impostor feelings mediated by social comparison orientation. MAS+ = positive masculinity; MAS- = negative masculinity; FEM+ = positive femininity; FEM- = negative femininity; SCO = social comparison orientation; IP = impostor feelings. Unstandardized estimates. Statistically significant results at $\alpha = 0.05$ are in boldface.

feelings. Interestingly, however, no significant relationship was found between positive femininity (e.g., emotional, sensitive) and the IP. This contradicts previous findings which indicated that a self-ascription of femininity relates to stronger impostor feelings (Patzak et al., 2017). The dimensions usually seen as stereotypically feminine are communion, warmth, or expressivity (Kite et al., 2008) and are depicted in positive femininity. Thus, the current data leads us to believe that impostor feelings are not per se related to feminine gender typing but rather to the self-ascription of attributes constituting negative femininity. Interestingly, the characteristics of negative femininity closely resemble some facets of neuroticism, i.e., anxiety, depression, self-consciousness, and vulnerability (Costa and McCrae, 1992). Thus, it would be worth investigating the relationship between gender typing and neuroticism and its association to the impostor phenomenon in future studies. Another aspect worth exploring is the analysis of the PNSRI scores within Bem's (1974) gender typology. Bem's gender typology consists of feminine, masculine, and androgynous gender types that are created from scores of the two BSRI scales. This characterization is of relevance with regard to the impostor phenomenon as it was shown that androgynous people experience feelings of fraudulence less frequently (September et al., 2001; Patzak et al., 2017). Therefore, it can be assumed that androgyny functions as a resilience factor against the IP. As a person's self-concept consists of not only positive but also negative aspects (Berger and Krahé, 2013), it might be interesting to advance Bem's typology by also including negative aspects of gender typology. Analyzing scores from the PNSRI (Berger and Krahé, 2013) by characterizing them within Bem's typology would most probably result in numerous gender types. It would be very interesting to explore what gender types can be found and how these relate to various constructs. Moreover, an established typology might be extremely beneficial with regard to the exploration of possible protective and risk factors for the impostor phenomenon. Such an endeavor is of relevance as there have been contradictory research findings on risk factors so far. As the impostor phenomenon can be conceptualized as a self-destructive thought pattern which in turn might result in or be linked to self-destructive behavior, it is surprising that earlier studies found masculinity to be a factor that predisposes individuals to self-destructive patterns (Tsirigotis et al., 2013). Contrary to this finding and in line with prior studies (September et al., 2001; Patzak et al., 2017), we found positive masculinity to be negatively related to the IP, which might in turn point toward it being a resilience factor. Altogether, our study shows that disentangling positive and negative aspects of gender identity is crucial for explaining impostor feelings in men and women.

Our second research question concerned the interrelatedness of gender typing, IP, and SCO. We anticipated the relationship between gender typing and the IP to be mediated by the tendency to engage in social comparison processes. This hypothesis was based on three findings. First, there is a close similarity between the symptoms of the IP and characteristics that were shown to facilitate social comparison processes (Festinger, 1954; Taylor et al., 1990; Ybema and Buunk, 1995). Second, schoolchildren experiencing impostor feelings were found tend to compare

themselves more often (Chayer and Bouffard, 2010). Third, women were found to have higher tendency to engage in social comparison processes than men (Gibbons and Buunk, 1999). Contrary to our expectation, the data suggests that SCO only mediates the association between negative femininity and IP but not the association between positive masculinity and the IP. The experience of strong impostor feelings by people who ascribe themselves stereotypically negative feminine characteristics can thus partly be explained by a higher tendency to engage in social comparison processes. This indicates that negative femininity is directly and indirectly (via SCO) associated with stronger IP, while positive masculinity is only directly associated with lower IP. The positive relationship between negative femininity and SCO can be explained in two ways: first, self-doubts are one characteristic of negative femininity and were shown to facilitate engagement in social comparison processes (Festinger, 1954). Second, as stated before, negative femininity also bears some similarity to neuroticism which was found to be linked to a higher SCO (Van der Zee et al., 1998).

The association between the IP and SCO suggested by the mediation model indicates that SCO is indeed an important antecedent of the IP. Since this relationship has only been studied once among schoolchildren (Chayer and Bouffard, 2010), more research is needed. To obtain a clearer picture on the constructs, future research could explore the relationship of these within a longitudinal design and predominantly focus on the influence of the developmental factor on the constructs and their associations. Inspired by Chayer and Bouffard (2010), it might also be of interest to also investigate the different social comparison preferences of people suffering from impostor feelings, i.e., whether they tend to engage in upward or downward comparison processes and whether they contrast or identify themselves with the comparison target. This is of importance as different social comparison preferences were shown to evoke different emotions (Smith, 2000). In their study, Chayer and Bouffard (2010) found a positive correlation between impostor feelings and upward contrast and downward identification. Since the sample consisted of children with mostly weak impostor feelings, more research is needed to establish a clearer picture on the social comparison preferences of people suffering from impostor feelings.

As impostor feelings are experienced quite frequently by students and were found to be associated with depression (McGregor et al., 2008), it is highly relevant to take measures to reduce the IP in university students. Based on our findings, we propose that reducing negative femininity or SCO might be beneficial to university students due to their close relationship to the IP. Prior research found lower levels of self-compassion to be associated with higher levels of IP (Patzak et al., 2017). Therefore, interventions aiming at increasing self-compassion might be effective in fighting feelings of fraudulence. When trying to combat impostor feelings in a university context, a focus on SCO might be especially effective as measures can be taken from both teachers and students themselves. Overall, we believe that interventions that strengthen the focus on the self and reduce competition between students might help to reduce social comparison processes. In assessing students'

performances, a shift from an “ability game” to an “equity game” might be beneficial as it does not foster comparisons among students but reaffirms hard work, persistence, and self-improvement (Covington, 2000). An equity game is characterized by criteria-referenced assessment and formative feedback which might further strengthen the students’ focus on their own competences and improvement. Since people were shown to engage in social comparison processes when stressed (Ybema and Buunk, 1995), measures of stress reduction might also be effective in reducing impostor feelings in university students. Social support has been found to moderate the impact of stress (Cobb, 1976). Therefore, classes that enable and promote group work and, therefore, foster network building among students might be helpful to reduce SCO. In addition, measures to reduce impostor feelings are not restricted to teachers but can be applied by students experiencing such feelings themselves. Keeping a reflective diary might help students to identify self-destructive thoughts and reduce stress. A study has shown that students who keep reflective diaries develop explanations for their feelings of stress and an improved self-efficacy with regard to future stressful situations (Travers, 2011). Moreover, the participants also experienced higher self-acceptance after keeping a diary. Therefore, diary keeping can be an effective measure to raise the students’ awareness that academia is only one part of their lives and consequently might reduce the assigned importance.

LIMITATIONS

The present study has several strengths, but some limitations need to be considered. Firstly, the present study was a correlation study and thus no causal conclusions can be made. Secondly, although the impostor phenomenon is defined by feelings of intellectual phoniness despite academic and/or professional success (Clance and Imes, 1978), in the present study, the IP was measured only subjectively using the GCIPS (Klinkhammer and Saul-Soprun, 2009). Therefore, it would be reasonable to include objective measurements of success (e.g., grade average) in future studies to see if different results occur between high-achievers and students with average or low achievement. Thirdly, the sample of the present study mainly consisted of female undergraduate university students that were recruited via Facebook. In order to gain a better understanding, future research should study the relation of the impostor phenomenon, social comparison, and gender typing separately in men and women. Moreover, in the recruitment process, future studies should consider different channels and not solely focus on platform users in order to yield more representative results. As university students represent an intensely studied sample, it would be interesting to investigate the discussed interplay in a sample consisting only of working people or Ph.D. students. The latter might suffer even more from impostorism due to them experiencing more pressure to be successful than undergraduate university students. Thirdly, the items measuring social comparison orientation were not specifically coined to suit situations university students encounter. It would be interesting to replicate the study using an

instrument that operationalizes comparison processes specifically among university students.

CONCLUSION

The present study contributes to the literature on psychological distress in university students by examining antecedents of the impostor phenomenon, i.e., the conviction to be unintelligent despite one’s academic success. Once again, the findings of the present study highlight the high prevalence of the IP among university students with 51.1% of the participants experiencing frequent to intense impostor feelings. The results show that the more university students identify with negative aspects of femininity and the less they identify with positive aspects of masculinity, the more they experience impostor feelings. Interestingly, positive masculinity had only a direct effect on the IP, while the relationship between negative femininity and the IP was partially mediated by social comparison orientation. In sum, the study demonstrates that universities should avoid fostering competition and facilitating comparisons among students but rather focus on the students’ individual talents, diligence, and self-improvement.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All listed authors contributed meaningfully to the manuscript, contributed to the study design and analyzed or interpreted the data, approved the final version of the manuscript for submission. FF and MK developed the study concept. FF and TY prepared the draft manuscript, and MK provided critical revisions.

