

POSITIVE EDUCATION: THEORY, PRACTICE, AND EVIDENCE

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POSITIVE EDUCATION: THEORY, PRACTICE, AND EVIDENCE

Topic Editors:

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

Samuel Mun-yin Ho, City University of Hong Kong, Hong Kong

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Editorial: Positive Education: Theory, Practice, and Evidence

Wenjie Duan^{1*}, Zheng Chen² and Samuel M. Y. Ho³

¹ School of Social and Public Administration, East China University of Science and Technology, Shanghai, China, ² Institute of Education, Wuhan University, Wuhan, China, ³ Department of Social and Behavioral Sciences, City University of Hong Kong, Hong Kong, China

Keywords: positive education, positive psychology, strengths perspective, PERMA-H, well-being

Editorial on the Research Topic

Positive Education: Theory, Practice, and Evidence

In one or two words, what do we desire most for the young generation? Seligman et al. (2009) once gave a test similar to this question in the beginning of his paper and argued that most people aspire well-being for their children. We believe that “positive education” is another answer to the question.

This paper aims to shed light on pathways and prospects of positive education. In the subsequent pages, we initially review key insights into studies that focused on the psychological well-being of individuals, which provides an empirical foundation for positive education. Moving beyond these studies, we focused on positive education. Studies under this category either adopted a holistic PERMA-H positive education model or examined one or two of its six elements. The PERMA model of flourishing was introduced by Seligman (2011), who classified psychological well-being into five domains, namely, positive emotions (P), engagement (E), relationships (R), meaning (M), and accomplishment (A). In late 2013, another element called positive health (H) was added to the PERMA model to embrace a holistic view of physical and psychological health (Norris et al., 2013). Finally, we highlight the contributions of this special issue and conclude with suggestions for future study.

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Douglas F. Kauffman,
Medical University of the Americas –
Nevis, United States

*Correspondence:

Wenjie Duan
duan.w@ecust.edu.cn;
duan.w@outlook.com

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INSIGHTS INTO INDIVIDUALS' PSYCHOLOGICAL WELL-BEING

This section addresses the aim of this paper to enhance the young generation's psychological well-being and deal with negative emotions by positive psychology. This group consists of five papers.

Chi et al. evaluated the effects of mindfulness-based stress reduction (MBSR) in the treatment of depression among adolescents and young adults by a systematic review of the literature and metaanalysis. Eighteen randomized controlled trials (RCTs) featuring 2,042 participants are included in the metaanalysis. Results showed that MBSR has modest effects for reducing depressive symptoms post-intervention. The meta-regression suggested that the average treatment effect might be moderated by control condition, treatment duration, and subjects' baseline depression. However, mediators such as individual strengths, timing, and sequence of change (Labelle et al., 2015) and rumination (Labelle et al., 2010), among others are not discussed and further research is required to assess the follow-up effects of MBSR on depressive symptoms. Extremera et al. indicated that students' own ability, particularly emotional intelligence (EI), including self-control skill, plays a buffering role for adolescent victims of cyberbullying from the harm of suicidal ideation and increases their levels of mental health. Thus, EI is an important life skill for adolescent students that should be taught in schools. EI programs may be beneficial to students with test anxiety (TA) problems. Pena and Losada examined this hypothesis and focused on emotional attention

and TA. They found that emotional attention is associated with high scores in self-rumination, thereby increasing reliance upon TA. Moreover, self-rumination fully mediates the link between emotional attention and TA. Similar to the notion that TA impairs school students' physical and emotional well-being, competence frustration has been consistently found to undermine one's intrinsic motivation in the same activity. Fang et al. explored a single basic psychological need (competence frustration) involving a sample of 617 undergraduate students in China and found an interesting phenomenon that was previously unreported. Notably, if competence frustration in this activity is sufficiently high and exceeds a critical point, then a restoration process would be activated to help individuals regain competence in the subsequent less-demanding activity. Thus, participants would exhibit enhanced intrinsic motivation toward the subsequent activity. Puente-Martínez et al. provided a reliable and valid measure of negative affect regulation to relieve negative emotions by involving a sample of 264 university students. They argued that negative affect regulation has greater relevance with eudemonic than hedonic well-being. The results of this study were beneficial for promoting emotional capacities to effectively cope with negative situations in educational contexts.

These five aforementioned papers provide certain empirical evidence that helps us understand how individuals, from toddler through adolescent stages, develop resiliency amidst difficulties and maladaptation. That is, their inner power or emotional ability helps overcome negative emotions and protect their mental health and well-being.

APPROACHES TO POSITIVE SCHOOL EDUCATION

Several group of papers are included for satisfying the criterion of focusing on the flourishing of young people, which is currently a well-established and measurable psychological construct worldwide (Silva and Caetano, 2011; Sumi, 2013; Villieux et al., 2016; Duan and Xie, 2019). The two papers adopted a holistic PERMA or PERMA-H positive education model (Norris et al., 2013) whereas the eight remaining papers focused on one or two elements of positive education (Seligman, 2011). The six elements include positive emotions, positive engagement, positive relationships, positive purpose (meaning), positive accomplishment, and positive health that is underpinned by focusing on character strengths.

Two papers (Shoshani and Slone; Lai et al.) contributed to the PERMA-H model through large-scale intervention programs in schools. Shoshani and Slone took preschool students as subjects and investigated the effects of positive psychology interventions on their subjective well-being, mental health, and learning behaviors through a RCT during one school year. The program focused on the four elements of the PERMA model including activities for enhancement of positive emotions, engagement, relationships, and achievement. Their findings revealed significant increases in subjective well-being and positive learning behaviors in the intervention group, whereas no

significant changes were found in the control group. Thus, the potential of positive psychological interventions for increasing subject well-being and positive learning behaviors at young ages was highlighted. The results were consistent with the conclusion of an early review on positive psychology interventions (PPI) in 12 schools from kindergarten to high school and PPI RCTs in other stages of life such as freshmen and adults (Gander et al., 2016). The ability of PPI to build the well-being of students have been manifested overtime and across cultures. Lai et al. validated a multidimensional measure of PERMA-H in the context of a positive education program evaluation among senior primary school students to provide a solid foundation for related scientific research and the understanding of the multidimensional framework of positive psychology concepts. The set of measurements would be an invaluable tool for the development of positive education in Hong Kong or other parts of China.

The eight remaining papers focused on a part of the positive education model. Research has shown that character strengths are linked to positive youth development (Park et al., 2004; Duan et al., 2015) and numerous valued outcomes (e.g., decreases in depression, increase in life satisfaction, and achievement) (Duan and Bu, 2017; Schutte and Malouff, 2019). In line with previous research, Zhang and Chen discovered that certain character strengths, namely, hope, curiosity, zest, perseverance, and love bear the strongest correlations with subjective well-being. Future self-continuity moderates the mediation of strength use because it moderates the effect of strength use on subjective well-being. These findings expand knowledge on future self-continuity and its relation to strength use and subjective well-being among undergraduates. Zhao et al. focused on growth mindset and grit and examined the mediating roles of leaning motivations. Results from a cross-sectional investigation administered to 1,842 students in a Chinese city indicated that learning motivations partially mediate the relationship between growth mindset and grit. This study extended the understanding of the underlying mechanisms through which growth mindset and grit positively influence education. Li et al. unveiled that students' previous achievements predicted their behavioral, emotional, and cognitive engagements, and the association between previous achievement and school engagement is strong among students under the scenario that incorporates incremental theory but not for those under the scenario that incorporates entity theory in emotional and cognitive engagements. Their findings revealed that students with positive notions of intelligence may perform better than those with negative notions. Drawing upon self-determination theory and previous studies, Orkibi and Ronen hypothesized that the association between self-control skills (SCS) and their subjective well-being may be mediated by students' perceived satisfaction of their basic psychological needs for competence, relatedness, and autonomy. The findings support the hypothesized model. Self-control skills are actual predictors of perceived needs satisfaction and, consequently, subjective well-being (SWB) in school. Yu et al. attempted to understand how academic achievement is affected by subjective well-being. Therefore, they investigated 434 university students in Hong Kong through an online survey.

The results showed that personal well-being exhibits long-standing positive effects on university engagement and thus on learning achievement during university years. Therefore, the promotion of holistic development among university students should be given increased attention. Widlund et al. examined a number of academic well-being (e.g., school burnout, schoolwork engagement, and mathematics self-concept) and mathematics performance profiles, apart from subjective well-being. These profiles were relatively stable across one school year during seventh to ninth grades. In addition, academic well-being and mathematics are positively related to students' educational aspirations. Steinmayr et al. investigated school-related and individual predictors of subjective well-being and academic achievements. Positive school climate including self-efficacy and the worry component of TA predicted SWB and/or GPA. Given that the family is also a key resource for children to grow and thrive, Duan et al. utilized the data from 19,487 Chinese junior school students from the 2013–2014 Chinese Educational Panel Survey and analyzed the effects of parental involvement and socioeconomic status on their children's academic achievements and school behaviors. The findings implied that parental involvement activities are highly beneficial for junior school students in families with low socio-economic status (SES). Academic socialization is generally associated with academic success, whereas home-based involvement closely relates to school behaviors. Thus, the promotion of parental involvement in low SES families should be given increased attention.

Together, these eight papers clarify a multidimensional positive education model by explaining how to understand, implement, and evaluate the model.

FUTURE HORIZONS FOR POSITIVE EDUCATION RESEARCH

This special issue aims to propose a leading-edge research from positive psychology and positive education literature to enhance our understanding of well-being and its significance in the field of education in this era that focuses on well-being as the ultimate goal of human societies. We begin by outlining five papers in the field of positive psychology, which determine the underlying mechanisms of young people's mental health and its relations to their academic achievements. Subsequently, we introduce 10 papers that are built on the concept of positive education or related to elements of positive education.

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This introductory article aims to highlight the studies in this special issue and motivate readers to appreciate and build on these contributions. White (2016) suggested that we must provide scientific evidence, organizational benefits, and philosophical arguments to support the integration of well-being in education. Therefore, we intend to provide suggestions following White's opinion.

First, robust evidence-based and scientifically informed results should be provided to researchers and policymakers to emphasize that well-being matters in its own right. Thus, enhanced and well-controlled tests, diachronic studies, large-scale investigations, cross-cultural studies, and metaanalysis should be conducted.

Second, better compelling cases of intervention programs than those previously conducted should be established to demonstrate the benefits of positive education and psychologically informed approaches to educational leaders, school educators, parents, and other shareholders. This approach may involve schools at all levels and of various types, from kindergartens to universities and from high-performing students to students with learning difficulties.

Third, positive parenting (Seligman, 2002) and its relationship to students' well-being and performances should be valued. To promote the research in this cross-context field, additional evidence is required through systemic investigations and interventions (Sanders et al., 2014). The increased understanding on the influence of families on students' well-being and school performances further bonds the ties that we build for schools and families. Thus, the vision of positive education will be clear for the young generation.

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Basic Psychological Needs Satisfaction Mediates the Association between Self-Control Skills and Subjective Well-Being

Hod Orkibi^{1*} and Tammie Ronen²

¹ School of Creative Arts Therapies, University of Haifa, Haifa, Israel, ² Renata Adler Memorial Research Center for Child Welfare and Protection, Gershon Gordon Faculty of Social Sciences, Tel-Aviv University, Tel-Aviv, Israel

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Wenjie Duan,
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*Correspondence:

Hod Orkibi
horkibi@univ.haifa.ac.il

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Although studies have shown that self-control skills (SCSs) are positively linked to both personal and interpersonal outcomes in adolescent students, studies on the putative mechanisms underlying this relationship are scarce. Drawing on Self-Determination Theory and previous studies, we theorized that the association between students' SCSs and their subjective well-being (SWB) in school may be mediated by students' perceived satisfaction of their basic psychological needs for competence, relatedness, and autonomy. The sample consisted of 1576 Israeli adolescent students (54% girls) in grades 10–12 (mean age 16) enrolled in 20 schools. A mediation model was tested with structural equation modeling and a robust bootstrap method for testing indirect effects, controlling for school-level variance. The findings supported the hypothesized model and a *post hoc* multi-group comparison analysis yielded gender invariance in the model. The findings suggest that both girls and boys with high SCSs may perceive themselves as having greater needs satisfaction in school and consequently higher school-related SWB. Implications for policy and practice are discussed.

Keywords: self-control, subjective well-being, school satisfaction, positivity ratio, self-determination theory, basic needs satisfaction

INTRODUCTION

Adolescents spend most of their time in school during a developmental period that is often associated with increased stress and turbulent emotional experiences (Colten and Gore, 1991; Silvers et al., 2012). Thus, promoting school-related subjective well-being (SWB) is crucial. Within a positive psychological framework, global or general SWB consists of two indicators: cognitive evaluation of life as satisfying and the experience of more frequent positive emotions than negative emotions (Diener et al., 1999, 2009). Most studies have examined global or general SWB in adults but only a few studies on adolescents have examined both the cognitive and emotional indicators of SWB in school. However, focusing on adolescent students' SWB in school is important because it may differ from their assessment of their general or other domain-specific SWB (Huebner et al., 2000; Zappulla et al., 2014). The accepted conceptualization of SWB in school consists of school satisfaction and the experience of more frequent positive emotions than negative emotions in school (Long et al., 2012; Liu et al., 2016; Tian et al., 2016).

The current study explored the contribution of self-control skills (SCSs), which have been linked to general SWB in both adults and adolescents (Hamama et al., 2012; Orkibi et al., 2014), to students' SWB in school.

Drawing on Self-Determination Theory, which is one of the major theories related to well-being that has been empirically applied to the school context (Niemic and Ryan, 2009; Tian et al., 2014a), we theorized and tested a model with students' perceived basic psychological needs satisfaction in school as a mediator accounting for this link. Studying the direct and indirect links between SCSs and SWB in school are important not only for a better understanding students' processes in an often turbulent developmental period, but can also inform the development and implementation of psycho-educational interventions.

The Benefits of SWB

Subjective well-being is particularly pertinent in adolescence because this transitional period of intense psycho-physical development can be one of the most difficult phases in life for some individuals (Steinberg, 2013). Studies have shown that students with higher *general* life satisfaction, the cognitive indicator of general SWB, reported better academic achievement, more school-satisfaction and positive school experiences, better relationships with peers and parents, higher self-esteem, levels of hope and sense of meaning, and less personal distress such as anxiety and depression (Gilman and Huebner, 2006; Marques et al., 2011; Nadeau et al., 2015).

Although there is ample evidence for the benefits of positive emotions in adults (for a review see Lyubomirsky et al., 2005; Fredrickson, 2013), less research has been done on the benefits of positive emotions in children and adolescents beyond the role of low positive emotions in developmental psychopathology (for a review see Davis and Suveg, 2014) and negative academic and behavioral outcomes (Roeser, 2001; Cohen, 2006). Research has shown that positive emotions linked positively with school satisfaction, adaptive coping, and student engagement (Lewis et al., 2009; Long et al., 2012; Liu et al., 2015; Orkibi and Tuaf, 2016).

In Israel, studies have consistently shown that adolescents' positive emotions (not school-specific) were significantly linked to more SCSs and subjective happiness, as well as less hostility and physical aggression (Agbaria et al., 2015; Gavriel-Fried et al., 2015). Israeli adolescents who reported a high positivity ratio – the experience of more frequent positive emotions (e.g., joy, pride, love) than negative emotions (e.g., fear, shame, anger) – also reported higher SCSs and perceived social support (Orkibi et al., 2014, 2015). A high positivity ratio in Israeli adolescents was significantly positively linked to general life satisfaction, past positive and future time perspectives, and negatively linked to past negative and present fatalistic time perspectives (Orkibi, 2015; Orkibi and Dafner, 2015). Israeli adolescent students' positivity ratio was significantly and positively linked to SCSs and pro-environmental behavior (Kerret et al., 2016). Based on these findings, the current study focused on the ways in which SCSs may contribute to adolescent students' SWB in school.

SWB in School

Subjective well-being in school consists of school satisfaction and the experience of more frequent positive emotions than negative emotions in school. The literature on SWB in schools has mostly focused on the cognitive component, namely school satisfaction. In the United States, students who were high on school satisfaction also scored significantly higher on measures of general life satisfaction, hope, and internal locus of control (Huebner and Gilman, 2006). Good teacher-student relationships and perceived peer social support (Jiang et al., 2013) as well as better in-school behavior (Suldo et al., 2014) also significantly positively correlated with school satisfaction.