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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.

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Sources of Stress and Their Associations With Mental Disorders Among College Students: Results of the World Health Organization World Mental Health Surveys International College Student Initiative

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The college years are stressful for many students. Identifying the sources of stress and their relative importance in leading to clinically significant emotional problems may assist in the development of targeted stress management interventions. The current report examines the distribution and associations of perceived stress across major life areas with 12-month prevalence of common mental disorders in a cross-national sample of first-year college students. The 20,842 respondents were from 24 universities in 9 countries that participated in the World Health Organization World Mental Health International College Student Initiative. Logistic regression analysis examined associations of current perceived stress in six life areas (financial situation, health, love life, relationships with family, relationships at work/school, problems experienced by loved ones) with six types of 12-month mental disorders (major depressive disorder, bipolar disorder, generalized anxiety disorder, panic disorder, alcohol use disorder, drug use disorder). Population attributable risk proportions (PARPs) were calculated to estimate the upper-bound potential effects of interventions focused on perceived stress in reducing prevalence of mental disorders. The majority of students (93.7%) reported at

least some stress in at least one of the six areas. A significant dose-response association was found between extent of stress in each life area and increased odds of at least one of the six disorders. The multivariable models that included all stress measures were significant for all disorders ($F = 20.6\text{--}70.6$, $p < 0.001$). Interpretation of PARPs as representing causal effects of stresses on disorders suggests that up to 46.9–80.0% of 12-month disorder prevalence might be eliminated if stress prevention interventions were developed to block the associations of stress with these disorders.

Keywords: stress, college students, mental disorder, anxiety disorders, mood disorders, substance use disorders

INTRODUCTION

The college years are an important developmental period when young people transition from adolescence to young adulthood (Arnett, 2000; Baghurst and Kelley, 2014). College students, especially first-year students, face numerous challenges in making successful transitions. These challenges can be exacerbated by life stresses that vary across students depending on objective circumstances and psychological resilience (Heffer and Willoughby, 2017). Although some level of stress is a normal part of life and can even be motivating in certain contexts (Robotham and Julian, 2006) high levels of stress pose a threat to well-being (Cohen et al., 2019) and academic attainment (Eicher et al., 2014). Targeted stress management interventions can be developed (Stillwell et al., 2017; Feiss et al., 2019) but no large-scale epidemiological studies have investigated the relative magnitudes of these stresses among college students across a range of life areas. Nor have studies estimated the potential importance of stress either overall or within individual life areas in accounting for common college student mental disorders.

The current report presents data on the prevalence and severity of stresses reported by first-year college students across nine countries in mental health needs assessment surveys carried out by the World Health Organization (WHO) World Mental Health International College Student Initiative (WMH-ICS). WMH-ICS implements such surveys among college students around the world (Alonso et al., 2019; Auerbach et al., 2019; Cuijpers et al., 2019) and implements, evaluates, and disseminates scalable preventive and ameliorative interventions guided by information obtained in the surveys about important areas of unmet need for treatment (Harrer et al., 2018; Harrer et al., 2019; Karyotaki et al., 2019). One area of particular interest is the development of psychotherapies that prioritize stressors most relevant to students (Cuijpers et al., 2018). The objective of the present paper was to investigate what the most common sources of stress are among college students and to what extent this may account for 12-month mental disorders that are common among college students (Auerbach et al., 2018).

MATERIALS AND METHODS

Study Design

Results are based on WMH-ICS surveys carried out with first-year students in a convenience sample of 24 colleges and

universities (8 private and 16 public; henceforth referred to as colleges) in nine countries (Australia, Belgium, Germany, Hong Kong, Mexico, Northern Ireland, South Africa, Spain, and the United States) between September 2014 and February 2018 (**Supplementary Tables 1, 2**). The surveys used web-based self-report questionnaires and an attempt was made to assess all first-year students in each college. A total of 21,369 questionnaires were completed, with sample sizes ranging from 208 in Hong Kong to 8,076 in Mexico. The weighted (by achieved sample size) mean response rate across surveys was 45.6%. The current sample includes five additional colleges and one additional country (a survey in Hong Kong) compared to earlier WMH-ICS survey reports (Alonso et al., 2018, 2019; Auerbach et al., 2018, 2019; Mortier et al., 2018b; Bruffaerts et al., 2019; Ebert et al., 2019). Poststratification weights (Groves and Couper, 2012) were used to adjust for non-response bias based on socio-demographic information provided by officials from the participating schools.

The analyses reported here are based on 20,842 respondents (**Supplementary Tables 1, 2**). The remaining 527 respondents were excluded either because they reported not being either male or female ($n = 79$), reported not being a full-time student ($n = 413$), or were missing information on gender or fulltime versus part-time student status ($n = 39$). Students that did not identify as male or female were excluded because they are the subject of more focused analyses that will be described in a future report. Part-time students were excluded because they were quite different from full-time students on many characteristics important to the analysis, including having an older age distribution and being more likely to be married, employed full-time, and have children. Students with missing gender data were excluded because gender is a core variable in many WMH-ICS analyses.

Data Collection Procedures

Data collection for this study was conducted using an online self-report survey that was distributed to all incoming first year students, who were invited to participate in various settings. This included during registration, health screenings or via a separate email invitation. The main strategies used to address the issue of low participation rates among students, were repeated rounds of contact together with an offer of small tokens in exchange for completing the survey.

After an initial contact, non-responders received follow-up personalized emails and ten colleges provided low-cost incentives

(e.g., movie passes, a raffle for store coupons), while one survey team used an additional strategy of providing incentives to a random sample of non-responders. In Mexico, students were enrolled in the survey at a number of mandatory events (e.g., student health evaluations and tutoring sessions) where time was allocated specifically for completing the survey.

At all survey sites, the local ethics or institutional review committee reviewed and approved the protocol to ensure protection of human subjects, in line with appropriate international and local guidelines. All students were requested to sign an informed consent prior to participation. Participation was voluntarily. Detailed information on the organizations responsible for ethics approval for each survey is available at this link: http://www.hcp.med.harvard.edu/wmh/ftpd/IRB_EthicsApproval_WMH-ICS.pdf. On completion of the survey, all students were provided with information on how to access mental health services at their institution, and additional in-depth information on services was provided to any student who reported recent and/or severe suicidal thoughts and behaviors (Mortier et al., 2018a).

Measures

Current Perceived Stress in Different Life Areas

The MIDUS self-report scale of perceived stress was used to assess stresses currently (at the time of survey) experienced by respondents in a series of seven life domains relevant to college students: financial situation, own health, love life, relationships with family, relationships with people at work/school, health and wellbeing of loved ones, and other problems experienced by loved ones (Kessler et al., 2004). We did not ask about the stresses associated with academic performance, as the survey was designed to be administered at the beginning of the academic year, which would be before such stresses became manifest. The scale asked respondents to rate “how much stress you have in each the following areas of life” for each of the life domains, with response options of none, mild, moderate, severe, and very severe coded 0–4 for purpose of the current analyses. This scale has demonstrated good internal consistency ($\alpha = 0.83$) in a sample of college students (Kiekens et al., 2016). Responses to the two questions about problems experienced by loved ones were combined into one category due to the high correlation between the two responses (Pearson $r = 0.72$). This was done by assigning the higher of the two scores to the composite, which is henceforth referred to as “problems of loved ones.”

Mental Disorders

The WMH-ICS survey instrument was developed to assess six common mental disorders: major depressive disorder (MDD), bipolar I-II disorder (BPD), generalized anxiety disorder (GAD), panic disorder (PD), attention deficit/hyperactivity disorder (ADHD), and drug abuse or dependence (DUD; referring to “drug use disorder”), using the Composite International Diagnostic Interview Screening Scales (CIDI-SC; Kessler et al., 2013a,b).

The CIDI-SC scales are short validated self-report screening scales designed to assess 12-month prevalence of disorders based on the definitions and criteria of the Diagnostic and Statistical

Manual of Mental Disorders, Fourth Edition (DSM-IV). The CIDI-SC scales have been shown to have good concordance with blinded clinical diagnoses [Area Under the Curve (AUC) of 0.70–0.78] (Kessler et al., 2013a,b; Ballester et al., 2019). The CIDI-SC has shown good concordance for all diagnoses in a college student sample (AUCs > 0.8). A seventh disorder, alcohol abuse or dependence (AUD; referring to “alcohol use disorder”), was assessed with the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993). Alcohol use disorder is defined as either a total score of ≥ 16 or a score of 8–15 with ≥ 4 on the AUDIT dependence questions (Babor et al., 2001). The AUDIT has been shown to have good concordance with clinical diagnoses (AUC of 0.78–0.91) (Reinert and Allen, 2002).

Socio-Demographics and College-Related Factors

We controlled for several socio-demographic variables in the analyses reported here: gender (male, female), age (16–18, 19, 20+), parental education (higher of two parents using the categories secondary school or less [low], some postsecondary education [medium], college graduate or more [high]), parental marital status (currently married to each other versus either divorced or at least one deceased), religion (Christian, other religion, no religion), and sexual orientation (heterosexual, gay or lesbian, bisexual, asexual, not sure, other). The survey included further questions on sexual attraction to and sexual contact with males and females and the responses yielded four distinct categories: heterosexual with no same-sex attraction, heterosexual with some same-sex attraction, non-heterosexual without same-sex sexual contact, and non-heterosexual with same-sex sexual contact. We also controlled for self-reported high school academic ranking (categorized as top 50% or bottom 50%) and country where the survey was conducted.

Analysis Methods

Weighting and Imputation

Data were weighted within each college to adjust for discrepancies between population socio-demographic distributions provided by college administrators and sample distributions. Standard post-stratification methods were used for weighting (Groves and Couper, 2012). Comparison of the distributions between respondents and populations found only one consistent difference prior to weighting: that females had a higher response rate than males. This was adjusted for in the weighting. As mentioned above, Spain used an “end-game” strategy to increase recruitment. Non-respondents at the end of the normal recruitment period were more aggressively followed-up. The “hard to reach” respondents who were eventually interviewed were assigned a weight equal to $1/p$, where p represented the proportion of non-respondents at the end of the normal recruitment period that was included in the end game, to adjust for the under-sampling of these hard-to-recruit respondents. An equal sum of weights was given to each country in the analysis.

Multiple imputation (MI) by chained equations (Buuren, 2012) was used to adjust for item-missing data, random internal sampling of survey sections in some countries to reduce survey length, and missing data due to skip logic errors that occurred

in a few countries. Twenty MI replicate datasets were used. All reported standard errors (SEs) and degrees of freedom were adjusted using Rubin's rules for combining multiple imputed estimates (Rubin, 2004).

Estimating Prevalence

The prevalence estimates presented here report on 12 month disorders, based on weighted within college proportions. The corresponding SEs are estimated using Rubin's rules to account for the imputation of missing data.

Estimating Associations

Logistic regression models were used to estimate the associations of perceived stress with 12-month disorders, controlling for socio-demographics (country, gender, age, sexual orientation, religion, parental education, marital status of parents, and self-reported high school ranking). Both univariable models with only one stress measure and multivariable models with all stress measures were estimated to evaluate predictive associations of the stress measures with the disorders. A logistic link function was used in all the models. We began by estimating linear associations of scores on the 0–4 stress scales with the outcomes and then tested for a difference in the slope discriminating between respondents with no stress (scores of 0) versus mild stress (scores of 1) compared to transitions across higher pairs of scores on the stress scale. This was done both because 0 was by far the most common score on each scale and because our intuition was that the difference between any stress and no stress might be more important (i.e., have a higher slope) than differences across the remainder of the range. This test was carried out using standard spline regression coding methods (Marsh and Cormier, 2002). The multivariable models that combined information about stresses across life areas were then estimated using the predictors in the best-fitting univariable models. We evaluated the combined predictive effects of groups of parameters using MI-adjusted Wald *F* tests.

Carrying Out Intervention Simulations

Population attributable risk proportions (PARPs; Greenland and Drescher, 1993) were calculated for the best-fitting multivariable model for each disorder in order to estimate the potential effects of interventions that either reduced stress or reduced the effects of stress on mental disorders. PARPs can be interpreted in this way based on the provisional assumptions that the stresses assessed are causal risk factors for mental disorders and that the causal effects of these stresses are captured by the logistic regression coefficients.

Simulations were used to calculate the PARPs. This began by estimating the expected prevalence of each mental disorder based on the best-fitting prediction model for that disorder. Expected prevalence estimates were then recalculated seven different times: six of these fixed the logit (or logits) of the predictor(s) in one area of stress to 0. The seventh set the logits for the predictors across all stress areas to 0. PARP was defined as the ratio of (i) the difference in the predicted prevalence of a given mental disorder in the observed data versus if the logits were set to 0

(ii) divided by the predicted prevalence of the disorder in the observed data. SEs of the PARP estimates were generated using the Jackknife Repeated Replication simulation method, where each college was treated as a stratum and two random half-samples per college were generated and treated as sampling error calculation units, with the whole Jackknife Repeated Replication estimation process embedded within the MI replicate design (Rust and Rao, 1996). All analyses were carried out using SAS Version 9.4 (SAS Institute Inc, 2014).

RESULTS

Socio-Demographic Distribution of the Sample

Most respondents were 16–18 years old (57.6%), female (54.7%), heterosexual with no same-sex attraction (76.2%), and Christian (70.6%) (**Supplementary Table 3**). Most respondents reported having a parent with a high level of education (55.9%) and that their parents were both living and still married to each other (75.4%).

Distributions of Mental Disorders and Stress

Twelve-month prevalence of mental disorders ranged from a high of 13.4% for MDD to a low of 1.9% for DUD (**Table 1**). Between two-thirds and three-fourths of respondents experienced at least mild stress about problems experienced by loved ones (74.8%), their own financial situation (68.6%), love life (66.8%), and their health (64.3%) (**Table 2**). About half of respondents experienced at least mild stress about their relationships with family (56.7%) and with people at school/work (52.9%). Among respondents who reported any stress in the given life area, mean (SE) severity was 2.0 (0.01) for problems of loved ones, 1.9 (0.01) for their own financial situation and love life, 1.8 (0.01) for relationships with family, 1.7 (0.01) for own health, and 1.6 (0.01) for relationships with people at school/work.

Aggregated across life areas, 93.7% of respondents had at least one type of stress rated at least mild (**Table 3**). The

TABLE 1 | Twelve-month prevalence estimates of DSM-IV disorders in the WMH-ICS sample (*n* = 20,842)¹.

	%	(SE)
(I) Mood		
Major depressive disorder	13.4	(0.3)
Bipolar disorder	3.3	(0.1)
(II) Anxiety		
Generalized anxiety disorder	13.1	(0.3)
Panic disorder	3.8	(0.2)
(III) Substance use		
Alcohol use disorder	6.4	(0.2)
Drug use disorder	1.9	(0.1)

WMH-ICS, World Mental Health Surveys International College Student Initiative; SE, MI-adjusted standard error. ¹Prevalence estimates are based on weighted data. See the text for a discussion of weighting.

TABLE 2 | Distribution of responses to the perceived stress questions in the WMH-ICS sample ($n = 20,842$)¹.

	None		Mild		Moderate		Severe		Very	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Financial situation	31.4	(0.4)	29.0	(0.4)	24.6	(0.4)	10.6	(0.3)	4.5	(0.2)
Own health	35.7	(0.4)	32.4	(0.4)	22.1	(0.3)	7.6	(0.2)	2.3	(0.1)
Love life	33.2	(0.4)	27.5	(0.4)	22.8	(0.3)	11.3	(0.3)	5.2	(0.2)
Relationships with family	43.3	(0.4)	25.5	(0.3)	18.5	(0.3)	8.4	(0.2)	4.2	(0.2)
Relationships at school/work	47.1	(0.4)	28.3	(0.4)	16.9	(0.3)	5.9	(0.2)	1.9	(0.1)
Problems of loved ones ²	25.2	(0.3)	27.4	(0.4)	25.9	(0.3)	14.6	(0.3)	6.9	(0.2)

WMH-ICS, World Mental Health Surveys International College Student Initiative; SE, MI-adjusted standard error. ¹Distributions are based on weighted data. See the text for a discussion of weighting. ²Combined across two separate questions. See text for details.

smallest proportion of students had stress in only one of the six life areas (8.1%) and the proportions were successively larger for students who had stress in between 2 (11.8%) and 6 (26.9%) areas. 73.8% of students had stress in at least three life areas. There was a significant positive association between number of stresses experienced and mean stress severity within the areas in which stress was experienced (Pearson $r = 0.36$, $p < 0.001$), with the mean (SE) stress level across stress areas where stress was experienced ranging from a low of 1.4 (0.02) among people that experienced stress in only 1 life area to a high of 2.0 (0.01) among people that experienced stress in all six areas.