Fewer studies have examined the cognitive and emotional indicators of SWB in school simultaneously; in other words, both school satisfaction and emotions experienced in school. Generally, school satisfaction has been shown to be significantly positively linked with positive emotions in school and negatively linked with negative emotions in school (e.g., Long et al., 2012). In an extensive line of studies with Chinese adolescent students, SWB in school was generally significantly linked to perceived social support (Tian et al., 2013; Liu et al., 2016), scholastic competence and social acceptance (Tian et al., 2015c). Similarly, SWB in school predicted students' sense of school belonging (Tian et al., 2015b). In a different study with Chinese adolescent students, a significant bi-directional association was found between basic psychological needs satisfaction at school (i.e., the need for autonomy, relatedness, and competence at school) and students' SWB in school (Tian et al., 2014a). School satisfaction and positive emotions in elementary school were significantly linked to gratitude and pro-social behaviors of Chinese students (Tian et al., 2015a). Thus overall, an emerging body of evidence points to the importance of SWB in school and its significant link to adaptive intrapersonal and interpersonal outcomes.

Self-Control Skills (SCS) and SWB

The current study draws on Rosenbaum's (1990) conceptualization of self-control as a learned repertoire of goal-directed skills that enable people to cope with distress and overcome difficulties related to maladaptive thoughts, emotions, and behaviors. This repertoire of SCS has strong implications for psycho-educational interventions that have been found to improve students' functioning (Ronen and Rosenbaum, 2010). A substantial body of research suggests that SCS are positively related to students' academic competency and performance, independent of general intelligence, cognitive ability, and prior achievements (Matthews et al., 2009; Liew et al., 2010; Zhou et al., 2010; Valiente et al., 2013, 2014). Studies on Israeli adolescents have found significant links between high SCS and fewer negative emotions, as well as more self-efficacy belief, positive emotions, and a higher positivity ratio (Ronen and Seeman, 2007; Orkibi et al., 2014, 2015; Orkibi and Ronen, 2015).

In addition to personal benefits, SCS have also been associated with interpersonal and pro-social outcomes. Studies have consistently shown that students with high SCS report higher perceived social support than students with low SCS (Orkibi and Ronen, 2015; Orkibi et al., 2015). Consistent with this trend,

students with high SCS also reported less hostile attribution bias (i.e., interpreting others' intentions or behaviors as hostile and threatening) and less physically aggressive behavior (Hamama and Ronen-Shenhav, 2012; Agbaria et al., 2015; Gavriel-Fried et al., 2015).

Overall, based on the literature, we theorized that students' SCS would link directly to students' SWB in school as well as be mediated through students' perceived satisfaction of their basic psychological needs (Ryan and Deci, 2000). Specifically, we theorized that because SCS include the ability to volitionally exert control over emotions, thoughts, and behaviors, a higher SCS would contribute directly to SWB in school by regulating cognitions, emotions, and behaviors. We also theorized that SCS would link to SWB indirectly, through the contribution of SCS to students' experiences of autonomy, relatedness, and competence needs satisfaction in school.

Basic Psychological Needs Satisfaction as a Mediator

Basic psychological needs theory is a sub-theory of a human motivation macro-theory known as Self-Determination Theory (Ryan and Deci, 2000). This theory posits that the satisfaction of the needs for autonomy, relatedness, and competence is crucial for motivation, optimal development, effective functioning, and good health (Milyavskaya and Koestner, 2011). From a general (not domain-specific) perspective, the need for autonomy refers to the need to experience one's behavior as volitional and self-endorsed rather than as pressured or coerced by forces perceived to be alien to the self. Note that "autonomy literally means 'self-governing' and implies, therefore, the experience of regulation by the self" (Ryan and Deci, 2004, p. 451). This is a key point in our proposed link between SCS and needs satisfaction, in that self-regulation is viewed as "an organizational function that 'coordinates' systemic behaviors and serves as a foundation for autonomy and the sense of self" (Shogren et al., 2015, p. 257). The need for relatedness refers to the need to feel significant, connected to, and cared for by important others rather than isolated or disconnected from others. The need for competence refers to the need to experience efficacy, mastery, and skillfulness rather than incompetence. The benefits of these needs satisfaction are documented in research across nations, cultures, and many life domains including education, work, healthcare, sport, parenting, and close relationships (see Deci and Ryan, 2008; Milyavskaya and Koestner, 2011).

Among the studies within the educational context, perceived goal mastery and teacher and peer support were significantly linked to school engagement and hope, whereas perceived autonomy was also linked to academic achievement in middle and high school students in the United States (Van Ryzin, 2011). In adolescent soccer (i.e., football) players in the United Kingdom, perceived coach-autonomy support and satisfaction of basic needs were positively linked to vitality and negatively to perceived exhaustion in soccer (Adie et al., 2012). In a study with Chinese adolescents, perceived satisfaction of the three basic psychological needs was significantly associated with self-rated

autonomy, sense of school connectedness, and sense of scholastic competence (Tian et al., 2014b). In a longitudinal study in China, basic needs satisfaction reduced adolescent students' anxiety and depression (Yu et al., 2016). A different longitudinal study in China showed that needs satisfaction significantly contributed to the prediction of the cognitive and emotional components of students' SWB in school (Tian et al., 2014b). Similarly, needs satisfaction in physical education was positively related to experiences of vitality and negatively related to negative emotions among high school students in Hong Kong (Liu and Chung, 2014).

There are fewer studies on the mediating role of basic needs satisfaction compared to the numerous studies on the direct links between needs satisfaction and outcomes. For example, needs satisfaction mediated the link between community-related self-esteem and well-being in adults in an urban community in the United States (Molix and Nichols, 2013). Needs satisfaction also mediated the inverse association between socioeconomic status (SES) and physical and mental health among adults in the United States (González et al., 2016). Competence and relatedness needs satisfaction mediated the link between coach-autonomy support and subjective vitality over two seasons in adolescent soccer players in the United Kingdom (Adie et al., 2012). In samples of adults in India and the United States, the relationships between perceived capabilities (i.e., personal, social, and material conditions) and both general SWB and the vitality-meaning composite score were mediated by basic needs satisfaction (DeHaan et al., 2015). In another study that examined multiple mediators in a sample of Chinese adolescent students, relatedness and competence needs satisfaction at school mediated the link between gratitude and SWB in school; autonomy needs satisfaction mediated the link between relatedness and competence needs satisfaction and SWB in school (Tian et al., 2016).

Causal Agency Theory, which emerged in the field of special education and is an extension of the functional model of self-determination (see Shogren et al., 2015, 2017) is particularly germane to the present study and the proposed link between SCS and needs satisfaction. Briefly, this theory posits that the motivation to satisfy basic psychological needs drives people to self-determined (self-caused) actions that enable them to act as causal agents in their own lives, thus enhancing self-determination and overall well-being. Self-determined actions, that lead to causal agency, are characterized by being volitional (i.e., consciously and autonomously self-initiated), agentic (i.e., self-directed toward a goal), and driven by action-control beliefs (i.e., one's beliefs about the relationships between actions/means and ends). Importantly, self-determined actions are "self-regulated and self-directed... [enabling] a person to make progress toward freely chosen goals and to respond to opportunities and challenges in their environments" (Shogren et al., 2015, p. 259). This is consistent with the abovementioned link between self-regulation, a sense of autonomy and a sense of self.

In line with this view, we reasoned that because SCS are goal-directed skills that help people regulate their emotions,

cognitions and behaviors (Rosenbaum and Ronen, 2013), SCS should in turn lead to greater self-determination in terms of helping students experience a greater sense of *autonomy*, volition, and self-endorsement of their behavior in school as well as a sense of *relatedness*, belonging, and genuine connection with teachers and peers, and a sense of *competence* by enabling them to effectively interact with their school environment and maximize opportunities to express or develop their capabilities and strengths.

Study Hypotheses and Model

Three hypotheses were formulated and tested. First, drawing on previously established links between SCS and general SWB in both adults and adolescents (e.g., Hamama et al., 2012; Orkibi et al., 2014), Hypothesis 1 posited that SCS would positively and directly link to the school-related positivity ratio and school satisfaction – the emotional and cognitive components of SWB in school, respectively. Based on the association in Causal Agency Theory between self-regulation and self-determination (Shogren et al., 2015; Wehmeyer and Shogren, 2017), Hypothesis 2 posited that SCS would be positively related to perceived basic psychological needs satisfaction in school, which reflects self-determination (Niemiec and Ryan, 2009). Finally, the current study contributes to the literature by focusing on the processes underlying the link between students' SCS and students' SWB in school. Drawing on previously established links between basic psychological needs satisfaction in school and SWB in school (e.g., Tian et al., 2014a), Hypothesis 3 posited that the link between SCS and SWB in school would be mediated by basic psychological needs satisfaction in school.

MATERIALS AND METHODS

Sample

The study sample was composed of 1576 adolescents (54% girls) in grades 10–12, aged 14–18 ($M = 16$, $SD = 0.88$) enrolled in 20 typical public schools located in the northern, central, and southern regions of Israel. Of this sample, 77% were born in Israel, 12% in the former Soviet Union, and 11% in “other” countries. Eighty-five percent of the sample had married parents, 12% divorced or separated parents, 2% a single parent, and 1% had “another” family situation. Most students (53%) were from a three-child family and were the eldest (48%). Most students (60%) stated their family's financial situation was “similar” to that of their peers.

Procedure

Permission to conduct the study was obtained from the Israel Ministry of Education and the University's Institutional Review Board. The students' parents received a printed letter informing them of the study and were asked their permission to allow their child to complete the questionnaires. Parents were provided with ample time to respond in writing or by telephone. To protect students from feeling coerced into participation and to prevent any potential for coercion and/or undue influence, it was clarified

that participation in the study was on a voluntary basis. It also was explicitly explained to the students that they had the right to refuse to participate or to withdraw from the study at any time, without any penalty or prejudice to their interests. Data were collected using internet-based survey software where logging-in to the online questionnaire signified student assent. Students responded during regular school hours in computer classrooms, proctored by a research assistant. Because the survey software did not let items be skipped, there were no missing data from the participating students.

Measures

The sociodemographic questionnaire asked students to provide the following information: gender, age, country of birth, grade level, school, parental marital status, number of siblings, and socio-economic status compared to other students in their class.

Self-Control Skills

The 32 item Adolescents' Self-Control scale assessed students' SCS (Rosenbaum and Ronen, 1991) in coping with disturbing thoughts, emotions and behavior such as solving skills, attentional control (i.e., distraction), cognitive reframing, delay of gratification, and use of self-talk and self-reinforcement. For example: “When I have to do boring homework, I think about how important it is for me.” Students rated the items on a scale ranging from 1 (*not characteristic of me at all*) to 6 (*very characteristic of me*), with higher mean scores indicating higher SCS. The scale's validity and reliability have been established (Zauszniewski et al., 2010), including its Hebrew version (Ronen and Rosenbaum, 2010; Orkibi et al., 2014). In the present study, the internal consistency coefficient was 0.84. In contrast to scales that measure self-control as a trait, this scale measures cognitive-behavioral skills that are shaped by experience and practice and thus has stronger implications for future psycho-educational interventions (for a review of self-control measures, see Duckworth and Kern, 2011).

Perceived Needs Satisfaction at School

The Students' Basic Psychological Needs at School scale was developed based on Self-Determination Theory (Tian et al., 2014b). This self-report scale consists of 15 items, five items for each subscale: need for autonomy (e.g., “I am free to arrange my studies and extracurricular activities at school”), need for relatedness (e.g., “I get along well with my teachers and classmates at school”), and need for competence (e.g., “I have been able to learn interesting new skills at school recently”). Students rated items on a scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Previous results provide good support for the validity and reliability of the scale (Tian et al., 2014b). In the present study, the internal consistency reliability coefficients of the total score was $\alpha = 0.82$. Because we were interested in need satisfaction in general, the mean of the 15 items was used in the analysis with higher scores representing greater perceived satisfaction of basic psychological needs.

TABLE 1 | Descriptive statistics and Pearson's correlations between the variables.

Variables	Self-control skills	Autonomy	Relatedness	Competence	School satisfaction	<i>M</i>	<i>SD</i>
Self-control skills	(0.84)					25.15	22.45
Autonomy	0.30	(0.80)				3.97	1.02
Relatedness	0.36	0.46	(0.83)			5.02	0.79
Competence	0.40	0.48	0.49	(0.75)		4.25	0.97
School satisfaction	0.42	0.52	0.54	0.61	(0.86)	4.06	0.96
Positivity ratio	0.40	0.39	0.43	0.44	0.47	1.65	0.74

All correlations were significant at the 0.001 level. Cronbach's alphas are displayed in parentheses on the diagonal. $N = 1576$.

School Satisfaction

It was measured on the 8 item school subscale of the 40 item Multidimensional Students' Life Satisfaction Scale that covers important life domains (Huebner, 1994; Huebner et al., 1998). Students rated their overall satisfaction with their school experiences on a scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*), where higher mean scores indicating greater school satisfaction. The scale has demonstrated good validity and reliability (Huebner et al., 1998). In the current study, the internal consistency reliability coefficient of the scale was $\alpha = 0.86$.

The Positive and Negative Affect Scale for Children

It is a 30 item self-report scale with 15 items for positive emotions and 15 items for negative emotions (Laurent et al., 1999). To measure the school-related positivity ratio, students ranked the frequency of each positive emotion (e.g., joy, pride, love) and negative emotion (e.g., fear, shame, anger) they had experienced in the previous few weeks *at school* using a scale ranging from 1 (*very few times*) to 5 (*a lot of times*). Laurent et al. (1999) reported evidence for good validity and reliability. In the current study, the alphas were $\alpha = 0.89$ for positive emotions and $\alpha = 0.90$ for negative emotions. To obtain a *positivity ratio* score, the mean score for positive emotions items was divided by the mean score for negative emotions items (Orkibi et al., 2015). A larger ratio (higher score) thus represented a greater number of positive over negative emotions.

Data Analysis

First, bivariate correlations for all the variables were explored. Second, we used IBM's Amos23 for a path analysis to test the theoretical model, particularly the mediating role of psychological needs satisfaction (mean score) in the *indirect* association between SCS (mean score) and school satisfaction (mean score) and the positivity ratio (the ratio of positive versus negative emotions in school). We ran the analyses while controlling for student age and school-level variance in SES as indicated by values provided by the Israeli Ministry of Education. School satisfaction and positivity ratio were allowed to co-vary. The model's fit to the data was evaluated using the criteria of $\chi^2/df \leq 3$, a comparative fit index (CFI) ≥ 0.95 , Tucker-Lewis coefficient (TLI) ≥ 0.95 , and a root mean square error of approximation (RMSEA) < 0.80 (Schreiber et al., 2006). The bootstrap method for testing indirect effects (i.e., mediation) was used with the confidence level set at 0.95 and bootstrap bias-corrected samples set at

5000. When zero is not in the 95% confidence interval, the indirect effect is significantly different from zero at $p < 0.05$ (two tailed) (Preacher and Hayes, 2004, p. 722). *Post hoc* multiple group comparison analysis was conducted to test whether the model differed by gender in structural weights (i.e., regression weights) using Amos multiple-group automated procedure (Byrne, 2010).

RESULTS

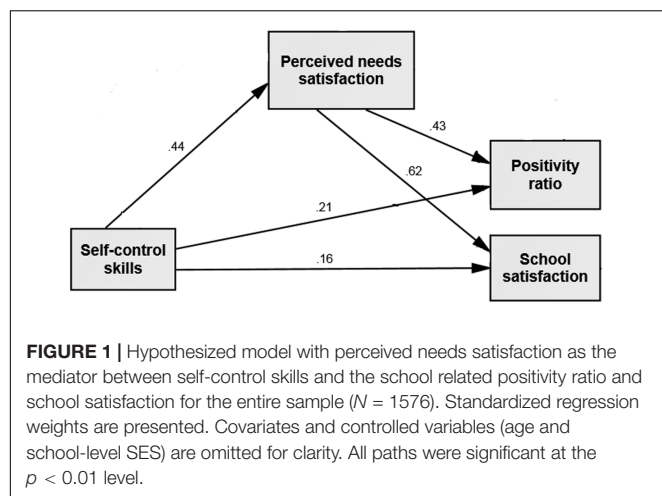
Descriptive Statistics

Table 1 presents the means and standard deviations for SCS, perceived needs satisfaction at school, school satisfaction, and the positivity ratio. For each variable, higher scores indicate higher levels of that psychological construct. As can be seen, of the three psychological needs satisfaction at school, relatedness had the highest score.