Univariable Associations of Stress With Mental Disorders

Univariable models were estimated for stress in one area at a time predicting each type of mental disorder controlling for the socio-demographic variables. The associations of socio-demographics with mental disorders are not reported here, as they have been reported previously (Auerbach et al., 2018). A significant positive association was found between each of the 6 0–4 linear stress measures and each of the six mental disorders, with the 36 odds ratios (ORs) in the range 1.3–1.7 (Supplementary Tables 4–9).

Multivariable Associations of Stress With Mental Disorders

Multivariable models documented powerful associations of the stress measures with odds of all mental disorders ($F = 44.3$ – 213.3 , $p < 0.001$) (Table 4). We also considered the possibility that interactions involving number of types of stress were important predictors, but none of these was significant in exploratory analyses. Stresses involving financial situation and love life were significant in predicting all six disorders. Stresses involving relationships with family members were significant in predicting four disorders. Stresses involving relationships at work/school were significant in predicting three disorders. Stresses involving the student's own health were significant in predicting two disorders. And stresses involving problems of loved ones were significant in predicting one disorder. GAD was predicted by all six types of stress, MDD and BPD by 4, PD and DUD by 3, and AUD by 2 types of stress.

TABLE 3 | Distribution and association between number of areas of perceived stress and mean stress severity in the WMH-ICS sample ($n = 20,842$)¹.

	%	(SE)	Mean ²	(SE)	(n) ³
Number of areas					
1	8.1	(0.2)	1.4	(0.0)	(1,685)
2	11.8	(0.3)	1.5	(0.0)	(2,435)
3	13.8	(0.3)	1.6	(0.0)	(2,886)
4	15.6	(0.3)	1.7	(0.0)	(3,270)
5	17.5	(0.3)	1.8	(0.0)	(3,665)
6	26.9	(0.4)	2.0	(0.0)	(5,579)
1 or more	93.7	(0.0)	1.7	(0.0)	(19,519)

WMH-ICS, World Mental Health Surveys International College Student Initiative; SE, MI-adjusted standard errors. ¹Number of areas with at least mild stress. Statistics are based on weighted data. See the text for a discussion of weighting. ²Means are calculated only for the areas of stress reported as present. ³Sample sizes are unweighted.

Population Attributable Risk Proportions

The PARP estimates suggest that the stresses considered here are associated with 46.9–80.0% of the prevalence of the disorders considered in this sample. This means that the projected prevalence estimates of the disorders among respondents with none of the stresses were only between 20% (i.e., 100% – 80.0%) and 53.1% (i.e., 100% – 46.9%) as high as the observed prevalence estimates (Table 5). Decomposition showed that stress due to love life was the strongest correlate of MDD (23.8%) and AUD (32.2%), stress in relationships at work/school was the strongest correlate of GAD (20.3%), stress in relationships with family was the strongest correlate of BPD (43.9%), stress due to one's own health was the strongest correlate of PD (42.6%), and financial stress was the strongest correlate of DUD (29.1%). The component PARPs sum to more than the overall PARP because of correlations among the types of stress.

DISCUSSION

Previous surveys of college students have consistently implicated finances, health, love life, relationships with friends, and relationships with family as sources of stress during the college years (Darling et al., 2007; Lust et al., 2008; Stallman, 2010; Beiter et al., 2015). We built on these previous surveys in

TABLE 4 | Multivariable associations of perceived stress with 12-month presence of DSM-IV mental disorders in the WMH-ICS sample ($n = 20,842$).

	Major depressive disorder		Bipolar disorder		Generalized anxiety disorder		Panic disorder		Alcohol use disorder		Drug use disorder	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Financial situation												
Linear	1.1*	(1.1-1.2)	1.3*	(1.2-1.4)			1.2*	(1.1-1.3)	1.2*	(1.1-1.3)	1.2*	(1.1-1.4)
Low spline					1.3*	(1.2-1.3)						
Own health												
Linear					1.2*	(1.1-1.2)	1.5*	(1.4-1.6)				
Love life												
Linear			1.2*	(1.1-1.3)					1.3*	(1.3-1.4)		
Low spline	1.5*	(1.4-1.6)			1.3*	(1.2-1.4)	1.2*	(1.1-1.3)			1.4*	(1.2-1.5)
Relationships with family												
Any	1.4*	(1.2-1.6)	1.7*	(1.3-2.2)								
Linear					1.1*	(1.0-1.1)					1.2*	(1.1-1.4)
Low spline	1.1*	(1.0-1.2)	1.2*	(1.1-1.4)								
Relationships at work/school												
Linear	1.2*	(1.1-1.3)	1.2*	(1.1-1.3)	1.3*	(1.2-1.3)						
Problems of loved ones												
Low spline					1.2*	(1.1-1.3)						
All stresses F	187.3*		84.8*		213.3*		71.1*		114.9*		44.3*	

WMH-ICS, World Mental Health International College Student Initiative; OR, odds ratio; CI, confidence interval. *Significant at the 0.05-level, using MI-adjusted tests. ¹All models based on weighted data controlling for the socio-demographic variables in **Supplementary Table 3**. Any = 0–1 dichotomy coded 0 for respondents who reported no stress in the life area and coded 1 for respondents who reported mild, moderate, severe, or very severe stress in the life area; Linear = 0–4 variable for respondents who reported no stress (0), mild (1), moderate (2), severe (3), or very severe (4) stress in the life area; Low spline = 1–4 variable for respondents who reported no stress (1), mild (1), moderate (2), severe (3), or very severe (4) stress in the life area.

TABLE 5 | Population attributable proportions of 12-month DSM-IV disorders associated with perceived stress based on the multivariable models in the WMH-ICS sample ($n = 20,842$)¹.

	Major depressive disorder		Bipolar disorder		Generalized anxiety disorder		Panic disorder		Alcohol use disorder		Drug use disorder	
	Est	(SE)	Est	(SE)	Est	(SE)	Est	(SE)	Est	(SE)	Est	(SE)
Financial situation	14.6	(4.1)	40.2	(6.3)	14.1	(2.8)	28.0	(15.5)	22.4	(5.4)	29.1	(11.0)
Own health	-	-	-	-	16.4	(4.1)	42.6	(13.5)	-	-	-	-
Love life	23.8	(2.5)	30.7	(10.1)	17.1	(2.2)	11.5	(8.9)	32.2	(5.0)	23.9	(7.6)
Relationships with family	21.3	(5.0)	43.9	(10.7)	9.8	(4.6)	-	-	-	-	25.1	(11.4)
Relationships at work/school	16.3	(3.2)	23.2	(7.5)	20.3	(3.2)	-	-	-	-	-	-
Problems of loved ones	-	-	-	-	14.0	(2.9)	-	-	-	-	-	-
All stresses	57.7	(2.7)	80.0	(3.7)	64.2	(1.7)	62.0	(9.9)	46.9	(4.2)	57.6	(8.5)

WMH-ICS, World Mental Health International College Student Initiative; SE, standard error. ¹Based on the models in Table 4. Standard errors were calculated using the Jackknife Repeated Replications simulation method embedded within MI replicates.

developing the brief WMH-ICS assessment of perceived stress. Our results are compelling in documenting strong associations of perceived stress across all the life areas considered with the full range of common mental disorders previously found to be associated with serious role impairments among college students (Auerbach et al., 2016).

Among the strengths of the study are the large cross-national sample, the investigation of stress across a number of different life areas, and the evaluation of all the mental disorders found in previous cross-national research to be most strongly related to academic role performance among college students (Mahmoud et al., 2012; Ibrahim et al., 2013). There are also several notable limitations. First, the colleges were a convenience sample, limiting the external validity of results. Second, the survey response rates were low across most participating sites. This is typical of other large-scale college student surveys (Eisenberg et al., 2013; Paul et al., 2015). Previous research has found a weak association between response rates and non-response bias (Groves, 2006). In the case of surveys about mental disorders this bias might be in the direction of overestimating the prevalence of mental disorders (Mortier et al., 2018a). As a result, the low response rates might have led to an over-estimation of disorder prevalence and might also have introduced some bias into the estimate of the associations between perceived stress and mental disorders.

A third limitation is that the stress measures assessed perceptions of stress rather than objective stressor characteristics. More extensive self-report questionnaires exist to assess objective stressor characteristics. Semi-structured interviews can also be used to obtain more objective measures of chronic stressors (Harkness and Monroe, 2016). Both of the latter approaches are labor intensive and burdensome to respondents, though, leading us to consider them infeasible for WMH-ICS surveys, as the latter were designed to be brief screening surveys that assessed a wide range of risk factors and disorders. However, given the very high PARPs found in the current report, it might make sense to carry out more focused surveys of objective chronic stressors in parallel with future WMH-ICS surveys.

A fourth limitation is that it is impossible to draw clear causal interpretations of the associations between stress and mental disorders using a cross-sectional non-experimental design of the sort used in the WMH-ICS surveys. The reason for this is that complex reciprocal associations are known to exist between chronic stress and mental disorders (Kassel et al., 2007; Liu and Alloy, 2010; Newman et al., 2013; Majd et al., 2017). It is noteworthy in this regard that a prior WMH-ICS report showed that 83% of the active mental disorders among first-year college students in our surveys were reported to have started in childhood or adolescence; that is, well *before* matriculation to college (Auerbach et al., 2016). This raises the possibility that the stresses associated with mental disorders among first-year college students might be chronic stressors that began prior to matriculation or acute stresses that were consequences of pre-existing mental disorders rather than causal risk factors for 12-month disorder onset-persistence. Finally, in the present work we focused on general stress sources in different meaningful areas of life. Building upon these findings, future

studies should incorporate specific stressors such as adjustment to the new environment.

Within the context of these limitations, we found that nearly all students experience stress in at least one of the life areas considered here; that the great majority of students experience at least some stress in multiple life areas; that perceived stress in each of these areas is an important correlate of at least one of the disorders considered here; that the joint predictive associations of these multiple stresses are additive; and that these joint predictive associations account for substantial proportions (46.9–80.0%) of the mood, anxiety, and substance use disorders considered here.

Although our data do not permit us to ascertain the causal role of stress in leading to these strong associations with the mental disorders considered here, experimental studies show that stress management interventions effectively reduce perceived stress, mood, and anxiety problems through a combination of problem-focused and appraisal-focused strategies (Van der Klink et al., 2001; Regehr et al., 2013; Conley et al., 2015; Breedvelt et al., 2018). Based on this evidence, the interventions needed to address the range of stresses experienced by college students would presumably include both training in problem-focused coping strategies to reduce the occurrence and severity of objective stressors and in emotion-focused coping strategies to reduce the impact of unmodifiable stressors (Baqtayan, 2015; Smith et al., 2016; Breedvelt et al., 2019; Stanisławski, 2019). Although the most consistently significant stresses found in the WMH-ICS data are in the areas of finances and love life, interventions would need to help students develop strategies to manage a wide range of stresses given that each type of stress considered in our analysis was associated with increased odds of at least 1 type of common mental disorder. Furthermore, the great majority of students with mental disorders reported stresses in several domains, so training in the management of stress overload might be of value.

Although it is as yet unclear how effective specific types of scalable therapies focused on the stresses of first-year college students would be in reducing mental disorders and improving academic performance, colleges and universities could play an important role in maximizing the potential value of such interventions by participating in systematic efforts to implement and evaluate pragmatic trials of the sort being developed by WMH-ICS to reduce the stresses of college students. To the extent that these interventions alleviate stress, they might also reduce prevalence of mental disorders, and, by virtue of the strong associations known to exist between mental disorders and academic performance (Bruffaerts et al., 2018; Wilks et al., 2020) improve the academic performance and subsequent life-long well-being of students.

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DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: The WMH-ICS data sharing agreement limits access of this data to members of the consortium. Requests to access these datasets should be directed to RK, kessler@hcp.med.harvard.edu.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Human Research Ethics Committee, Curtin University, Australia Commissie Medische Ethiek-KU Leuven, Katholieke Universiteit (KU) Leuven, Belgium Ethik-Kommission der FAU, Friedrich-Alexander Universität (FAU) Erlangen-Nürnberg, Germany Survey and Behavioural Research Ethics Committee, Chinese University of Hong Kong, Hong Kong Comité de Ética e Investigación, Instituto Nacional de Psiquiatría Ramón de la Fuente, Mexico Research Ethics Committee, Ulster University, Northern Ireland UCT-Human Research Ethics Committee UCT; Stellenbosch University-Health Research Ethics Committee, University of Cape Town (UCT), South Africa Parc de Salut MAR – Comité Ético de Investigación Clínica, Institut Hospital del Mar d'Investigacions Mèdiques (IMIM), Spain Partners Human Research Committee/Institutional Review Board, Partners HealthCare, McLean Hospital, Harvard Medical School, United States. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

The named co-authors fulfilled the requirements of authorship either by providing data or working on data analysis. EK, NS, and RK produced the first draft and the final revision reflects key comments on the intellectual content from all co-authors. All authors contributed to the article and approved the submitted version. RK accepted the responsibility of taking any steps needed to verify the accuracy and integrity of any part of this work.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2020.01759/full#supplementary-material>

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The Differential Role of Coping, Physical Activity, and Mindfulness in College Student Adjustment

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Research has examined the function of stress management techniques, including coping, physical activity, and mindfulness on college students' adjustment. The present study examined the differential contributions of three stress management techniques to students' maladaptation (perceived stress, depression, anxiety, and loneliness) and adaptation (self-esteem). Undergraduate students ($N = 1185$) responded to an online survey. Hierarchical linear regression results indicated that all three stress management techniques – coping, physical activity, and mindfulness – were related to the five outcomes as predicted. Higher levels of disengagement coping strategies were related to higher perceived stress, anxiety, and depression. Components of mindfulness emerged as a strong predictor of adaptation.

Keywords: mental health, college students, stress, coping, mindfulness, physical activity

INTRODUCTION

College Student Stress

In line with prior research documenting a link between perceived stress and negative health outcomes (McMahon et al., 2003; Eiland and Romeo, 2013; McCormick and Green, 2013), students transitioning to college have reported increased problems across several domains (Conley et al., 2014). This includes mental health symptoms. One study found that nearly half (45.8%) of surveyed college students experienced a psychiatric disorder, personality disorder, or substance use disorder in the past 12 months (Blanco et al., 2008). Focusing specifically on depressive symptoms Selkie et al. (2015) reported a point prevalence rate of 17% for major depressive disorder in college students. Further, about 6–10% of college students experienced suicidal ideation in the past 12 months (Wilcox et al., 2010; Eisenberg et al., 2013).

Taken together, research suggests that many college students are experiencing significant physical and psychological problems that appear to be associated with elevated levels of perceived stress. Several approaches for the management of stress have been examined, including coping, physical activity, and mindfulness; each of these stress management approaches will be briefly discussed in the following sections.

Stress and Coping

Coping can be broadly defined as any behavior intended to manage stress (for definition and discussion, see Lazarus and Folkman, 1984). Prior research has identified significant individual

differences in the kinds of emotional, physiological, and cognitive coping responses deployed in response to a variety of life stressors (Skinner et al., 2003; Carver and Connor-Smith, 2010). Such individual differences in coping methods can partially explain why people experience stress in vastly different ways (Connor-Smith and Compas, 2004). Some broader classification schemes of coping include problem-focused versus emotion-focused coping (Folkman and Lazarus, 1980), approach versus avoidance coping (Roth and Cohen, 1986), and engagement versus disengagement coping (Compas et al., 2001). Focusing on the classification scheme of engagement and disengagement coping (Carver and Connor-Smith, 2010), research generally suggests that the former is associated with adaptive functioning whereas the latter is associated with maladaptation (see, for example, Compas et al., 2001; Clarke, 2006; Carver and Connor-Smith, 2010; see Villatte et al., 2015 for a discussion of the clinical implication of avoidance). Examples of engagement coping include problem-solving, support-seeking, and positive thinking; disengagement coping includes avoidance, denial, and wishful thinking (Compas et al., 2001).

Stress and Physical Activity

Although physical activity has been associated with reductions in perceived stress and anxiety and an elevation of overall mood (Dunn et al., 2001; Penedo and Dahn, 2005; Galper et al., 2006; VanKim and Nelson, 2013), levels of physical activity generally decline across the transition from adolescence to young-adulthood (Butler et al., 2004; Deforche et al., 2015).

VanKim and Nelson (2013) found that students who engaged in frequent vigorous physical activity were less likely to report poor mental health and perceived stress than students who exercised less frequently.

Various theories provide explanations for the well-documented association between physical activity and improved physical and mental health. For example, the “fitness hypothesis” suggests that cardiovascular and sympathetic nervous systems show diminished stress responses after improvements in fitness level (Holmes and Roth, 1985), while the “mastery hypothesis” suggests that exercise gives an individual a sense of accomplishment and consequent improvement in mood (Carmack et al., 1999). It has also been suggested that physical activities can provide individuals with an effective method of distraction from stressful situations (Carmack et al., 1999). As such, the existing literature in this domain suggests that physical exercise may help individuals manage high levels of stress they are experiencing in collegiate settings.