Correlation Analyses

Table 1 presents inter-correlations between the observed values of all the variables, confirming Hypothesis 1 and Hypothesis 2. Although all the correlations were significant, the strongest positive correlations were between psychological needs satisfaction at school and school satisfaction. Of the three psychological needs, competence had the strongest correlation with school satisfaction.

In addition, Pearson correlation analysis between age and the variables yielded significant, albeit weak, correlations between age and SCS ($r_s = 0.07, p < 0.01$), autonomy ($r_s = -0.07, p < 0.01$), competence ($r_s = -0.05, p < 0.05$), and school satisfaction ($r_s = 0.09, p < 0.01$). Spearman rho correlations between gender (coded: 1 = boys, 2 = girls) and the variables yielded significant correlations between gender and SCS ($r_s = 0.11, p < 0.001$) with girls scoring significantly higher ($M = 27.20, SD = 22.90$) than boys ($M = 22.74, SD = 21.70$); between gender and autonomy ($r_s = -0.08, p < 0.01$) with boys scoring significantly higher ($M = 4.06, SD = 0.98$) than girls ($M = 3.90, SD = 1.05$); between gender and school satisfaction ($r_s = 0.07, p < 0.01$) with girls scoring significantly higher ($M = 4.11, SD = 0.96$) than boys ($M = 3.99, SD = 0.96$); and between gender and positivity ratio ($r_s = -0.20, p < 0.001$) with boys scoring significantly higher ($M = 1.79, SD = 0.73$) than girls ($M = 1.53, SD = 0.72$). Student-reported SES correlated significantly with the positivity ratio in

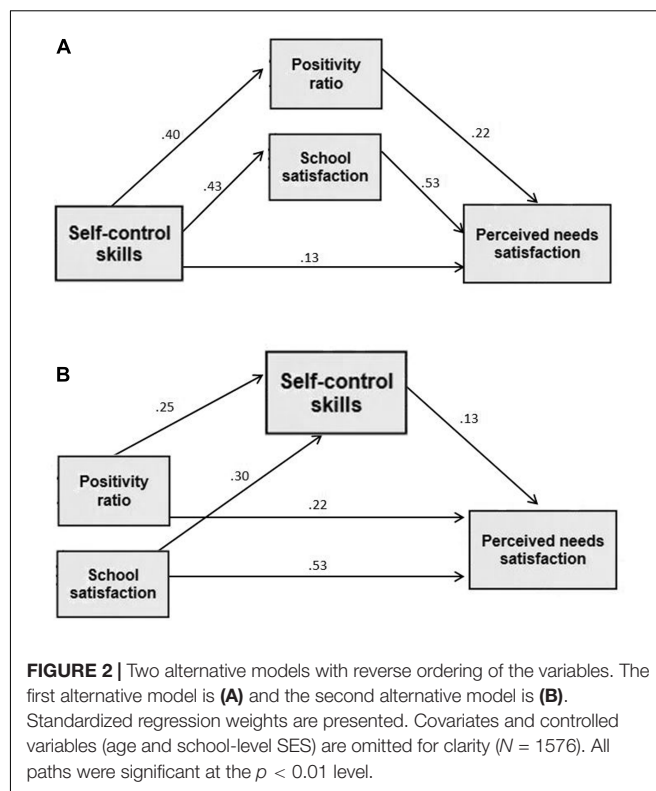


school ($r_s = 0.06$, $p < 0.05$). Given these correlations, age, gender, and SES were included in the analyses described below.

Theorized Mediation Model

Given the significant correlations between age and the other variables, age was included in the model to control for its potential effect on the model variables. Student-reported SES was first included in the model but then omitted because there was no effect on the variables in the model. Importantly, we ran the analyses controlling for school-level variance in SES as indicated by each school's Nurturing Index score that was provided by the Israeli Ministry of Education. A Nurturing Index score is a variable that ranges from 1 to 10 and reflects the overall SES characterizing a given school's student body as a whole (see BenDavid-Hadar and Zideman, 2010). We thus added paths from the school-level SES variable to the model variables.

The path analysis indicated that the theorized model depicted in **Figure 1** provided a good fit to the data as shown in **Table 2**. A significant *indirect* link, through perceived psychological needs satisfaction as a mediator, was found between SCSs and school satisfaction (95% CI = [0.242, 0.301], $p < 0.01$) as well between SCS and the school-related positivity ratio (95% CI = [0.164, 0.215], $p < 0.01$). Because the CI did not include zero, the null hypothesis of no mediation was rejected in both paths. Thus, the findings confirmed the model suggested in Hypothesis 3. Note that the explained variance was 20% for psychological needs satisfaction, 30.5% for positivity ratio, and 50% for school satisfaction.



Alternative Mediation Models

As advocated in the methodological literature (James et al., 2006), we ran *post hoc* path analyses of two alternative models with reverse ordering of the variables to examine the theoretical possibility of reverse causation. The models were compared in terms of model fit indices. Based on studies showing bidirectional links between SWB and needs satisfaction (Tian et al., 2014a), in the first alternative model, **Figure 2A**, SCS was linked to school related positivity ratio and satisfaction (the mediators), that in turn was linked with psychological needs satisfaction. The second alternative model, **Figure 2B**, was based on Baumeister's idea that in the presence of positive emotions people can exert better self-control (e.g., Baumeister et al., 2007; Baumeister and Sparks, 2008). Accordingly, school related positivity ratio and satisfaction *preceded* SCS (the mediator), which in turn was linked with perceived needs satisfaction as an outcome. As shown in **Table 2**, the analysis of the two alternative models yielded fit indices that were inferior to those of the hypothesized model.

TABLE 2 | Goodness-of-fit indices for the theorized, alternative, and gender models.

Model	χ^2	df	χ^2/df	p	CFI	TLI	RMSEA (90% CI)
Theorized	8.15	3	2.72	0.043	0.99	0.99	0.03 [0.005, 0.061]
Alternative 1	9.43	3	3.143	0.024	0.99	0.98	0.04 [0.012, 0.065]
Alternative 2	26.25	4	6.56	0.001	0.99	0.95	0.06 [0.039, 0.052]
Gender constrained	17.24	16	1.08	0.370	0.99	0.99	0.007 [0.000, 0.025]
Gender unconstrained	10.11	6	1.68	0.120	0.99	0.99	0.2 [0.000, 0.042]

df, degrees of freedom; CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, root mean square error of approximation.

Theorized Model Invariance across Gender

Given the abovementioned significant gender-related results we conducted a *post hoc* analysis to test whether the theorized mediation model differed for girls ($n = 848$) versus boys ($n = 728$). As shown in **Table 2**, we constructed two models for comparison: an unconstrained model that posited a distinctive model for each gender group, and a fully constrained model that posited equality (i.e., invariance) on all regression weights between the gender groups (Byrne, 2010). The results of model comparison showed that the constrained and unconstrained models did not significantly differ ($\Delta\chi^2 = 7.132$, $\Delta df = 10$, $p = 0.71$). A CFI difference ($\Delta CFI = 0.001$) was used as a criterion for the model invariance as recommended by Cheung and Rensvold (2002). A value of CFI less or equal to 0.01 indicates that the null hypothesis of invariance should *not* be rejected. The Akaike information criterion (AIC) which is used for model comparison, with lower values reflecting better fit (Schreiber et al., 2006), also indicated that the constrained model (69.24) was superior to the unconstrained model (82.11). These findings indicate that, overall, the model was *not* significantly different for girls and boys.

DISCUSSION

Whereas most studies have focused on negative links between SCS and maladaptive outcomes, this study contributes to the growing empirical evidence on the significant positive links between SCS and adaptive outcomes (Orkibi et al., 2014; Gavriel-Fried et al., 2015; Kerret et al., 2016). Specifically, the findings confirm Hypothesis 1 that increases in students' perceived ability to exert SCS are related to their experience of greater school satisfaction and more positive than negative emotions in school. In other words, the findings point to the possibility that experiencing greater SWB in school is, at least to some extent, due to students' ability to regulate their cognitions, emotions, and behaviors as measured here.

Furthermore, using a relatively large sample of adolescent students, the present study provides additional empirical support for the application of Self-Determination Theory to the educational context (Tian et al., 2014b), and extends the literature on this topic by confirming Hypothesis 2 that SCS and perceived psychological needs satisfaction are positively correlated. More specifically, SCS may enable students to respond more constructively and cope more successfully with challenges in school, and thus enhance their perception of basic needs satisfaction in school. This interpretation coincides with the conceptualization of self-control as a set of goal-directed skills that enables people to volitionally act upon their aims, overcome difficulties, and thus feel more resourceful and capable (Rosenbaum, 1990; Rosenbaum and Ronen, 2013). It is also consistent with the abovementioned Causal Agency Theory, according to which self-regulated, volitional, and agentic actions may foster adolescents overall well-being through needs satisfaction and self-determination (Wehmeyer and Shogren, 2017). Note that the two alternative

models we examined had fit indices that were inferior to those of the hypothesized model, pointing to the possibility that SCS are indeed predictors of perceived needs satisfaction and, consequently, SWB in school – thus confirming Hypothesis 3. This contrasts with the inverse view that positive emotions lead to self-control (e.g., Baumeister et al., 2007; Baumeister and Sparks, 2008). Clearly, additional longitudinal and experimental studies are warranted to further clarify these relationships.

Regarding gender differences, despite the correlations between gender and some of the variables, our theorized model was not significantly different for boys and girls. This suggests that the overall contribution of SCS to SWB in school (direct link), as well as the contribution of perceived basic psychological needs satisfaction to the relationship between SCS and SWB in school (indirect link), was possibly similar in all students. Nevertheless, further studies are warranted given the mixed findings of gender differences in SWB indicators in the literature, with some reporting differences (Jiang et al., 2013; Tian et al., 2015b; Liu et al., 2016) and others not (Huebner et al., 2001; Long et al., 2012). Studies have also reported mixed findings of gender invariance in needs satisfaction (Liu and Chung, 2014; Tian et al., 2014b) versus gender differences, particularly regarding higher competence satisfaction in boys (Leversen et al., 2012; Tian et al., 2014a).

Several limitations of this study should be noted. First, the cross-sectional design of this study precludes causal inferences. Future studies should include a longitudinal design to test reverse causation and help establish the sequence of change in the variables. Second, although self-reports are often used to assess *subjective* thoughts and emotional experiences, additional sources are recommended to obtain outcome data on overt SCSs. Future studies could include teacher, parent or peer reports, to provide valuable additional information. Such a methodology could help account for the social desirability bias that can influence students' responses. Third, the extent to which school curricula are actually designed to facilitate basic needs satisfaction could be examined through document analyses and teachers' reports.

Despite these limitations, the study has a number of practical implications. The results suggest that educators and parents should consider employing methods to enhance students' SWB in school by using interventions designed to cultivate their SCS. These could include cognitive-behavioral strategies such as positive reappraisal, cognitive restructuring, using self-talk, and planning steps toward achieving academic as well as adaptive personal and interpersonal goals (e.g., Rosenbaum and Ronen, 2013; Azoulay and Orkibi, 2015). Furthermore, increased perceived needs satisfaction may serve as a "mechanism of change" that may further promote SWB in schools (Shirk et al., 2013). Thus, educators, administrators and policy makers would do well to consider applying classroom practices that support students' satisfaction of autonomy (e.g., increase choice and provide structured guidance), relatedness (e.g., show kindness and respect, acknowledge students' feelings), and competence (e.g., communicate expectations, enable active participation in

adequate challenges, provide positive and informational feedback) (Niemiec and Ryan, 2009; Doll et al., 2014; Chang et al., 2017) not only to increase academic outcomes but also, as our findings suggest, to increase students' SWB in school.

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HO and TR designed the study, analyzed data, and wrote the paper.

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Test Anxiety in Spanish Adolescents: Examining the Role of Emotional Attention, and Ruminative Self-focus and Regulation

Mario Pena* and Lidia Losada

National University of Distance Education, Madrid, Spain

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Wenjie Duan,
Wuhan University, China

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Javier Fiz Pérez,
Università Europea di Roma, Italy
Sharinaz Hassan,
Curtin University, Australia

*Correspondence:

Mario Pena
mpena@edu.uned.es

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Emotional attention has been found as a key predictive dimension of stress. However, very few studies have investigated the relationship between emotional attention and test anxiety. The objective of the present study was to analyze the role of emotional attention, measured using the Trait Meta-Mood Scale (TMMS), on the level of test anxiety, and measured using the Test Anxiety Inventory (TAI). In addition, we examined the potential mediating role of Self-Rumination and Self-Reflection, as measured through the Rumination-Reflection Questionnaire (RRQ), on the relationship between emotional attention and test anxiety. The sample included 385 Spanish adolescents between 14 and 19 years of age. Mediation analysis results are consistent with a model in which Self-Rumination, but no Self-Reflection, mediates the relationship between Emotional Attention and Test Anxiety. Finally, several potential implications of these findings to improve quality of life in adolescents are discussed.

Keywords: emotional attention, self-rumination, self-reflection, test anxiety, adolescents, emotional intelligence, depression

INTRODUCTION

Test anxiety (TA) is an internalizing behavior among students and a major emotional problem that has a negative effect on learning. It is a reaction of an emotional negative character generated before the expectative created by the imminence or presence of a test and that many students perceive it as a threat to the person (Álvarez et al., 2008). According the Anxiety and Depression Association of America (ADAA), different categories have been established to determine the symptoms of TA: physical (headache, nausea, diarrhea, excessive sweating, shortness of breath, rapid heartbeat, light-headedness and feeling faint can all occur), emotional (feelings of anger, fear, helplessness, and disappointment) and behavioral/cognitive (difficulty concentrating, thinking negatively and comparing yourself to others).

Test anxiety can be understood from multiple theoretical perspectives. First of all, it should be considered if TA has been assessed as a one-dimensional, two-dimensional or multidimensional construct. Early conceptions conceived TA as a one-dimensional construct. However, research revealed its multidimensional nature (Stöber, 2004; Piemontesi et al., 2012). Liebert and Morris (1967) differentiated two principal components of TA: worry (cognitive component) and emotionality (affective component). Later, multidimensional conceptualizations of TA were of increasing importance. So, Hodapp (1995) differentiated various dimensions of TA: worry, emotionality, interference, and lack of confidence.

Secondly, according to Wine (1971), a highly test-anxious person distributes his attention between self-relevant and task-relevant variables during task execution. But a low-test-anxious person focuses his attention entirely on the task. Likewise, the attentional control theory postulates that anxiety impairs the efficiency of two types of attentional control (Derakshan and Eysenck, 2009). On one side, anxiety impairs negative attentional control which involved in inhibiting attention to task-irrelevant stimuli. On the other side, anxiety impairs positive attentional control which involved in flexibly switching attention between and within tasks to maximize performance. So, according with Eysenck et al. (2007), efficient functioning of the goal-directed attentional system is affected by anxiety. Also, processing is affected by the stimulus-driven attentional system. Besides, anxiety increases attention to threat-related stimuli to decreasing attentional control.

Finally, Processing Efficiency Theory is one of most remarkable theoretical models to explain the effects of TA on performance (Eysenck and Calvo, 1992; Calvo, 1996; Calvo and García, 1999). Thoughts of worry generated by anxious subjects have two main effects: they interfere with memory processing and they enhance the use of complementary resources. Therefore, if the student has these additional resources, such as: adaptive coping styles with academic stress (task-orientation and preparation, seeking social support, and avoidance), he/she can reduce anxiety and improve the individual performance (Piemontesi et al., 2012).