Stress and Mindfulness

More recent research has examined the role of mindfulness (e.g., Kabat-Zinn, 1982, 2003) in student adaptation. Mindfulness can be defined as “the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding experience moment by moment” (Kabat-Zinn, 2003, p. 145). As such, mindfulness practice is an attention-related construct that focuses on improving one’s intention, attention, and attitude in order to gain greater awareness in non-judgmental and accepting ways (Shapiro et al., 2008). The overall goal of mindfulness practice is to be both present and compassionate in life’s moment-to-moment experiences (Shapiro et al., 2008). A growing body of research suggests that higher levels of mindfulness are associated with lower levels of perceived stress, anxiety symptoms, depressive symptoms, suicidal ideation, and pain (Baer, 2006; Araas, 2008; Anastasiades et al., 2017).

Research on college students has begun to elucidate associations between mindfulness and positive outcomes (e.g., reduction in stress and anxiety) among college students (for a review of this topic, see Bamber and Schneider, 2016). For example, Zimmaro et al. (2016) demonstrated that undergraduates with higher dispositional mindfulness perceived less stress and also exhibited lower cortisol levels, suggesting that mindfulness may be an effective mediator of physiological and psychological stress in a college setting. Similarly, Shapiro et al. (2008) reported that undergraduate students who increased mindfulness through a mindfulness-based stress reduction (MBSR) program (Kabat-Zinn, 1982, 2003) experienced reductions in perceived stress. Other similar studies have demonstrated that full MBSR programs are not necessary to achieve the desired effect; Call et al. (2014) found that brief, discrete elements of standard MBSR treatments are sufficient to significantly attenuate anxiety and stress in college students. A meta-analysis of cognitive, behavioral, and mindfulness interventions for college students suggested that mindfulness interventions can successfully reduce anxiety and depressive symptoms (Regehr et al., 2013).

TABLE 1 | Demographic characteristics of study participants.

Characteristic	<i>n</i>	%
Current class standing		
First Year	273	23.0
Sophomore	300	25.3
Junior	222	18.7
Senior	390	32.9
Race/Ethnicity		
African American	40	3.4
API	127	10.7
Latino	69	5.8
White	837	70.6
Mixed Race/Other	112	9.5
Gender		
Male	508	43.0
Female	674	57.0
Transgender	3	<0.1
Sexual orientation		
Heterosexual/Straight	1013	85.5
Gay/Lesbian	55	4.6
Bisexual	92	7.8
Other	25	2.1
Perceived family socioeconomic status		
Lower	132	11.1
Middle	594	50.1
Upper	459	38.7

Similarly, Lynch et al. (2011, 2018) provide evidence to indicate the Mindfulness-Based Coping with University Life 8 week program significantly reduced negative mental health outcomes among students. The literature reviewed herein suggests that mindfulness is associated with adaptive functioning in college students and may be taught to reduce perceived stress and enhance well-being.

The Current Study

The various lines of research discussed above provide clear evidence that college students can manage the perceived stress effectively through any or all of (a) adaptive coping, (b) physical activity, and (c) mindfulness. However, the differential contribution of each of these variables on student response to stress has not been studied, and thus comparisons of effectiveness or pragmatic interventional recommendations cannot differentiate among these coping methods. Therefore, this study considered all three variables, as well as potential confounding variables, as predictors of five aspects of student adjustment: perceived stress, loneliness, self-esteem, and symptoms of anxiety and depression. Although there are multiple indexes of adaptive functioning (e.g., academic achievement, social competence), we focus on self-esteem as it has both been widely studied and consistently found to be an indication of well-being (for a review on the topic, see Cast and Burke, 2002 see also Wagner et al., 2013; Randal et al., 2015). We focus on depression and anxiety as key outcome variables as prior theoretical and empirical research has suggested that these symptoms are core indices of the psychopathological process (e.g., Caspi et al., 2014) and are related to stress and coping (e.g., Skinner et al., 2003). Based on prior research, we predicted that greater use of adaptive coping, physical activity, and mindfulness would all be associated with student well-being. Given the limited intervention resources available, understanding the differential effects of coping approaches may guide both theoretical understanding of the underlying processes and pragmatic choices about interventions to further test. As comparisons between the three coping methods studied have not previously been made, and no clear theoretical reason exists to posit that one may be broadly more effective than another, no

specific predictions were made with regard to magnitude of effect or comparisons between the three methods.

MATERIALS AND METHODS

Procedure

Study procedures were approved by the Institutional Review Board of the first author's institution. Data collection occurred at a small liberal arts college in New England over a 2-week period. All enrolled undergraduate students ($N = 2496$) received an email inviting them to participate in a study about their experiences with stress. A total of 1185 participants participated in the survey, representing a response rate of 47.48%. Emails contained a unique link to a QualtricsTM survey. This process was utilized to ensure participants only responded once. The survey took approximately 15 min to complete. Participants completed electronic consent, by selecting either, "I consent to participate" or "I do not consent to participate." While participants' responses to the survey were anonymized, participants were offered the opportunity to enter their email in a raffle to win one of ten \$50 gift cards.

Measures

Demographics

Participants were asked to self-report gender (male, female, or transgender), sexual orientation (heterosexual, gay/lesbian, bisexual, or other), race/ethnicity (African American, Asian Pacific Islander, White, Latino, mixed race, or other), as well as their perceived socioeconomic status (SES) (lower, middle, or upper).

Anxiety

The Generalized Anxiety Disorder-7 (GAD-7) scale was used to measure anxiety (Spitzer et al., 2006). Participants respond to seven items, indicating how often (0 = not at all to 3 = nearly every day) they are bothered by experiences such as "Feeling nervous, anxious or on edge" or "Being so restless that it is hard to sit still." The items are summed to create a composite score; higher scores reflect greater levels of anxiety. For the GAD-7, the minimally clinically important difference (MCID), or the

TABLE 2 | Summary of intercorrelations, means, and standard deviations for mental health outcomes and predictors.

Measures	1	2	3	4	5	6	7	8	9	10	M	SD
1. Stress		0.72***	0.67***	0.51***	-0.61***	0.54***	0.18***	-0.10***	-0.54***	-0.62***	18.16	6.44
2. Anxiety			0.71***	0.50***	-0.56***	0.52***	0.23***	-0.07*	-0.50***	-0.61***	14.84	5.70
3. Depression				0.60***	-0.62***	0.63***	0.12***	-0.14***	-0.56***	-0.61***	16.70	5.68
4. Loneliness					-0.54***	0.42***	-0.06	-0.20***	-0.37***	-0.47***	43.35	11.86
5. Self-esteem						-0.47***	-0.06	0.17***	0.47***	0.63***	29.95	5.96
6. Disengaged coping							0.22***	-0.05	-0.42***	-0.49***	3.47	1.05
7. Engaged coping								-0.01	-0.10**	-0.22***	4.92	1.46
8. CPAQ									0.08*	0.08*	23.54	9.93
9. Mindfulness awareness										0.51***	24.93	6.94
10. Mindfulness non-judgment											26.68	8.96

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. CPAQ, Concise Physical Activity Questionnaire.

within-person change of clinical significance, is approximately four (Toussaint et al., 2020). In this study, the internal reliability was $\alpha = 0.92$.

Depression

The Patient Health Questionnaire-9 (PHQ-9) was used to measure depressive symptomology (Kroenke et al., 2001). The PHQ-9 includes nine items that participants respond to as they consider how often they had been bothered by each of the items over the last 2 weeks. Items include “Little interest or pleasure in doing things” as well as “Trouble falling or staying asleep, or sleeping too much.” A four-point response scale is provided, which includes not at all (0), several days (1), more than half the days (2), and nearly every day (3). Summed items create a composite score; higher scores indicated greater levels of depressive symptoms. The MCID for the PHQ-9 is approximately five (Kroenke, 2012). The internal reliability was $\alpha = 0.88$.

Loneliness

The UCLA Loneliness Scale (Vs. 3) was used to measure loneliness (Russell, 1996). Participants responded to 20 items, which included “How often do you feel you lack companionship” as well as “How often do you feel left out.” The response set included four responses, never (1), rarely (2), sometimes (3), and always (4). Higher scores reflect greater levels of loneliness. Internal reliability for this scale was $\alpha = 0.94$.