In a school environment, TA causes poor cognitive performance, psychological distress and ill health, as well as TA is associated with lower academic performance (Zeidner, 1998). There is a widespread agreement about the relationship between scholastic underachievement and TA, and about the negative impact the feeling of anxious when taking a test has on students' life. Chapell et al. (2005) investigated this relationship, finding that a significant inverse relationship exists between TA and grade point average (GPA). Hembree (1988) examined the relationship between TA and others variables. Students' self-esteem is affected by TA, finding an inverse relationship between both variables. Also fear of negative evaluation, defensive attitude, and other forms of anxiety relates directly to TA. The test-anxious students got a poor performance and were less motivated when they were exposed to highly evaluative classrooms (Hancock, 2001).

Because of the serious consequences of TA on learning and its increased prevalence during adolescence (Ahmadpanah et al., 2016), it is crucial to identify whether individual characteristics may contribute to this incremental form of anxiety. In this sense, attention to feelings represents an important personal resource associated with multiple indicators of non-adaptive functioning. People who pay attention to emotions tend to observe and think about their feelings and moods. It is well established that when the process of paying attention to moods becomes excessive, people obtain higher scores on depression and anxiety symptoms and this might increase ruminations or intrusive thoughts (Goldman et al., 1996; Salovey et al., 2000; Fernández-Berrocal et al., 2004). Also, the findings support the consideration of emotional attention

as a theoretically relevant construct and predictive empirically individual differences in accounted for depression and burnout (Extremiera et al., 2006; Pena and Extremiera, 2012; Pena et al., 2012).

Recent research has shown increasing interest in emotional self-conscious and their implications for well-being, health and better emotional adjustment (Bastian et al., 2005; Schutte et al., 2007). Emotional attention was negatively associated with lower social functioning in women (Extremiera and Fernández-Berrocal, 2002). In the same way, attention to feelings was positively associated with negative affect (e.g., distressed, irritable, guilty, fearful, and nervous) as measured through the Positive and Negative Affect Schedule (PANAS), and negatively associated with life satisfaction (Sánchez-Álvarez et al., 2015). Salovey et al. (2002) found that attention to moods was correlated with lowered cortisol and blood pressure responses to laboratory challenges and psychophysiological measures of adaptive coping. On the other hand, Moriarty et al. (2001) found a relationship between attention to feelings and sexual delinquency. The scores of the adolescent sex offenders' partners were higher on attention to feelings than non-sex offenders partners. Besides, a growing body of research has pointed out that the own experience of affect has broadly been linked to mental disorders (Boden et al., 2013). Affective instability was positively correlated with attention to emotion (Gohm and Clore, 2002; Thompson et al., 2009), and lower levels of attention to emotion were better predictors of recovery from Major Depressive Disorder (MDD) than severity of MDD, Negative Affect, or Positive Affect (Thompson et al., 2013).

Some researchers have suggested that individuals with higher scores for trait emotional intelligence had lower TA scores (Ahmadpanah et al., 2016). However, up to date, no studies have been reported about the effect of emotional attention on TA. Therefore it is necessary to provide empirical evidence on this issue.

Self-Rumination and Self-Reflection as Proposed Mediators

Previous studies have analyzed the positive relationship between higher dispositional self-focus attention and negative affect. Trapnell and Campbell (1999) found evidence for this relationship for ruminative forms of self-focus attention, while reflective self-focus was associated with adjustment (Joireman et al., 2002; Teasdale and Green, 2004; Elliott and Coker, 2008).

Trapnell and Campbell (1999) differentiated two types of dispositional self-focus: rumination and reflection. In both cases, more attention to self is required. However, there are different reasons to pay attention (Silvia et al., 2005). The principal motives behind self-focused rumination are: perceived threats, losses, or injustices to the self. Whereas, curiosity or interest in his/her self are behind self-focused reflection (Trapnell and Campbell, 1999).

A meta-analysis of 179 correlational studies was carried out by Olatunji et al. (2013) to explore the relationships between rumination and symptoms of anxiety and depression. Findings revealed moderate associations between rumination and symptoms of anxiety and depression.

Self-focused rumination is a non-adaptive coping strategy, which consists in bringing to mind in a recurring way, the stress generating situation and all that it implies for the person. Instead, strategy of self-help would represent an adaptive strategy, which refers to maintaining one's own emotional well-being while under stress, and includes the expression of emotions and instrumental help seeking and emotional help seeking from others (Zuckerman and Gagne, 2003). Individual differences research on attending to emotions has been adequately reflected in empirical studies. Nevertheless, the majority of the studies were performed using adults' samples and clinical samples only. In addition, the relationship between attention to emotions and stress has been directly investigated. But we know of no research that has examined the relationship linking Emotional Attention and the perception of TA and their possible mediators, using samples of adolescents.

So, the objective of the present study was to analyze the relationship between Emotional Attention, Self-Rumination, Self-Reflection and the perception of TA in adolescents (Figure 1). In addition, we wanted to investigate Self-Rumination and Self-Reflection as a possible mediator between Emotional Attention and TA. We hypothesized that emotional attention would be positively correlated with anxiety and depression (H1) and self-rumination, but not self-reflection, would mediate the relationship between emotional attention and the perception of TA (H2).

The literature has revealed the importance of considering gender differences in TA and self-rumination. So, some authors emphasize that an exam situation depends on its level of anxiety based on gender (Sowa and LaFleur, 1986; Everson et al., 1991; Fiore, 2003). On the other hand, several studies have revealed gender differences involved in rumination (Broderick, 1998; Nolen-Hoeksema and Jackson, 2001; Calmes and Roberts, 2008). Likewise, anxiety and depression are interrelated and both are internalizing disorders. So, it is necessary controlling the affective dimension of depression effect because it shares affective domain with emotional attention; in addition, his relation has been demonstrated of consistent form by the anxiety (Lovibond and Lovibond, 1995; Cole et al., 1998).

MATERIALS AND METHODS

Participants

The sample consisted of 385 adolescents studying in public school from Madrid and Toledo (Spain) (221 males -56%- and 171 females -44%-). Mean age was 16.49 years ($SD = 1.33$; range 14–19). Participation in the study was voluntary and confidential. This study was carried out in accordance with the Declaration of Helsinki and ethical guidelines and was approved by the Research Ethics Committee of the UNED. Participants' parents gave informed written consent, and the adolescents gave written assent.

Procedure

The application of the questionnaire was carried out by one researcher (first author). The students received instructions

on how to fill the questionnaire correctly. Afterward, the participating students completed pen-and-paper versions of the questionnaires in a group setting, who anonymously, confidentially, and voluntarily filled in the questionnaires. Thus, a convenience sample was taken, based on adolescent students who had wanted to take part in the study voluntarily. Once the questionnaires were completed, the students returned them to the researcher for statistical processing (SPSS v. 19).

Measures

Emotional Attention

Emotional Attention was measured by using the attention subscale of the Trait Meta-Mood Scale (TMMS; Salovey et al., 1995). TMMS is a self-report measure which was designed to assess individuals' beliefs about their own emotional abilities. The Attention subscale includes eight items. Attention conveys to what extent individuals tend to observe and think about their feelings and moods. The Spanish version by Fernández-Berrocal et al. (2004) was used and adequate reliability and validity have been reported. Cronbach's alpha was 0.86 for the Emotional Attention subscale.

Test Anxiety Inventory (TAI; Spielberger, 1980)

It's a self-report instrument that consists of 20 items or statements (Cronbach's alpha of 0.92) answered on a 4-point Likert-type scale. The respondents are asked to report how often they experience anxiety symptoms taking a test (before, during, and after a test). Respondents must indicate how often they have experienced the reaction to tests described in each statement, yielding a total TA score ranging. The TAI also consists of two subscales: worry and emotionality, the two major components of TA. Chapell et al. (2005) have suggested that these two scales reflect the cognitive concerns and emotional responses, associated with evaluation stress. The Spanish version by Serrano and Delgado (1991) was used, for which adequate reliability was reported (Cronbach's alpha of 0.83). The internal consistency (Cronbach Alpha) in the present sample was 0.93 (total score), 0.87 (worry) and 0.90 (emotionality).

The Beck Depression Inventory-II (BDI-II; Beck et al., 1996)

It is a self-report questionnaire which consists of 21 items to assess the intensity of depression in clinical and normal patients: current cognitive, affective and somatic depressive symptoms. Each item is rated on a 3-point scale ranging from 0 to 3: "zero" score indicates lack of symptoms of depression, and "three" indicates severe symptoms of depression. The Spanish version by Sanz et al. (2003) was used, for which adequate reliability has been reported (Cronbach's alpha of 0.90). Cronbach's alpha in the present sample was 0.86.

Rumination-Reflection Questionnaire (RRQ; Trapnell and Campbell, 1999)

It is a self-report questionnaire constructed to identify two forms of self-focus or self-attentiveness: self-rumination and

self-reflection. Self-rumination is considered maladaptive while self-reflection is considered adaptive for mental health (Nakajima et al., 2014). RRQ contains two scales with 12 items each rated on a 5-point Likert scale (1 = “strongly disagree” and 5 = “strongly agree”). The Spanish version was used, for which adequate reliability is reported. In the present sample Cronbach’s alpha coefficients were 0.90 for the Self-Rumination scale and 0.91 for Self-Reflection subscale.

RESULTS

Table 1 shows the means, standard deviations and internal consistency reliabilities (Cronbach’s alpha coefficients) for all measured variables.

Preliminary Analyses

Means, standard deviations and zero-order correlations of the study variables are presented in **Table 2**.

Across all participants, Emotional Attention was positively associated with all measures: TA (worry and emotionality), Depression, Self-Rumination and Self-Reflection. Besides, worry and emotionality showed positive associations with depression and self-rumination. Further, TA and Depression were positively correlated with Self-Rumination. However, self-reflection is not significantly correlated with worry, emotionality, TA and depression. Finally, results showed significant positive associations between Self-Rumination and Self-Reflection.

TABLE 1 | Means, standard deviations and Cronbach α values.

	<i>n</i>	Means	Standard deviations	α Cronbach
Emotional attention	384	3,31	0.73	0.85
Worry IAE	382	1,98	0.70	0.87
Emotionality IAE	382	2,31	0.78	0.90
Test Anxiety IAE	370	2,24	0.67	0.93
Depression	385	0,49	7.5	0.86
Self-Rumination RRQ	369	1.20	0.81	0.84
Self-Reflection RRQ	370	1.30	0.74	0.78

TABLE 2 | Correlation coefficients among measures.

	1	2	3	4	5	6	7
(1) Emotional attention	–						
(2) Worry IAE	0.182**	–					
(3) Emotionality IAE	0.245**	0.745**	–				
(4) Test anxiety IAE	0.224**	0.910**	0.938**	–			
(5) Depression	0.141**	0.419**	0.339**	0.387**	–		
(6) Self-Reflection	0.415**	0.091	0.063	0.066	–0.016	–	
(7) Self-Rumination	0.443**	0.325**	0.345**	0.343**	0.411**	0.310**	–

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

Self-Rumination and Self-Reflection as a Mediator between Emotional Attention and Test Anxiety

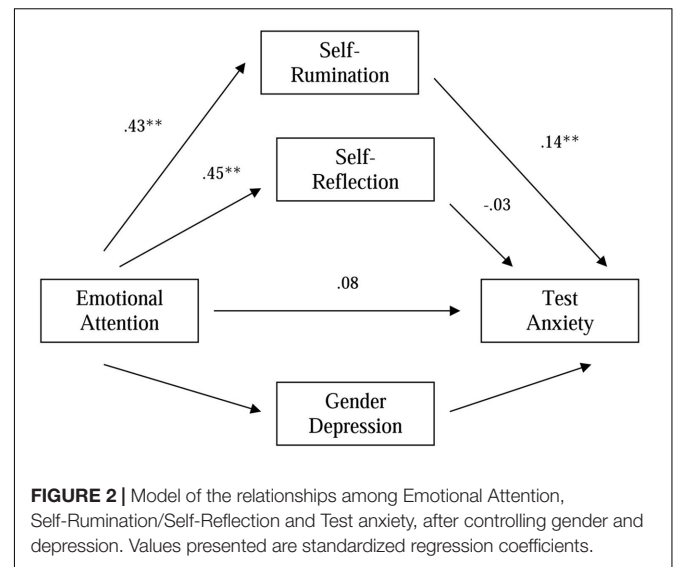
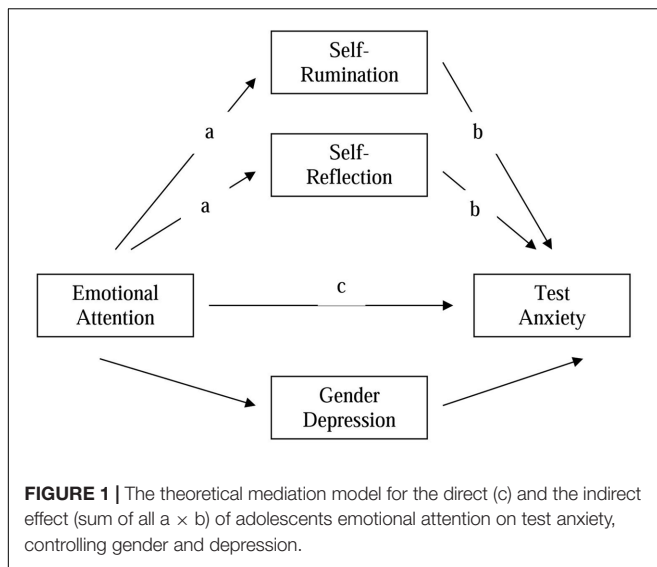
We conducted this study using mediation analyses to explore whether the relationship between Emotional Attention and Test Anxiety was mediated by Self-Rumination and Self-Reflection. So, following recommendations on best practices for examining mediation in small samples (Mackinnon et al., 2004; Hayes, 2013), we used bootstrapping: a non-parametric resampling procedure for testing the significance of the hypothesized mediation models. In particular, using the SPSS Macro provided by Preacher and Hayes (2008), we employed the non-parametric resampling method (bias-corrected bootstrap) with 5,000 resamples to derive 95% confidence intervals. So, we examined the statistical significance of the indirect effect of Emotional Attention on TA via the hypothesized mediators (self-rumination and self-reflection).

When we analyzed the mediation effect of Self-Rumination on TA, the indirect effect was estimated to lie between 0.0153 and 0.1215 with 95% confidence interval. Because zero is not in the 95% confidence interval, we can conclude that the indirect effect is significantly different from zero at $P < 0.05$, and that, as predicted, Self-Rumination mediates the relationship between Emotional Attention and TA. However, similar results were not obtained for the mediation effect of Self-Reflection on TA. In this case, the indirect effect was estimated to lie between -0.0724 and 0.0299 , with 95% confidence interval, for TA. Because in this case the 95% confidence interval includes zero, we can conclude that these indirect effects are not significantly different from zero at $P < 0.05$. So, Self-Reflection does not mediate the relationship between Emotional Attention and TA (**Figure 2**).

In this study the true total indirect effect is 95% likely to range from -0.0127 to 0.1098 . In this case, zero occurs between the Lower Limit and the Upper Limit; then we can conclude that the total indirect effect was not significant (**Table 3**).

DISCUSSION

In the present work, we analyzed the effects of the Self-Rumination and Self-Reflection in mediating the association of Emotional attention and TA.



Overall, our results suggest that Emotional Attention in adolescents is an important factor for processing emotional information during a TA experience. Mor and Winquist (2002) have examined the hypothesis that self-focused attention influences negative affect (i.e., depression and anxiety). However, researchers don't know why people with high emotional attention report higher (or more) intense TA than others. In order to extend previous work, we have conducted a study specifically focusing on the mediating role of Self-Rumination and Self-Reflection in the association between Emotional Attention and TA, after controlling gender and depression.

Our results indicate that people with greater Self-Rumination report higher levels of TA. These findings are consistent with previous works that identified associations between high levels of Self-Rumination and higher emotional disorder (Elliott and Coker, 2008); replicating previous findings that have also shown that ruminative self-focus is a negative predictor for psychological well-being (Harrington and Loffredo, 2010) and is maladaptive (Teasdale and Green, 2004). Further analyses suggested that the cognitive components of worry and self-preoccupation, which are presents in Self-Rumination, play an important role in TA (Minor and Gold, 1985; Sarason, 1988). Worried adolescents' student become more anxious under testing conditions because they maintain a style of recurrent negative thinking (rumination); that is, the causes, consequences, and implications of negative

events and feelings are repetitively analyzed (Baer, 2007). So, they are not able to face the test situation keeping calm and trusting their knowledge and personal resources.

In addition, our findings agree with those obtained in other studies (Salovey et al., 2000; Jiménez and López-Zafra, 2008), showing that people who have a greater emotional attention manage less effectively the negative emotions in stressful situations. The results of the present study confirm that self-rumination mediates the influence of emotional attention on TA perception. These results also are consistent with the idea that people with high emotional attention tend to perceive higher TA than those who have lower emotional attention. In fact, they generate high levels of self-rumination during the exam (Mor and Winquist, 2002). In this way, mediation analysis results are consistent with a model in which negative affect mediates the relationship between emotional attention and TA perception. Consequently, self-rumination fully mediated the link between emotional attention and TA: emotional attention was associated with high scores in self-rumination; and these high self-rumination scores in turn increased reliance upon TA.

We will briefly outline some of the limitations of this study. The results should be interpreted in light of these limitations. Firstly, our study design was cross-sectional one, which prevented us from establishing causal relationships between Emotional Attention, Self-Rumination and TA. Causal relationships can

TABLE 3 | Summary of multiple mediation analyses on Emotional Attention and Test Anxiety (5000 bootstraps samples).

Independent variable (IV)	Mediators	Dependent variable (DV)	Effect of IV on M (a)	Effect of M on DV (b)	Total effect (c)	Direct effect (c')	Indirect effect (c - c')	Effect on DV through proposed mediators covariates	(IC) 95%
Emotional attention		Test Anxiety			0.12**	0.08	0.04	Gender:0.25** Depression:0.02**	0.0153 to -0.1215 -0.0724 to -0.0299
	Self-Rumination		0.43**	0.14**					
	Self-Reflection		0.45**	-0.03					

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

be established by using a randomized controlled trial design with intervention and controlled condition would be highly recommended. Likewise, it should take longitudinal approaches in order to examine the casual effects of emotional deficits on adolescent's well-being with better accuracy. Secondly, despite of the sample is representative of the population, the use of a convenience rather than a random sample reduced generalizability of results. Finally, for future researchers, it would be necessary to examine whether the grade level would have some influence on TA. This would provide better understanding of the differentiating role that Emotional Attention plays in scholars from different educational levels. Finally, as Palmieri et al. (2009) have pointed out there is an important aspect of emotional awareness that is not captured by TMMS which is the ability to understand the source of one's own emotions.

It would also be interesting for future research to explore why people are feeling what they are feeling, to examine whether personal resources and strategies that people use to mitigate their TA may be associated with their emotional intelligence.

Despite these limitations, our findings provided an opportunity for critical discussion and reflection. Theoretically, our findings make an important contribution to an expanding literature on attention to emotion. The present study provides insight into how emotional attention influences self-rumination and the TA. Regarding practice, our research might exert a positive effect on quality of adolescents' life by reducing the deleterious effects of negative emotions provoked by TA or lower education achievements. In this way, it may help to design

pedagogical interventions aimed at improving this emotional ability in people with TA problems. It should be emphasized the importance of training the emotional attention as an essential part of emotional intelligence programs, as a tool for enhancing reflective thinking, where students feel fascinated, not anxious or worried, to discover new things about themselves. Teaching individuals with TA problems through emotional intelligence programs may therefore be a useful way to approach this issue in schools. On the other hand, teachers may play an important role in developing an awareness of the adaptive coping styles with academic stress; rather than adolescent scholars focus only on their negative emotions and thoughts. Hence, teachers can assist scholars by teaching them to identify and cope with the emotions produced by stressful scholar task, before and during the examination, and increasing the perceived belief that they can change themselves. Finally, adaptive emotional regulation strategies should be promoted, and maladjustment behaviors associated with TA and rumination should be prevented or challenged over the scholar period.

AUTHOR CONTRIBUTIONS

Each author has made substantial contributions to the work. Conception or design of the work: MP and LL. Data collection: MP. Data analysis and interpretation: MP and LL. Drafting the article: MP and LL. Critical revision of the article: MP and LL. Final approval of the version to be published: MP and LL.

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Incremental Theory of Intelligence Moderated the Relationship between Prior Achievement and School Engagement in Chinese High School Students

Ping Li, Nan Zhou, Yuchi Zhang, Qing Xiong, Ruihong Nie and Xiaoyi Fang*

Institute of Developmental Psychology, Beijing Normal University, Beijing, China

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Cuttlefish Arts, United States

*Correspondence:

Xiaoyi Fang
fangxy@bnu.edu.cn

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School engagement plays a prominent role in promoting academic accomplishments. In contrast to the relative wealth of research that examined the impact of students' school engagement on their academic achievement, considerably less research has investigated the effect of high school students' prior achievement on their school engagement. The present study examined the relationship between prior achievement and school engagement among Chinese high school students. Based on the Dweck's social-cognitive theory of motivation, we further examined the moderating effect of students' theories of intelligence (TOIs) on this relationship. A total of 4036 (2066 girls) students from five public high school enrolled in grades 10 reported their high school entrance exam achievement in Chinese, Math and English, school engagement, and TOIs. Results showed that (a) students' prior achievement predicted their behavioral, emotional, and cognitive engagement, respectively, and (b) the association between prior achievement and behavioral, emotional, and cognitive engagement is strong for students with an incremental theory but not for those with an entity theory in the emotional and cognitive engagement. These findings suggest that prior achievement and incremental theory were implicated in relation to adolescents' school engagement. Implications and future research directions were discussed.

Keywords: prior achievement, school engagement, theory of intelligence, Chinese high school students

INTRODUCTION

Over the past decade, researchers on adolescents' academic development have become increasingly interested in investigating the Chinese students' learning and achieving (Hau and Ho, 2010). One of the reason is that Chinese education leads the world in comparisons of educational achievement. For example, the results from the cross-national Program for International Student Assessment (PISA, Gurria, 2014) consistently rank Shanghai-China as first in mathematics, reading, and science performance. Another reason is that Chinese high school and university admissions are almost solely determined by students' academic achievement (i.e., test scores in entrance exams), students who attain higher scores go to key high schools and universities, while others go to regular high schools and universities (Hu et al., 2015). Promoting educational success is also a key policy objective of the Chinese government (e.g., Ministry of Education of the People's Republic of China, 2010).

One promising avenue for improving Chinese adolescents' educational prospects is school engagement, or the degree to which students are involved in and committed to the academic and social activities in school, as such engagement plays an influential role in promoting academic success and influencing a wide range of adolescent outcomes (see Upadaya and Salmela-Aro, 2013, for a review). A large number of studies have examined the unidirectional predictive relationship between school engagement and academic achievement (e.g., Li and Lerner, 2011, 2013), such as students who are actively engaged in school are more likely to perform well academically (Abbott-Chapman et al., 2014). Little research, however, has focused on the opposite direction of effects, that is, the impact of prior achievement on school engagement. Indeed, the prior achievement is one of a very important antecedent variable that predict school outcomes (Hattie, 2009). Previous study has found that the associations between achievement and engagement appear to vary by students' theories of intelligence (i.e., beliefs about whether intelligence is fixed or malleable, TOIs) (e.g., Hong et al., 1999). In the current study, we invested the links between prior achievement and school engagement. We placed particular attention on the extent to which students' TOIs conditioned the primary relations of interest. That is, we sought to determine whether the links between prior achievement and school engagement were stronger or weaker for students with an incremental versus students with an entity theory. Such work can elucidate the value of educational interventions targeting students' TOIs and suggest the extent to which such efforts could be more or less effective if targeted to specific student populations.

Prior Achievement and School Engagement

Most researchers view school engagement as a multidimensional construct, including behavioral, emotional, and cognitive components (Fredricks et al., 2004; Reschly and Christenson, 2012; Li and Lerner, 2013). Behavioral engagement refers to the range of actions that reflect participation in school-based activities; emotional engagement refers to students' affective reactions (i.e., interest, boredom, or anxiety) in the classroom and toward school; and cognitive engagement refers to students' investment (i.e., motivation, strategic learning skills, and problem solving) in learning (Fredricks et al., 2004; Upadaya and Salmela-Aro, 2013; Owen et al., 2016). These components describe different aspects of school engagement and are positively associated with each other (Fredricks et al., 2004; Li and Lerner, 2013).

Previous studies have documented the effects of school engagement on adolescents' academic achievement (e.g., Wang and Holcombe, 2010; Wang and Peck, 2013; Wang et al., 2015). For instance, Scheidler (2012) found that a tripartite measure of school engagement positively predicted standardized test scores among 8th Grade students. The identification of this association adds to our understanding of school engagement but provides little information about three important issues. Firstly, the previous work on school engagement has been empirically

tested by using Western participants. Although the total number of Chinese high school students in 2015 was 23 million (National Bureau of Statistics of China, 2016), representing the largest group in the world, little is known about the Chinese high school students' school engagement. Secondly, previous studies have overwhelmingly emphasized the unidirectional effects of school engagement on academic achievement, little is known about the effect of prior achievement on school engagement. Indeed, students' prior achievement (i.e., performance on standardized tests) has been widely viewed as a strong predictor of their success in school (Kitsantas and Zimmerman, 2009). Researchers also found that prior achievement is associated with some aspects of school engagement (e.g., Garavalia and Gredler, 2002; Liem et al., 2008), such as students with low prior achievement often avoid seeking help when struggling (Du et al., 2016).

Thirdly, recent research has examined the reciprocal relationship between school engagement and academic achievement among high school years (i.e., grades 10, 11, and 12). The results showed that school engagement and academic achievement were mutually predictive and that these predictions varied from grade to grade (Chase et al., 2014). However, to our knowledge, no existing study has investigated the relations between prior achievement and school engagement over the high school transition period (i.e., new 10th graders). These new 10th graders represent a large population of Chinese high school students—approximately eight million individuals in 2015 year (National Bureau of Statistics of China, 2016). When they make the transit into high schools, they are faced with greater academic stress than their Western counterparts at this stage because of the fierce competition of college entrance examination, which is usually considered to be the most important examination for all Chinese students (Liu and Lu, 2011a,b). They also experience an exceptional amount of pressure from teachers and parents to succeed in college entrance exams (Li and Prevatt, 2008).

TOIs as a Moderator

According to Dweck's (2000) social-cognitive theory of motivation, students may hold different beliefs about the nature of intelligence (i.e., whether intelligence is fixed or malleable). Some students believe it to be more of a fixed unchanging "entity," while other students regard it as something that is malleable—something that can be improved or increased with effort. Well-documented differences exist in the links between students' TOIs and both academic achievement and school engagement. Empirical research suggests that the two beliefs of intelligence shape students' achievement in different ways such that an incremental theory of intelligence facilitates and an entity theory of intelligence inhibits students' achievement (e.g., Good et al., 2003; Blackwell et al., 2007; Paunesku et al., 2015). Similarly, some evidence suggested that TOIs may be a key factor in explaining some aspects of school engagement, wherein students with an entity theory showed more helplessness approach to schoolwork, increased academic self-handicapping, truancy, and disengagement, and are more likely to feel various types of negative emotions such as anger, anxiety, shame, hopelessness, and boredom (King et al., 2012; Wang and Ng, 2012; De Castella and Byrne, 2015).

In addition to these well-established differences, there is some evidence that the relations between prior achievement and school engagement may be conditioned by TOIs. For example, students with an incremental theory were more likely to believe that working hard was necessary and effective in achievement than those students with entity theory (Blackwell et al., 2007). Students with an incremental theory were also show greater engagement, persistence, and resilience in the face of learning setbacks (Mangels et al., 2006) and were more likely to take remedial action aimed at improving future achievement (Hong et al., 1999). Most relevant to the present study, previous studies suggested that low prior achievement students' help-seeking avoidance is likely underscored by academic self-efficacy. That is, students with low self-efficacy are more likely to believe that the need for help is confirmation of low ability, therefore, they are less likely to seek help. In contrast, students with high self-efficacy do not worry that the need for help indicates that their lack of ability and are more likely to secure the necessary help (Ryan and Shin, 2011; Amemiya and Wang, 2016). Based on these findings, we expected that students' TOIs would condition the association between prior achievement and school engagement. Specifically, students with an incremental theory may be more likely to view their prior achievement as a diagnosis of the engagement they have engaged in school and thus may continue to engage in schoolwork to improve their abilities. In contrast, students with an entity theory often consider their prior achievement as largely a diagnosis of their innate abilities and might be less engaged in schoolwork given their view of ability as innate rather than dynamic.

The Current Study

The main goals of present study were twofold. The first goal was to examine the associations between Chinese high school students' prior achievement and their school engagement. Based on the extant literature, we hypothesized that students' prior achievement will be positively related to school engagement. The second goal was to explore whether TOIs had an impact on the relationship between prior achievement and school engagement. In this respect, we hypothesized that prior achievement was more strongly associated with school engagement among students with an incremental theory than among those with an entity theory.

Notably, prior research has demonstrated that school engagement was influenced by family socioeconomic status (SES), gender, and educational expectations (Li et al., 2010; Li and Lerner, 2011). Thus, in order to eliminate the effects of the variables stated above, the present study considered these variables as control variables.

MATERIALS AND METHODS

Participants

The participants consisted of 4036 (2066 girls) students (mean age = 15.41, $SD = 0.55$) enrolled in grades 10. These students were recruited from five public high school in Panyu District of Guangzhou, located in Guangdong province, southern China.

Three of them are key high schools (3107 students), and the rest two are regular high schools (929 students).

Procedure

As part of a larger study, the students filled in the questionnaires during the first semester. All participants were informed about the confidentiality and anonymity of their responses and were encouraged to provide honest answers in the questionnaire. Also, students were assured that they could quit the session whenever they decided to do so. The survey took place in the classroom in groups of 24–55 students, on a regular school day, in the presence of an experienced research assistant, and lasted for about 40 min. Permission for the study was obtained from school authorities and principals. The oral consent forms were obtained from students and their parents.

Several demographic questions were asked about students, including age, gender, educational expectations, parents' marital status, health status, and family SES.

Measures

Prior Achievement

Students' high school entrance exam achievement in Chinese, Math, and English were obtained from the school. The entrance exam took place in 3 months before our survey. Scores for these three major subjects have been found to be a valid measure of school academic achievement in China (Chen et al., 2011). Scores in each subject were standardized within the grade. The mean across the three subjects was taken, with higher scores representing higher achievement (Zhao and Wang, 2014).

School Engagement

We used the 15-item Behavioral–Emotional–Cognitive School Engagement Scale (BEC-SES) to measure the tripartite school engagement (Li, 2010). The behavioral engagement subscale includes five items indicating contribution to class discussion, preparation, skipping class, and finishing homework on time. The response format ranged from 1 (never) to 4 (Always). The Cronbach's alphas in the current study was 0.56. The emotional engagement subscale includes five items that assess students' sense of belonging and affect toward school. The response format ranged from 1 (strongly disagree) to 4 (strongly agree). The Cronbach's alphas in the current study was 0.74. The cognitive engagement was measured by five items designed to assess the extent to which students valued education and things learned at school, as well as their thoughts about learning. The response format was also a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). The Cronbach's alphas in the current study was 0.89.

Theories of intelligences

Three items were adopted from the Implicit Theory of Intelligence Scale (e.g., Hong et al., 1999) to measure participants' entity theory of intelligence ("You have a certain amount of intelligence and really cannot do much to change it," "Your intelligence is something about you that you can't change very much," and "You can learn new things, but you can't really change your basic intelligence"). All items were scored on a 6-point

Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). The responses were reverse coded; the mean of three items was taken, with higher scores indicating a stronger incremental theory of intelligence (e.g., Dweck et al., 1995). This measure has acceptable reliability and validity in China (e.g., Wang and Ng, 2012; Zhao and Wang, 2014). In the current study, the alpha coefficient for the measure was 0.94.

SES and Educational Expectations

We used the information concerning parents' educational level and current occupations to assess family SES (Yang et al., 2010). Specifically, paternal/maternal education level consisted of five categories: (1) elementary school, (2) junior high school, (3) senior high school (including occupational middle school), (4) up-to-3-year college, and (5) 4-or-more-year university. Occupation level consisted of three categories: no job, part-time job, and full-time job. These two indicators were all treated as ordinal scale. A composite SES score was then created by standardizing educational and occupational levels (Z-score) and adding the standardized scores (Janicki-Deverts et al., 2007).