Perceived Stress

The Perceived Stress Scale (PSS-10; Cohen et al., 1994) was used to measure participant stress levels. This 10-item self-report scale measures the degree to which participants appraise situations in their lives as stressful. Participants were asked to reflect on how they felt about certain situations in the last month, using a five-point Likert scale (0 = never; 4 = often). Example items include “In the last month, how often have you felt that you were on top of things?” as well as “In the last month, how often have you felt nervous and stressed?” Higher scores reflected greater levels of perceived stress. Internal reliability was $\alpha = 0.87$.

Coping

The Brief COPE (Carver, 1997) assesses a variety of coping strategies used to manage life stressors. This 28-item self-report scale asks the participant to think of a stressful issue in his or her life and then answer the degree to which he or she used coping strategies, using a four-point Likert Scale ranging from 1 (I haven’t been doing this at all) to 4 (I’ve been doing this a lot). Fourteen subscales can be created to assess a variety of different coping behaviors, such as denial, behavioral disengagement, and active coping. Eight of these subscales are considered to be adaptive and six are considered to be maladaptive. Higher score indicates more frequent usage of a particular strategy. This study computed two aggregate coping score scores: engagement coping and disengagement coping. Each of these aggregate scores consisted of four subscales of the Brief COPE. Mean values for active coping, use of emotional support, use of instrumental support, and planning were used to calculate engagement coping; mean values of self-distraction, denial, substance use, and behavioral disengagement were used

TABLE 3 | Hierarchical regression analyses predicting stress, anxiety, and depression.

Variable	Model 1 Predicting Stress					Model 2 Predicting Anxiety					Model 3 Predicting Depression				
	B	SE B	β	t	R ²	B	SE B	β	t	R ²	B	SE B	β	t	R ²
Step 1					0.06					0.05					0.04
Gender	-2.38	0.43	-0.18	-5.55***		-2.05	0.38	-0.17	-5.39***		-1.05	0.37	-0.09	-2.81**	
Race	0.88	0.47	0.06	1.87		0.63	0.42	0.05	1.50		1.23	0.41	0.10	3.01**	
SES	-1.81	0.44	-0.14	-4.10***		-1.21	0.39	-0.10	-3.08**		-1.63	0.38	-0.14	-4.26***	
Step 2					0.51					0.47					0.57
Disengagement coping	1.59	0.17	0.26	9.21***	0.46	1.27	0.16	0.24	8.15***		2.13	0.14	0.40	15.19***	
Engagement coping	-0.07	0.11	-0.02	0.60		0.22	0.10	0.06	2.26*		-0.24	0.09	-0.06	-2.71**	
CPAQ	-0.01	0.02	-0.02	-0.74		0.01	0.02	0.01	0.34		-0.03	0.01	-0.05	-1.98*	
Mindfulness awareness	-0.22	0.03	-0.24	-8.48***		-0.16	0.02	-0.19	-6.62***		-0.19	0.02	-0.24	-9.02***	
Mindfulness non-judgment	-0.24	0.02	-0.34	-11.38***		-0.23	0.02	-0.36	-11.60***		-0.17	0.02	-0.28	-9.81***	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. R² values are adjusted; Gender was coded 0 = female, 1 = male; race was coded Caucasian = 0 and Non-Caucasian = 1; SES was coded 0 = low and middle SES and 1 = high SES. Mindfulness Awareness, Mindfulness acting with awareness; CPAQ, Concise Physical Activity Questionnaire.

TABLE 4 | Hierarchal regression analyses predicting loneliness and self-esteem.

Variable	Model 4 Predicting Loneliness						Model 5 Predicting Self-esteem					
	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>R</i> ²	ΔR^2	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>R</i> ²	ΔR^2
Step 1					0.04						0.05	
Gender	−1.65	0.79	0.07	−2.08*			−1.65	0.79	0.07	−2.08*		
Race	3.28	0.87	0.13	3.75*			3.28	0.87	0.13	3.75*		
SES	−3.14	0.82	0.13	−3.84**			−3.14	0.82	0.13	−3.84**		
Step 2					0.34	0.19					0.48	0.42
Disengagement coping	2.90	0.37	0.26	7.84***			−1.10	0.16	−0.19	−6.52***		
Engagement coping	−1.61	0.23	−0.20	−6.97***			0.45	0.10	0.11	4.37***		
CPAQ	−0.15	0.03	−0.13	−4.48***			0.06	0.02	0.09	3.66***		
Mindfulness awareness	−0.18	0.06	−0.11	−3.32***			0.11	0.03	0.13	4.64***		
Mindfulness non-judgment	−0.39	0.05	−0.29	−8.42***			0.31	0.02	0.47	15.15***		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. R^2 values are adjusted; Gender was coded 0 = female, 1 = male; race was coded Caucasian = 0 and Non-Caucasian = 1; SES was coded 0 = low and middle SES and 1 = high SES. Mindfulness Awareness, Mindfulness acting with awareness; CPAQ, Concise Physical Activity Questionnaire.

to calculate the disengagement coping subscale. The internal reliability was $\alpha = 0.89$ for engagement coping and $\alpha = 0.76$ for disengagement coping.

Self-Esteem

The 10-item Rosenberg Self-Esteem Scale (Rosenberg, 1965) was used to measure self-esteem. Participants responded to items utilizing a four-point scale, ranging from (1) strongly disagree to (4) strongly agree. The 10 items are summed, with higher scores indicating higher levels of self-esteem. Items included “I feel that I am a person of worth, at least on an equal basis with others” and “I certainly feel useless at times” (reversed coded). Internal reliability was $\alpha = 0.91$.

Physical Activity

The Concise Physical Activity Questionnaire (CPAQ) was used to measure the amount and type of physical activity participants engaged in Sliter and Sliter (2014). The CPAQ is four-item self-report scale that asks how many days per week various types of physical activity were done for 20 consecutive minutes in the past month. Physical activities included light aerobics, moderate aerobics, vigorous aerobics, and muscle strengthening. Responses ranged from (0) physically unable to participate in an activity/elected to not participate in an activity, (1) 1 day per week or less, (2) 2–3 days per week, (3) 4–5 days per week, (4) 6–7 days per week. A composite score is computed by multiplying the responses to the vigorous aerobic activity by 2.5 and summing this score with the other three items. Internal reliability was $\alpha = 0.88$.

Mindfulness

Two subscales from the Five Facet Mindfulness Questionnaire (Baer et al., 2006) were used to measure the mindfulness constructs of Acting with Awareness and Non-judging of Inner Experience. Each subscale contained eight items. Participants rated items on a five-point Likert scale (1 = never or rarely true; 5 = very often or always true). Items for the subscales included “When I do things my mind wanders off and I’m easily distracted” (Reverse coded – Acting with Awareness) and “I criticize myself

for having irrational or inappropriate emotions” (Reverse coded, Non-Judging of Inner Experience). The three other subscales from the FFMQ were excluded because of evidence suggesting participant misinterpretation of questions (Describing; Jensen et al., 2016), and empirical evidence of performance inconsistent with the two included subscales used (Observing and Non-reactivity; Jensen et al., 2016; Eilenberg et al., 2017; Hedman et al., 2017; Rudkin et al., 2018). The internal reliability for the subscales used were $\alpha = 0.92$ for Acting with Awareness and $\alpha = 0.96$ for Non-Judging of Inner Experience.

Data Preparation and Analysis

All analyses were performed using SPSS 25 (IBM Corp., 2017). Basic descriptive statistics were calculated, including means and standard deviations of key variables as well as participant demographics. Participants were included in analyses if they completed the measures used in that analysis; thus, there is minor variability in n between each analysis.

Statistical assumptions of hierarchical regressions were tested prior to further analysis. Correlations between variables indicated that none of the variables were overly correlated with each other. Collinearity statistics were also examined to determine acceptable levels of Tolerance and VIF were met. Four hierarchical linear regression models were run, separately predicting Stress (as measured by the PSS; Cohen et al., 1994), Anxiety (as measured by the GAD-7; Spitzer et al., 2006), Depression (as measured by the PHQ-9; Kroenke et al., 2001), and Loneliness (as measured by the UCLA Loneliness Scale; Russell, 1996). In each model, gender (coded as male = 0 and female = 1), race (coded as Caucasian = 0 and all other = 1), and SES (coded as 0 = low and middle SES and 1 = high SES) were entered in step 1. Step 2 added engagement and disengagement coping (as measured by the Brief COPE; Carver, 1997; see above for discussion of the creation of engagement and disengagement grouped scales), physical activity (as measured by the CPAQ; Sliter and Sliter, 2014), and mindful awareness and mindful non-judgment (as measured by the Five Facet Mindfulness Questionnaire; Baer et al., 2006; see above for discussion of the selection of the two subscales used). Models

were assessed for overall model prediction of variability for the outcome measure.