Educational expectations were assessed by asking students what final academic degree they wanted to obtain (i.e., 1 = high school, 2 = junior college, 3 = undergraduate, 4 = master, and 5 = doctor), with higher scores corresponding to higher educational expectations.

Analytic Procedures

Hypotheses were evaluated by conducting path analysis with Mplus version 7.4 (Muthén and Muthén, 2012). Given that the tested models were just identified (i.e., number of identifying restrictions equaled number of estimated parameters), no indices of global fit are reported. Missing values (ranged from 0 to 0.50% on grade) were addressed using full information maximum likelihood estimation methods, a preferred technique for producing parameter estimates with minimal bias (Schlomer et al., 2010).

RESULTS

The descriptive statistics for the study variables are shown in **Table 1**. The correlations among prior achievement, TOIs, and three dimensions of school engagement were statistically significant and in the expected directions.

Results for the model are presented in **Figure 1**. Prior achievement, TOIs, and the interaction between prior achievement and TOIs were specified as predictors of behavioral, emotional, and cognitive engagement. The school, gender, age, health status, educational expectations, SES, and their parents' marital status were specified as control variables linked to behavioral, emotional, and cognitive engagement. Consistent with hypotheses, prior achievement was positively associated with behavioral, emotional, and cognitive engagement, respectively. Associations between prior achievement and behavioral, emotional, and cognitive engagement were not different from each other using a ward test [behavioral versus emotional: 95% CI (−0.002, 0.001); behavioral versus cognitive:

95% CI (−0.002, 0.002); cognitive versus emotional: 95% CI (−0.002, 0.001)].

Prior achievement also interacted with TOIs in the prediction of behavioral, emotional, and cognitive engagement, respectively (**Figure 2**). Specifically, the association between prior achievement and behavioral engagement is stronger for students with an incremental theory ($b = 0.01$, $\beta = 0.17$, $p < 0.01$) than those with an entity theory ($b = 0.004$, $\beta = 0.08$, $p < 0.01$). Prior achievement was associated with emotional engagement for students with an incremental theory ($b = 0.01$, $\beta = 0.12$, $p < 0.01$) but was not associated with emotional engagement for students with an entity theory ($b = -0.0002$, $\beta = -0.004$, $p > 0.05$). Similarly, prior achievement was associated with cognitive engagement for students with an incremental theory ($b = 0.01$, $\beta = 0.13$, $p < 0.01$) but was not associated with cognitive engagement for students with an entity theory ($b = 0.003$, $\beta = 0.04$, $p > 0.05$).

DISCUSSION

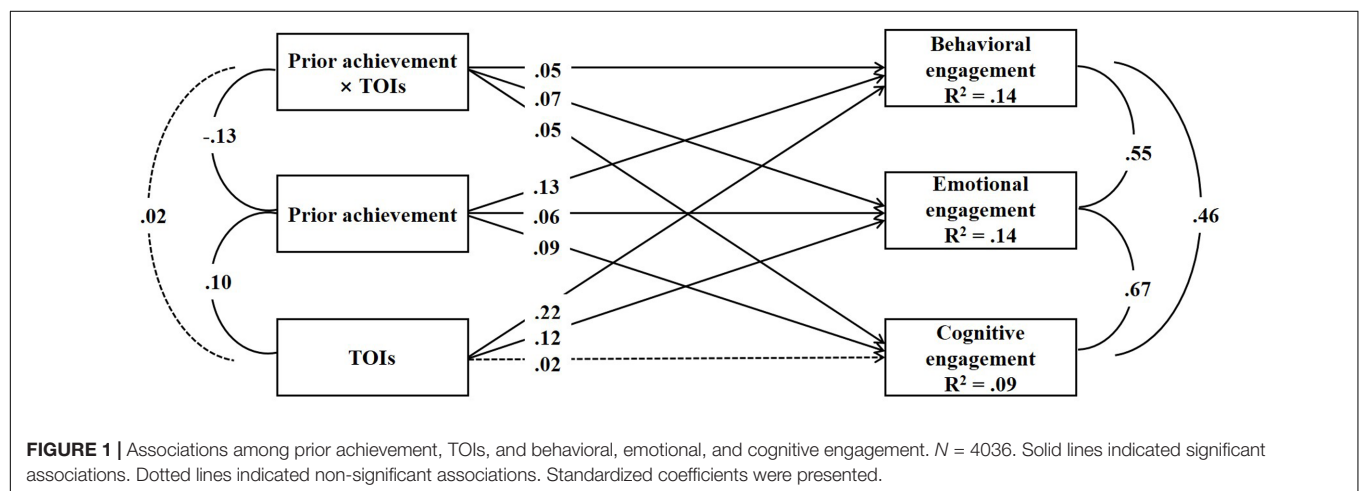
School engagement plays a prominent role in aspects of academic success and individual well-being (Upadaya and Salmela-Aro, 2013). The present study examined the relationship between Chinese high school students' prior achievement and their school engagement, and the moderating effect of students' TOIs on this relationship. We found that prior achievement significantly predicted school engagement. More importantly, students' TOIs moderated the relationship between prior achievement and school engagement.

In consideration of school engagement is presumed to be malleable (Fredricks et al., 2004), recent research has explored predictors of school engagement (e.g., Hospel and Galand, 2016). For example, Dotterer and Lowe (2011) found that classroom context is an important predictor of school engagement. With some important exceptions (Chase et al., 2015), the present study explored the effect of prior achievement on school engagement. Consistent with the findings in the Western societies (Chase et al., 2014), we found that Chinese high school student's prior achievement significantly predicted their behavioral, emotional, and cognitive school engagement. These findings support the notion that academic achievement is not only an outcome, but can also predict the degree to which students are engaged in school. That is to say, the more that students thrive in school academically, the more efficacious they feel, which, in turn, increases all three components of engagement in the school context (Salmela-Aro and Upadaya, 2012; Chase et al., 2014). This high relationship accounts for what many researchers call the "Matthew effect," which is based on the biblical notion that rich get richer and the poorer get poorer or do not gain as much (Hattie, 2009).

We found that Chinese students' TOIs moderated the relationship between prior achievement and behavioral, emotional, and cognitive engagement. The association between prior achievement and behavioral, emotional, and cognitive engagement is strong for students with an incremental theory but not for those with an entity theory in the emotional and

TABLE 1 | Correlations and descriptive statistic among variables.

	1	2	3	4	5	6	7	8	9	10	11	<i>M</i>	<i>SD</i>
1. School type													
2. Gender	0.05**												
3. Age	−0.08**	−0.06**										15.41	0.55
4. Health status	0.03*	−0.09**	0.01									4.07	0.83
5. Educational expectations	0.19**	−0.09**	−0.01	0.11**								3.60	0.90
6. Parents' marital status	−0.02	0.01	−0.01	−0.09**	0.02							1.27	0.89
7. SES	0.21**	−0.03*	−0.05**	0.11**	0.20**	−0.09**						0.00	0.64
8. Prior achievement	0.61**	0.10**	−0.06**	0.01	0.26**	−0.03	0.22**					0.00	11.34
9. Behavioral engagement	0.11**	0.15**	−0.02	0.19**	0.11**	0.02	0.06**	0.17**				3.10	0.53
10. Emotional engagement	0.18**	0.09**	0.01	0.25**	0.16**	−0.01	0.09**	0.17**	0.60**			3.01	0.58
11. Cognitive engagement	0.10**	0.10**	0.03	0.20**	0.16**	−0.03	0.07**	0.14**	0.50**	0.69**		3.16	0.66
12. TOIs	0.06**	−0.02	−0.01	0.06**	0.15**	0.01	0.04**	0.10**	0.24**	0.16**	0.06**	4.10	1.33

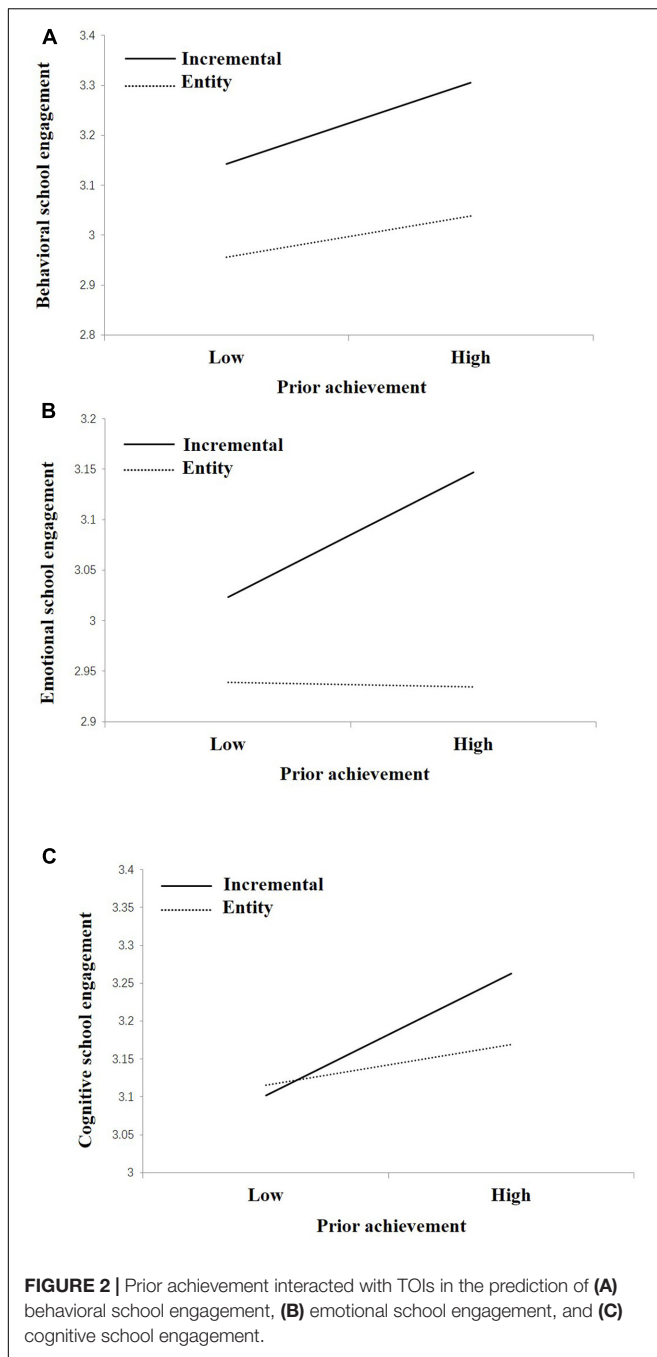
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

cognitive engagement. Such result can largely be attributed to differences in incremental and entity students' beliefs about the role of effort in achievement (Miele and Molden, 2010; Miele et al., 2011; De Castella and Byrne, 2015; see also Yeager and Dweck, 2012, for a review). The effort dimension is a key element for distinguishing between the incremental versus entity theory of intelligence. Specifically, students with an incremental theory attribute their academic achievement to effort more often than to ability, whereas students with an entity theory attribute their academic achievement to innate and stable ability rather than to effort (e.g., Blackwell et al., 2007; Miele et al., 2011). Although effort is perceived as a tool to improve ability in an incremental theory of intelligence, it is evidence of a lack of ability in an entity theory of intelligence (Blackwell et al., 2007). As a result, students with an incremental (versus entity) theory were more likely to take remedial action if performance was unsatisfactory (Hong et al., 1999), and more likely to make school engagement, such as seek out help from their teacher and take more advanced math course (Romero et al., 2014). It is also argued that Chinese students typically do not regard intelligence as fixed but malleable through learning, enabling them to take a persistent rather than helpless approach to

schoolwork, and subsequently perform well (Hau and Ho, 2010).

Moreover, effort-making is regarded as a necessary means to improve one's learning, especially in Chinese context. As some popular Chinese proverbs describe, "making effort to compensate for inadequate intelligence (qín néng bù zhuo)," "With persistence, an iron pestle can be ground down to a needle (tiě chu mó chéng zhēn)," "Learning is like rowing upstream; not to advance is to drop back (xué rú nǐ shuǐ xíng zhōu, bù jìn zé tuì)," "practice makes perfect (shú néng shēng qiǎo)." These beliefs are the reasons why many Chinese parents and teachers constantly encourage their children or students to invest full school engagement in academic learning, even if the students are already performing well (Li, 2012; Chen et al., 2016).

Another possible explanation involved goal setting (Burnette et al., 2013). Previous research has shown that students with an entity theory are more concerned with pursuing performance goals (i.e., goals aimed at documenting their ability) (Cury et al., 2006). As a consequence, these students are more likely to shun opportunities (i.e., behavior, emotional, and cognitive engagement in the present study) for learning, to give up easily when faced with challenges or setbacks, and generally to avoid



tasks they might have difficulties to master (Hong et al., 1999; Dupeyrat and Mariné, 2005). Moreover, students with an entity theory believe they succeed because they are lucky, not because they exert a lot of effort (Robins and Pals, 2002). Conversely, Chinese students with an incremental theory pursue learning and mastery goals (i.e., goals aimed at increasing their ability) (Chen and Wong, 2015). These students are more likely to think that school engagement is necessary and effective for achieving goals; they also show more willingness to engage effort and to change strategy when facing failure as well as success (i.e., low and high prior achievement) than students with an entity theory

(Robins and Pals, 2002; Blackwell et al., 2007; Chen and Wong, 2015). Moreover, students with an incremental theory view their success as a result of engagement, they do not believe luck plays an important role in their success (Robins and Pals, 2002).

Prior achievement was not associated with emotional and cognitive engagement for students with an entity theory. A possible explanation about this observation is that emotional and cognitive engagement (versus behavioral engagement) are not explicitly or directly related to the school-based activities (i.e., prior achievement) since these two factors are internalizing behaviors and can be attained outside the school environment. Consistent with this explanation, previous studies found that the regression coefficient for emotional engagement on achievement was not as strong as behavioral engagement on achievement (Chase et al., 2014). An alternative explanation would be that high school students with an entity theory do not want to change their emotional and cognitive engagement. As suggested by Heckman and Masterov (2007), by the time students have reached high school, their study habits and attitudes toward school are entrenched to such a degree that very little will alter their academic achievement. In the current study, this phenomenon of stable attitudes and performance may have manifested itself especially for those students with an entity theory. Previous studies supported this explanation as well, such that the predicted effects of entity theory of intelligence on emotional (i.e., enjoyment, hope, and pride) and cognitive (i.e., deep and shallow strategy use) engagement in learning failed to emerge (Dupeyrat and Mariné, 2005; King et al., 2012).

In sum, the current study contributed to the research on students' school engagement in at least three ways. First, we contributed to the study of Chinese high school students' school engagement by using a multidimensional measure, including behavioral, emotional, and cognitive engagement. It has been able to provide a much richer picture of this dynamic concept, as well as a fully explanation of students' behavior and attitudes toward school. Second, we built upon previous research by exploring antecedents of school engagement by testing whether prior achievement predicted school engagement. Third, we built upon previous research by examining whether TOIs moderated the link between prior achievement and school engagement.

Despite all this, our study is not without limitations. Chase et al. (2014) suggested that the strength of the association between school engagement and academic achievement has been found to vary significantly depending on how engagement is measured, such as self-reported or observational assessments. Future studies may consider a triangulation of measures from both observational assessments (i.e., teacher and parent ratings) and students (i.e., in the current study) in order to evaluate these constructs in adolescence more effectively. The use of multiple methods can also reduce mono-reporter bias and inflated responses due to social desirability. In addition, the present study is a correlational study, which could not establish a causal relationship. Considering that previous study suggested that TOIs as a point of intervention in efforts to enhance students' academic success (Yeager and Dweck, 2012), further work might implement a growth mindset intervention with high school students and determine its impact on the relationship between

academic achievement and school engagement. Specifically, future research should focus on improving students' incremental theory to address the inadequate school engagement of low prior achievement students over the high school transition period (Yeager et al., 2016).

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of Ethics Review Committee at the School of Psychology, BNU with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Ethics Review Committee at the School of Psychology, BNU.

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AUTHOR CONTRIBUTIONS

PL, NZ, and XF designed this study and draft the manuscript; PL, YZ, QX, and RN performed research; PL, NZ, and XF analyzed data. All authors approved the final version of manuscript for submission.