RESULTS

Demographics are reported in **Table 1**. A series of correlation analyses between the predictor variables and the dependent variables are presented in **Table 2**. The regression model predicting stress scores was statistically significant, $F(8,889) = 119.33$, $p < 0.001$, adjusted $R^2 = 0.51$. Disengagement coping ($\beta = 0.26$, $p < 0.001$), mindfulness acting with awareness ($\beta = -0.24$, $p < 0.001$), and mindfulness non-judgment ($\beta = -0.34$, $p < 0.001$) all emerged as significant predictors for stress. The regression model predicting anxiety was also statistically significant, $F(8,887) = 100.83$, adjusted $R^2 = 0.47$; disengagement coping ($\beta = 0.24$, $p < 0.001$), engagement coping ($\beta = 0.06$, $p < 0.05$), mindfulness acting with awareness ($\beta = -0.19$, $p < 0.001$), and mindfulness non-judgment ($\beta = -0.36$, $p < 0.001$) all emerged as significant predictors.

The overall regression model predicting depression was statistically significant, $F(8,888) = 149.19$, adjusted $R^2 = 0.57$. The following four predictors were significant: disengagement coping ($\beta = 0.40$, $p < 0.001$), engagement coping ($\beta = -0.06$, $p < 0.001$), physical activity ($\beta = -0.05$), mindfulness acting with awareness ($\beta = -0.24$, $p < 0.001$), and mindfulness non-judgment ($\beta = -0.28$, $p < 0.001$). The final regression model for loneliness was significant, $F(8,889) = 58.31$, adjusted $R^2 = 0.34$, and in this model, all five predictor variables were significant (disengagement coping: $\beta = 0.26$, $p < 0.001$; engagement coping: $\beta = -0.20$, $p < 0.001$; physical activity: $\beta = -0.13$, $p < 0.001$; mindfulness acting with awareness: $\beta = -0.11$, $p < 0.001$; mindfulness non-judgment: $\beta = -0.29$, $p < 0.001$). The regression model predicting self-esteem was statistically significant, $F(8,888) = 103.76$, $p < 0.001$, adjusted $R^2 = 0.48$ and all five predictors were significant as well (disengagement coping: $\beta = -0.19$, $p < 0.001$; engagement coping: $\beta = 0.11$, $p < 0.001$; physical activity: $\beta = -0.09$, $p < 0.001$; mindfulness acting with awareness: $\beta = 0.13$, $p < 0.001$; mindfulness non-judgment: $\beta = 0.47$, $p < 0.001$). Regression analyses are summarized in **Tables 3, 4**.

DISCUSSION

College students are experiencing high levels of stress (Bayram and Bilgel, 2008; Leary and DeRosier, 2012). After transitioning to college, students report increased difficulty in several domains (Conley et al., 2014), including mental health symptoms and considerable substance use (e.g., Johnston et al., 2016). Such research findings have highlighted the need to better understand different approaches for the management of stress in college students. To our knowledge, no study to date has examined the differential contribution of three stress management approaches – coping, physical activity, and aspects of mindfulness – on college student adjustment/maladjustment.

Participants in this study experienced high levels of stress. According to available cutoff scores for the Perceived Stress Scale

(PSS), on average, students endorsed experiencing “moderate” levels of stress; roughly 10% of the sample reported experiencing “high” levels of stress. Further, on average, students self-reported experiencing “severe” levels of anxiety and “moderately severe” levels of depression. This suggests that participants in this study experienced both high levels of stress and adjustment difficulties, as evidenced by elevated rates of anxiety and depressive symptoms.

Hierarchical linear regression results supported the view that coping, physical activity, and components of mindfulness are all predictive of student adaptation. Engagement coping was associated with lower levels of depression and loneliness as well as with higher levels of self-esteem. Conversely, greater levels of disengagement coping were associated with greater levels of perceived stress, anxiety, depression, and loneliness as well as with lower levels of self-esteem. These results align with prior research documenting that engagement coping is generally associated with adaptation while disengagement coping is generally associated with maladaptation (Clarke, 2006; Carver and Connor-Smith, 2010; Mahmoud et al., 2012). Unexpectedly, engagement coping was predictive of higher levels of anxiety in this study. Although inconsistent with the implicit directionality of the regression model tested, it is possible that students who are experiencing high levels of anxiety are reporting the use of more coping strategies, even those that are conceptualized as being adaptive. Unfortunately, our methods did not allow us to differentiate between prevalence and effectiveness of coping strategy use. Future longitudinal or interventional research should evaluate the nature of this relationship.

Physical activity emerged as a significant predictor of three outcome variables in hierarchical regression analyses. Consistent with prior research and our hypothesis, higher rates of physical activity were predictive of lower levels of depression, lower levels of loneliness, and higher levels of self-esteem. Prior research has documented that physical activity is associated with a reduction in stress and anxiety while also elevating mood (Dunn et al., 2001; Penedo and Dahn, 2005; Galper et al., 2006; Baghurst and Kelley, 2014). Prior research has also documented the benefits of physical activity on college student well-being and functioning (VanKim and Nelson, 2013; Wunsch et al., 2017). Our results directly align with the prior research by documenting that physical activity is a significant predictor for three indices of student well-being: depression, loneliness, and self-esteem.

This study found that the two indices of mindfulness – mindful awareness and mindful non-judgment – were both associated with lower stress, lower anxiety, lower depression, lower loneliness, and higher self-esteem. Examination of beta weights suggested that the magnitude of this effect was particularly strong for both mindfulness variables *relative to* other predictor variables. The finding that mindful awareness and mindful non-judgment emerged as strong predictors within statistical models that also considered coping and physical activity represents a notable finding of this study. Such statistics suggest that components of mindfulness are closely linked to college student adjustment – a view that is also supported by prior research in the field. Existing research has documented that higher levels of mindfulness are linked to lower levels of perceived

stress, anxiety symptoms, depression symptoms, and suicidal ideation (Baer et al., 2006; Anastasiades et al., 2017). Further, recent research has documented that mindfulness attributes in college students are associated with a wide range of positive outcomes (e.g., Bamber and Schneider, 2016; Zimmaro et al., 2016).

Results from this study have implications for applied work. Given that all examined stress management approaches were predictive of student adaptation, students could be educated about the potential benefits of being physically active, using adaptive coping behaviors (e.g., engaging with the source of stress), reducing the use of disengaged coping strategies and fostering mindfulness. Even while considering other adaptive stress responses, mindfulness emerged as a particularly consistent and strong predictor of well-being. Given that mindfulness skills can be taught to emerging adult populations to enhance well-being (Shapiro et al., 2008; Regehr et al., 2013; Call et al., 2014), our results support the view that mindfulness skills could be taught to college students as a prevention and intervention for adjustment problems.

Limitations

The cross-sectional nature of the data collected does not allow for causal inferences. As such, our findings cannot speak to whether the examined stress management strategies (coping, physical activity, and mindfulness) *caused* the outcomes of interest, perceived stress, anxiety symptoms, depression symptoms, loneliness, and self-esteem. It is possible that these results reflect a relationship between stress and mindfulness that is either bidirectional or points in the opposite direction described, such that stress reduces mindfulness (which may then in turn increase stress). More complex dynamics still allows for intervention at either point in the causal cycle, but the present study cannot distinguish between those possibilities. Further, the narrow range of participant ages restricted our ability to assess changes across college career. Finally, this study recruited participants from a small and competitive liberal arts college in New England, which may make it difficult to generalize our findings to the overall population of college students. Future research on this topic could address these limitations by using a longitudinal or experimental approach and could recruit participants that are representative of the overall college (or perhaps emerging adult) populations.

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CONCLUSION

These findings shed light on the differential contributions of coping, physical activity, and aspects of mindfulness on college student functioning. Our findings suggest that students who report higher levels of mindfulness appear to be better adjusted across several domains of functioning. As such, efforts to foster mindfulness in college students may support well-being and protect emerging adults from the potentially harmful effects of stress.

DATA AVAILABILITY STATEMENT

The datasets generated for this study will not be made publicly available to protect the confidentiality of research participants the data is not publicly available.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Middlebury College Institutional Review Board. The participants provided their electronic informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RM, MS, JS, EL, TR, and CR contributed to the design and data collection. RM, MS, JS, and VP contributed to analyses. All authors contributed to the writing of drafts of the manuscript. RM, MS, and VP completed final manuscript for submission.

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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.

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