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Positive Education for Young Children: Effects of a Positive Psychology Intervention for Preschool Children on Subjective Well Being and Learning Behaviors

Anat Shoshani^{1*†} and Michelle Slone^{2*†}

¹ Baruch Ivcher School of Psychology, Interdisciplinary Center Herzliya, Herzliya, Israel, ² School of Psychological Sciences, Tel Aviv University, Tel Aviv, Israel

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Edited by:

Wenjie Duan,
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Sherri Homer,
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United States
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Università degli Studi di Torino, Italy

*Correspondence:

Anat Shoshani
ashoshani@idc.ac.il
Michelle Slone
mich@post.tau.ac.il

[†]These authors have contributed
equally to this work.

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Despite the flourishing in recent years in applications of positive psychology in the field of education, there is a paucity of research investigating positive psychology interventions for preschool children. The present study examined the effects of a positive psychology-based intervention conducted in Israel on children's subjective well-being, mental health and learning behaviors. Twelve preschool classrooms of 3–6.5 year-olds were randomly assigned to a positive psychology intervention condition or a wait-list control condition. In the intervention condition, during one school year, 160 children experienced eight modules of basic concepts in positive psychology that were adapted to the developmental characteristics of young children and were compared to 155 children in demographically similar control classrooms. Children were administered a pre-test and post-test of subjective well-being measures. In addition, children's mental health and emotional well-being were measured by parental questionnaires. Preschool teachers completed questionnaires concerning children's learning behaviors. The findings showed significant increases in subjective well-being and positive learning behaviors among the intervention participants, with no significant changes in the control group. The results highlight the potential of positive psychology interventions for increasing subjective well-being and a positive approach to learning at young ages.

Keywords: preschool, intervention, positive-psychology, positive education, mental health, well-being, children

INTRODUCTION

Recognition of the importance of social and emotional development in young children has become a primary priority of early childhood education. Successful negotiation of this developmental period includes, among other acquisitions, the ability to form positive relationships, to establish positive self-esteem, to effectively express feelings and regulate emotions, to persevere and engage positively with challenging tasks, and to adopt a positive outlook in a dynamic environment (Bowman et al., 2000; Shonkoff and Phillips, 2000; Duckworth et al., 2007; Oades et al., 2011). Therefore, the increasing psychological and mental health focus on the foundational early childhood developmental period has led to international interest in promoting socio-emotional development and personal strengths in early childhood education (Honig, 2002).

Many of the competencies acquired during this developmental period are the foundational constructs embraced in the Positive Psychology approach to education that focuses on the optimal functioning of educators and children in the different educational settings. This area of inquiry has flourished recently in the form of Positive Education that seeks to integrate positive psychology elements with educational practices (Seligman et al., 2009; Sin and Lyubomirsky, 2009; Stiglbauer et al., 2013; Shoshani and Steinmetz, 2014). Increasingly, educational intervention programs include positive psychology constructs such as character strengths, gratitude, positive emotions and engagement to improve children's well-being and mental health. Most of these interventions have been instituted in schools with a paucity of positive psychology interventions for young children in preschool educational settings. Informed knowledge of the effectiveness of these interventions in promoting preschool children's well-being is sorely lacking. The present study describes the construction of a positive education program applied by trained kindergarten teachers and investigates the efficacy of this program on promoting preschool children's well-being, strengths and socio-emotional abilities and reducing difficulties.

The Need for Positive Education in the Preschool

Extensive research has examined children's developmental needs in preschool settings from the vantage point of school readiness (Pianta et al., 2007). The accumulated data regarding preparedness for transition to school show a focus on five domains including physical and motor skills, social and emotional competencies, language development, approaches to learning, and cognitive development (National Association for the Education of Young Children [NAEYC], 1996). In practice, preschool education places a disproportionate emphasis on the cognitive aspects of school readiness while the social and emotional aspects receive less attention (Shoshani and Aviv, 2012).

An alternative prism suggests that focus on the cognitive domain and subjective well-being can be synergistic and that both are crucial in the current preschool reality. The developmental cascade model suggests that children's seemingly distinct cognitive and emotional milestones are intertwined and progressively affect each other over time (Masten and Cicchetti, 2010). Traditional educational policies, based on the belief that focusing on children's academic attainment is inversely related to children's well-being and mental health, should be reconsidered. Likewise, the notion that investing more time in well-being and health leads to the neglect of academic learning and subsequently in lower achievements should also be reviewed (Bonell et al., 2013).

In addition to the synergism between the cognitive and socio-emotional domains, a focus on promoting mental health among preschoolers is important in and of itself. Early socio-emotional development provides a blueprint for subsequent mental health since it lays either a sturdy or a frail scaffold for positive or negative trajectories (Shonkoff and Phillips, 2000). Indeed,

the prevalence of emotional disorders among young children is receiving worldwide attention (Côté et al., 2009). Studies report high levels of chronic mild to moderate mental health and behavior problems, particularly among young children from low socio-economic status families (Qi and Kaiser, 2003). The United States National Early Intervention Longitudinal Study identified 10–40% of infants and toddlers studied as having behavioral and emotional difficulties (United States Department of Education, 2001).

The early emergence of behavioral problems prompts the need for promoting a strong social and emotional base in preschool settings. Referral to mental health services at this age is particularly challenging, making the preschool a natural context for attending to children's socio-emotional needs and promoting strengths, competencies and positive developmental trajectories (Hemmeter et al., 2006). In this regard, positive education can serve a dual function, providing a primary prevention platform for mental health problems that implements universal intervention practices, and facilitating subjective well-being, sense of happiness and self-actualization (Rones and Hoagwood, 2000; Shoshani and Slone, 2013; Slone and Shoshani, 2014).

Dimensions of Well-Being of Young Children

Despite the recognized and undisputed importance of young children's well-being, the literature is equivocal regarding the nature and elements of well-being and the paths toward its measurement and promotion. The abstract, multi-dimensional, and culturally constructed nature of the concept has led to an inconsistency in its definition in different fields (Barblett and Maloney, 2010). The classic notion of subjective well-being was operationalized as the relatively high presence of positive affect, the low presence of negative affect, and satisfaction with life (Myers and Diener, 1995). In the educational domain, well-being has been conceptualized both as an outcome and as a process that facilitates children's advancement toward content learning and other developmental milestones. However, the study of well-being among children in the educational context is scarce compared to that of adolescents (Mashford-Scott et al., 2012).

Recently, Seligman (2011) proposed a model featuring five conditions that enable well-being among children and adults: Positive emotions, Engagement, Positive Relationships, Meaning, and Achievement that form the acronym "PERMA" and documented the model's applicability in educational settings. The intervention constructed and implemented in the present study was based on this model, adjusted for applicability to young children. Due to the difficulty in conceptualizing and facilitating meaning among young children (Shoshani and Russo-Netzer, 2017), the element of meaning was not included in the present intervention program.

The aspect of positive emotions in the PERMA model relates to various feelings of happiness including joy, pleasure, and fun. Several studies have confirmed a positive relation between emotional intelligence and children's tendencies toward prosocial

behavior (Eisenberg and Fabes, 1998; Luengo Kanacri et al., 2017). A positive relation between emotional understanding and mothers' reports of children's prosocial behavior has been shown even among young toddlers (Ensor and Hughes, 2005). Among older children aged 5, 9, and 13, comprehension of emotional expression was found to be directly associated with empathy. In turn, the positive relation between empathy and prosocial behavior has been supported, although this relation was found to be weaker for girls than boys (Roberts and Strayer, 1996). School-based interventions promoting socio-emotional learning and awareness of positive emotions have demonstrated increased positive attitudes and behaviors oriented toward learning (Elias et al., 1997; Graziano et al., 2007). In addition, positive emotions such as gratitude and appreciation have been found to promote enhanced positive affect in classrooms (Froh et al., 2009).

The second element of well-being in the PERMA model is engagement which is defined as a sense of involvement and absorption in an activity, otherwise known as a state of "flow" (Csikszentmihalyi, 1991; Seligman, 2011). Studies have shown that the cultivation of children's socio-emotional skills is associated with increased bonding to the school and adherence to norms (Elbertson et al., 2009). Additionally, classroom environments that encourage engagement have been associated with interest, attention, and curiosity during learning (Krapp, 1999).

The third aspect of the PERMA model refers to positive relationships defined as a perception of receiving support from others together with feelings of connection and security with others (Seligman, 2011). Positive and secure relationships with family, friends and peers are crucial in young children's social-emotional development (Denham et al., 2003). Children's ability to form positive relationships with adults enables the development of a secure basis for emotional development (Kochanska, 2001) and promotes the acquisition of social skills, self-confidence and self-esteem (Schneider et al., 2001; Gillath et al., 2005). Secure and stable relationships provide the opportunity for children to discover the effects of their behaviors on others and to gain control over the environment (Hyson, 2004).

Finally, the aspect of achievement in the PERMA model relates to a drive or ambition to accomplish personal goals (Seligman, 2011). The determination to meet challenges and maintain interest in goals over time, even when hindered with failure, have been associated with children's life satisfaction (Peterson et al., 2007; Duckworth and Quinn, 2009). Similarly, high levels of self-control and persistence have been associated with children's well-being (Howell, 2009).

Research has provided relatively consistent evidence that positive psychology interventions that aim to advance the PERMA factors can increase subjective well-being, prosocial behavior, and a sense of achievement and decrease mental health problems among school children (Eades, 2005; Slone and Shoshani, 2006; Boehm and Lyubomirsky, 2009; Duckworth and Quinn, 2009; Morris, 2009; Seligman et al., 2009; Williams, 2011; Slone et al., 2013; Shoshani and Steinmetz, 2014; Shoshani et al., 2016). However, findings are lacking for the

potential benefits of positive psychology interventions for young children.

The Current Positive Education Intervention – The Maytiv Preschool Program

The Maytiv preschool program was constructed by a team of psychologists in an institution of higher education in Israel. The program was administered by preschool teachers, trained and guided in the elements of the intervention. The program focused on four elements of the PERMA model with activities for enhancement of positive emotions, engagement, positive relationships and achievement.

The module for facilitating positive emotions addressed emotional expression, emotional regulation, empathy, positive thinking, and the ability to differentiate between positive and negative feelings and to express both freely. Examples of activities in this module included identification of personal sources of happiness, exercises for expressing gratitude, free expression of different feelings in movement, art, speech and facial expressions, and descriptions of memories of happy experiences. The second module dealing with engagement aimed to cultivate interest and enjoyment in activities based on encounters with personally fulfilling experiences. Examples of activities in this module consisted of playing with personally meaningful toys brought from home to the kindergarten, the opportunity to select a personally enjoyable topic or activity to the morning group meeting, identifying and using personal character strengths in the different roles adopted in the daily activities in the kindergarten. The third module aimed to facilitate positive social relationships and was based on the ability for positive communication with peers and adults, support for prosocial behavior and cooperation, and encouragement of acts of kindness and empathy. Illustrative activities in this module included games that demanded peer cooperation, exercises in playing with friends in different situations, encouragement of offering positive responses to other children, simulated conflict resolution and consideration for a friend's feelings. The fourth module of achievement addressed identification and pursuit of goals and personally significant objectives. Activities in this module included games that emphasized perseverance in challenging situations, games that provided sense of efficacy and support for willingness to continue trying despite failure, and selection of and working on personal projects such as producing a book of drawings or exploring interesting topic.

The purpose of the present study was to examine the efficacy of the Maytiv Preschool program in promoting mental health, subjective well-being and adaptive preschool functioning as compared to a matched waiting-list control group in a pre-test to post-test repeated measures design.

The central hypothesis of the study predicted that participants in the intervention group would exhibit a greater pre- to post-intervention increase in their subjective well-being (higher positive emotions and life satisfaction and lower negative emotions), mental health (lower emotional and behavioral problems), and adaptive preschool functioning (self-regulation,

empathy, pro-sociality, and positive approaches to learning) than participants the control group. In addition, the exploratory question examined whether efficacy of the intervention differed across socio-demographic background characteristics, such as the child's age, gender, and family socio-economic status.

MATERIALS AND METHODS

Participants

Participants were 315 preschool children (153 girls, 162 boys) aged 3–6.5 ($M = 4.53$, $SD = 0.93$) from 12 demographically similar preschool classrooms in a central city in northern Israel. In Israel, kindergarten is part of the preschool system.

State kindergartens in Israel cater for children from 3 to 6 years old, in three age groups: ages 3–4, 4–5, and 5–6.

Assignment to study conditions followed a two-step process. First, 42 preschools were selected from 64 preschool classrooms in the same geographic area. Exclusion criteria for preschools were ultra-orthodox religious preschools, special education, a small number of children, or demographically incomparable preschools. Eighteen preschool teachers expressed interest in participating in the program and agreed to a random selection process.

In the second stage, six of the interested preschools were randomly selected for the intervention and six were allocated to a wait list control group. All 352 children in the 12 preschools were eligible to participate in the study. All parents complied with informed consent requirements, except for five parents who refused consent for their children participating in the assessments in the study. A total of 32 children did not complete the study; 18 due to absence and 14 due to refusal to participate in the second measurement. Thus, the intervention groups comprised 160 and the control 155 children who completed both the pretest and posttest measures. Both groups were approximately evenly divided by gender (48.5% boys, 51.5% girls). The study population consisted of Jewish children, 98% of them were Israeli born. A total of 189 parents also agreed to participate in the study and completed questionnaires about their children, of which 86.7% were the mothers. The age range of the parents at the beginning of the study was 24–52 years ($M = 36.29$, $SD = 4.70$), 1.5% were single, 92% were married and 6.5% were divorced. Sixteen parents dropped out of the study at the second measurement.

Measures

Measures for Children

The Shortened Positive and Negative Affect Scale for Children (PANAS-C) (Ebesutani et al., 2012) is the brief version of the PANAS-C (Laurent et al., 1999), a standardized measure that assesses levels of positive and negative emotions experienced over the previous few days. The measure comprises 10 adjectives that relate to five positive emotions (cheerful, happy, joyful, proud, lively) and five negative emotions (mad, miserable, afraid, sad, scared), rated on a 5-point Likert scale. The scale has not been validated for children below age 7 due to difficulties in administering paper-and-pencil questionnaires to young

children. Therefore, in this study, we modified the scale in several ways. First, we read aloud the items to children individually. Second, we simplified some of the complex wording (positive emotions – joyful, happy, glad, excited, and proud; negative emotions – angry, unhappy, afraid, scared, and sad). We also changed the response scale from the original 5-point Likert scale to a 3-point pictorial Likert scale. The scale showed a series of three boxes ranging from empty to full and we asked the participants to indicate whether they felt the emotion none of the time (empty box), sometimes (half full box), or all of the time (full box). In this study, alpha coefficients were 0.89 and 0.86 at time 1 for the positive and negative affect subscales respectively.

Brief Multidimensional Students' Life Satisfaction Scale (BMSLSS) (Seligson et al., 2003) is a self-report five-item measure for children and adolescents that assesses life satisfaction in different domains. On a 7-point scale ranging from 1 (terrible) to 7 (delighted). Each item assesses life satisfaction in one of five areas (e.g., "I would describe my satisfaction with my family life/friendships/school experience/myself/where I live as..."). The scale was modified for suitability for young children by changing the item to reflect the children's rating of satisfaction with their families, friends, preschool, home, and self-experiences depicted by little shadow figures representing the domain. The child-adapted instructions were "How happy are you with your ...". The rating scale was adapted from the numbers 1–7 to a 5-point scale depicted by a series of smiley faces ranging from a large green smiling face, a smaller green smiling face, a neutral half green, half red face, a larger red sad face, and a large red sad face. The present study yielded $\alpha = 0.80$ on the pre-test measurement.

Affective Situations Test for Empathy (FASTE) (Feshbach and Roe, 1968) is measure designed to assess empathy and consists of eight narratives, accompanied by three slides each, that describe hypothetical daily life situations that arouse emotion. The instrument presents narratives and a series of slides depicting a young child in four different affective situations, with two sequences for each situation – happiness, sadness, fear, and anger. The instrument contains alternative depictions according to gender. The contents for each of the four affective situations were: (1) Happiness – birthday party, winning a television contest; (2) Sadness – a lost dog, social rejection; (3) Fear – lost child, frightening dog; (4) Anger – a child snatching away a toy, false accusation. Children report their feelings concerning each situation and reports were recorded verbatim. Responses are scored with two points for a match between the situation observed and the child's response, one point for a consistent negative or positive response that was inaccurate, and no points for an inconsistent or irrelevant emotion. A total empathy score for each child was assessed as the sum of empathic responses to all of the affective situations.

The Head-to-Toes task (HTKS) (McClelland and Cameron, 2012) was used to evaluate children's behavioral self-regulation. The task requires cognitive flexibility, and inhibitory control and working memory. Children are required to first follow one of two commands for action and then are requested to respond with a conflicting, non-automatic action. For example, if the experimenter says, "Touch your head," the correct response

would be to touch one's toes. Task complexity is increased with additional conflicting actions. After a practice session, children perform the task according to instructions from the experimenter. The measure is scored with two points for a correct action, one point for a self-correcting actions and no points for an incorrect action, such that the scores for the 20 item scale ranged from 0 to 40.

Measures for Parents

The Parent Version of the 10-Item Positive and Negative Affect Schedule for Children (PANAS-C-P) (Ebesutani et al., 2012) is a 10-item scale presented to the parents who assess their child's positive and negative affect. Parents rate the extent to which their child had displayed each mood in the previous few days on a five-point Likert scale ranging from 1-very slightly- to 5- extremely. Research has supported convergent and discriminant validity of the scale with measures of childhood anxiety and mood disorders and high internal consistency (Ebesutani et al., 2012). In this study, alpha coefficients were 0.93 and 0.91 at time 1 for the positive and negative affect subscales respectively.

Strengths and Difficulties Questionnaire (SDQ) (Goodman et al., 1998) is a 25-item self-report instrument that assesses mental health disorder. The questionnaire yields a total difficulties score and five scales consisting of five items each – Emotional symptoms (e.g., I am often unhappy, depressed or tearful), Conduct problems (e.g., I take things that are not mine from home, school or elsewhere), Hyperactivity scale (e.g., I am constantly fidgeting or squirming), Peer problems (e.g., I am usually on my own) and a Prosocial scale (e.g., I often volunteer to help others). In this study, ratings on the four difficulties scales were summed to produce a total difficulties score. The fifth scale, the prosocial scale, was calculated and constituted part of the adaptive preschool functioning outcome variable. This study used the Hebrew version of the SDQ as translated by the Israeli Ministry of Health. The instrument demonstrates good criterion validity for both community and clinic samples and high cross-informant correlations between self-report to parent- and teacher-reports (Goodman et al., 1998). The Hebrew version has yielded good internal consistency ($\alpha = 0.51\text{--}0.72$) and good construct, concurrent, and discriminant validity (Mansbach-Kleinfeld et al., 2010). In this study, Cronbach's alphas were good for the total difficulties score (0.79), and for the four problem scales (0.72–0.81).

Measures for Preschool Teachers

Approaches to Learning Scale (Zill and West, 2001) assesses approaches to learning behaviors in preschool children. The seven item teacher-report scale evaluates children's learning behaviors in seven areas: attentiveness, eagerness to learn, task persistence, learning independence, organization, flexibility, and ability to follow classroom rules. Scores range from 1 to 4, with higher scores indicating more frequent displays of positive learning behaviors. Scores on this scale have been correlated with reading, mathematics, and science scores in kindergarten and first grade and the scale shows good criterion validity (Entwisle and Alexander, 1998). In this study, the Alpha Coefficient was 0.78 on the pre-test.

Intervention and Control Conditions

Intervention Program

The intervention program included two parallel phases. One phase consisted of a preschool teachers' training workshop led by a clinical psychologist trained in group dynamics and in positive psychology. The second phase consisted of the parallel administration by preschool teachers of an age-appropriate program to the children in the classroom.

In the first phase, consisting of a positive psychology training workshop, preschool teachers took part in a 34 academic hour workshop that included two 90-min introductory sessions and 15 bi-weekly 90-min lessons from September 2016 to June 2017. The teacher workshops were conducted in the afternoon in the local teachers' training center. The workshops provided teachers with an introduction to positive psychology, explanations of the content, provision of tools that could be personally useful, and provision of materials to be imparted to the children. Preschool teachers were encouraged to engage actively in the learning process in order to increase assimilation of the material. This engagement took the form of personal sharing, shared exercises during the workshop and homework exercises. They were also provided with a textbook consisting of techniques for teaching the curriculum and implementing the lessons in their preschool classes. Although difficult to monitor, preschool teachers were requested to avoid sharing this material outside of the workshops. All participating preschool teachers gave informed consent and none refused participation even when offered the opportunity to do so.

The children's program was delivered in the classroom during the preschool day. In order to ensure standardization of the intervention, preschool teachers were equipped with a textbook containing curriculum materials and plans of all the lessons. The curriculum consisted of four content modules, each of which consisted of two subject units. The basic units were: positive emotions (expression and management of emotions and gratitude), engagement (love of learning and character strengths), achievement (focusing and persistence), and positive relationships (positive relationships and empathy). The textbook contained theoretical material concerning each module and a rich and varied set of activities for each session containing discussions, stories, songs, games, and activities that could be combined into the regular preschool daily activities such as during artwork time and free play. Each unit contained 20 activities that were delivered over a period of 1 month, 5 activities per week, such that the program began in October 2016 and continued for 32 weeks.

Implementation fidelity

After each monthly module, preschool teachers were requested to complete a report that evaluated the extent to which the teachers adhered to the lesson plan. Teachers reported whether they had managed to deliver all activities on a polar question for each component. Analysis of the fidelity reports revealed that teachers implemented on average 18 of the 20 activities in each unit ($M = 18.27$, $SD = 0.74$). All the teachers reported enthusiastic participation by the children and excellent cooperation.

Control Group

The control group was a no-treatment waiting list passive control group. The control classrooms did not have any positive psychology lessons nor did they participate in any other social-emotional curriculum during the implementation of the intervention, but rather continued with the regular preschool curriculum and activities.

The control group participated in the evaluation study at the two measurement time points and was placed on the waiting list for the Maytiv preschool program after completion of the study.

Procedure

Data were collected in two waves, time 1 in September 2016 at the beginning of the Israeli school year, and time 2 in June 2017, at the end of the school year. After receiving authorization for the study from the Israeli Ministry of Education's ethics committee and the Herzliya Interdisciplinary Center Academic Ethics Committee, research assistants contacted the preschool teachers and parents and received written informed consent. In order to ensure that consent was informed, teachers and parents were supplied with information about the research, intervention, control and randomization process. Parents signed consent for their children to participate in the intervention and in the research and to complete questionnaires about their children themselves. Parents received a \$20 gift voucher for their participation in each time wave. A total of 89 parents from the intervention group and 64 parents from the control group consented to participation and completed questionnaires at both time points. An additional 18 parents completed questionnaires at time 1 but failed to complete the study. Teacher and Parent questionnaires were completed electronically using the Qualtrics platform.

In order to ensure confidentiality, participants were assigned an identification number and were re-identified only for follow-up purposes. Additionally, provisions for debriefing or counseling were available to any participant who felt negatively impacted from participation in the program or study. None of the teachers, parents or children sought counseling services from the Maytiv team during or following the program.

Each child was taken individually by an experimenter from the classroom to the experimental room, a quiet and pleasant private room in the preschool. Children were informed that they were going to see pictures, perform tasks, and hear stories about children their own age. Tasks and questionnaires were presented on a laptop screen and were administered in a counterbalance order. The duration of the data collection procedure was approximately 20 min.

Data Analysis

All statistical analyses were performed with SPSS software (version 24.0). Baseline differences in demographic characteristics between the groups were analyzed with χ^2 analysis for discrete variables and independent sample *t*-tests for continuous variables. Changes in the outcome variables were examined with repeated measures Analyses of Variance (ANOVAs), using type of intervention with two levels (intervention and control group) and time with two levels (pre-

and post-intervention), as factors. The within-subjects factors were positive and negative affect (child and parent report), life satisfaction, self-regulation, empathy, mental health difficulties (the total score of the SDQ), prosocial behavior, and approaches to learning. The Bonferroni correction was used to account for multiple comparisons ($p < 0.005$). Cohen's *d* was used to estimate the magnitude of intervention effect sizes at post-intervention relative to baseline status. Missing data accounted for less than 2% for all the study variables and a multiple imputation method was utilized to impute missing values.

RESULTS

Description of Sample at Baseline

Table 1 summarizes the demographic information and baseline characteristics of the participants in each group. Baseline comparisons revealed no significant pre-intervention differences between the intervention and the control group on the demographic or baseline measures.

Correlations for the measured variables in the study at baseline are presented in **Table 2**. Children's age was positively related to positive affect, life satisfaction, empathy, self-regulation, positive approach to learning, and lower mental health problems. Boys were reported to have more behavioral problems and less empathy, and positive and negative emotions than girls. Children's positive emotions were positively related to life satisfaction, prosocial behavior, and less emotional problems. Life satisfaction was also related to the child's empathy and self-regulation.

Intervention Effects

Comparisons of mean changes between intervention and control groups are presented in **Table 3**. None of the study variables showed significant kurtosis or skewness that would necessitate transformation.

We first conducted exploratory analyses to examine potential covariates of subjective well-being and mental health change over the year, including age, grade level, gender, family status, socio-economic status, and the baseline variables. Age was the only variable that was significantly correlated with one of the outcome variables (the conduct problems modification), and so was included as a covariate in the relevant analysis. The effects of the intervention were examined using repeated measures analysis of variance, with time as a within-subjects factor and experimental condition as a between-subjects factor.

Analyses of the self-report outcomes showed significant interaction effects between intervention and time (pre- and post-intervention) on children's positive emotions, $F(1,313) = 10.93$, $p = 0.001$, $\eta^2 = 0.04$, life satisfaction, $F(1,313) = 9.68$, $p = 0.002$, $\eta^2 = 0.03$, and empathy, $F(1,313) = 8.65$, $p = 0.004$, $\eta^2 = 0.03$, but not on negative emotions, $F(1,313) = 1.83$, $p = 0.18$, $\eta^2 = 0.007$. *Post hoc t*-test comparisons revealed that children in the intervention group showed significant pre- to post-intervention increases in positive emotions ($M = 0.84$, $p < 0.001$, Cohen's $d = 0.38$), life satisfaction ($M = 0.46$, $p < 0.001$,

TABLE 1 | Sample characteristics at baseline.

	Control group (<i>n</i> = 155)	Intervention group (<i>n</i> = 160)	Statistic	<i>P</i>
Gender				
Girls, <i>n</i> (%)	72 (46.4%)	81 (50.6%)	$\chi^2 = 1.80$	0.20
Age (years); <i>Mean</i> (SD)	4.45 (0.84)	4.58 (0.83)	$t = 1.38$	0.16
Socioeconomic status (PR)				
High middle class <i>n</i> (%)	17 (20.2%)	15 (16.8%)	$\chi^2 = 1.18$	0.55
Middle class	50 (59.6%)	60 (67.4%)		
Low middle class	17 (20.2%)	14 (15.8%)		
Preschool levels				
Ages 3–4, <i>n</i> (%)	50 (32.3%)	49 (30.6%)	$\chi^2 = 0.11$	0.95
Ages 4–5, <i>n</i> (%)	54 (34.8%)	58 (36.3%)		
Kindergarten, ages 5–6.5, <i>n</i> (%)	51 (32.9%)	53 (33.1%)		
Positive emotions- CR	12.59 (2.33)	12.19 (2.35)	$t = 1.51$	0.13
Negative emotions – CR	9.48 (2.90)	9.73 (2.90)	$t = 0.76$	0.44
Empathy- CR	9.08 (5.23)	8.91 (5.25)	$t = 0.29$	0.77
Self-regulation- CR	23.38 (13.29)	20.12 (15.97)	$t = 1.96$	0.06
Life satisfaction- CR	3.88 (0.81)	3.82 (0.74)	$t = 0.69$	0.49
Positive emotions- PR	19.44 (4.62)	19.39 (3.91)	$t = 0.10$	0.91
Negative emotions – PR	11.37 (3.41)	11.63 (3.52)	$t = 0.67$	0.51
SDQ- total difficulties- PR	24.35 (4.01)	24.53 (4.37)	$t = 0.38$	0.70
Prosocial- PR	12.06 (1.91)	12.14 (1.87)	$t = 0.38$	0.71
Approaches to Learning-TR	3.20 (0.34)	3.12 (0.43)	$t = 1.82$	0.07

CR, child report; PR, parent report; TR, teacher report; SDQ, strengths and difficulties questionnaire; *N* for parents of intervention group is 89 and of control group is 84.

Cohen's $d = 0.67$) and empathy ($M = 2.01$, $p = 0.003$, Cohen's $d = 0.34$), with no significant changes in these measures in the control group. There was no significant interaction effect between intervention and time on negative emotions. For self-regulation, there was a significant positive effect of time, $F(1,313) = 9.82$, $p = 0.002$, $\eta^2 = 0.03$, but no significant interaction of time \times intervention, $F(1,313) = 0.21$, $p = 0.65$, $\eta^2 = 0.001$.

Analyses of the parent-report data showed a similar pattern for children's positive emotions of time \times intervention significant effect, $F(1,171) = 9.11$, $p = 0.004$, $\eta^2 = 0.02$, with significant increases in the intervention group ($M = 2.72$, $p < 0.001$, Cohen's $d = 0.81$), and no significant changes in the control group. For prosocial behavior, we also found a significant increase in the intervention group, $F(1,171) = 7.29$, $p = 0.004$, $\eta^2 = 0.03$, ($M = 1.15$, $p < 0.001$, Cohen's $d = 0.66$), while there was no significant change in the control group. There were no significant differences between the intervention and the control groups in changes in negative emotions, $F(1,171) = 1.78$, $p = 0.19$, $\eta^2 = 0.05$, and in total mental health difficulties, $F(1,171) = 1.63$, $p = 0.18$, $\eta^2 = 0.04$. However, there was a main effect of time on total mental health difficulties, $F(1,171) = 7.52$, $p = 0.002$, $\eta^2 = 0.04$, with a significant decrease in difficulties from pre- to post-intervention in both the intervention and control groups. The time \times age interaction effect was not significant ($p = 0.13$). A beneficial effect of the intervention was also found on the teachers' reports on children's approaches to learning, $F(1,171) = 10.15$, $p = 0.003$, $\eta^2 = 0.21$, with significant increase over the year in positive learning behaviors and engagement in the intervention group ($M = 0.31$, $p < 0.001$, Cohen's

$d = 0.62$), but with no significant changes in the control. Cohen's d effect sizes for the magnitude of the significant changes in the intervention group were in the small to large range (0.34–0.81) according to Cohen (1988).

DISCUSSION

This research represents the first study to advance and examine the efficacy of a positive education program for preschool children. Despite the recognized value of positive education, its importance at the preschool level has lagged behind in this field. Educators and parents place great importance on children's happiness and well-being, yet the field of developmental positive psychology has not gained sufficient attention at the research and practical levels. The focus of the study and subsequent findings highlight the importance of integrating positive psychology contents into children's daily activities in the preschool.

The central hypothesis of this study contained three dimensions of functioning – subjective well-being, mental health and preschool functioning – in order to enable a broad evaluation of the effects of the intervention. The first part of the hypothesis predicted pre- to post-intervention increases in well-being in the intervention, as compared to the control group. Findings showed a significant increase in the intervention but not in the control group in children's positive emotions and no change in negative emotions as reported by both parents and children themselves. In addition, findings indicated significant increases in children's self-report of life satisfaction, which is not a trivial finding given that the period of early childhood is usually characterized by many natural opportunities for positive emotions in play,

TABLE 2 | Bivariate correlations between baseline variables.

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Age	0.08	0.11	0.01	0.22***	0.33***	0.41***	0.01	-0.18*	-0.12	-0.31***	0.04	-0.25**	-0.17*	-0.23**	0.29***
2 Gender (boys)	-	-0.03	-0.02	-0.09	-0.12*	-0.07	-0.17*	-0.18*	0.10	0.17*	-0.15	0.00	0.01	0.03	-0.17*
3 Positive emotions- CR	-	-	-0.21***	0.25***	0.01	-0.03	0.28***	-0.29***	-0.34***	-0.10	0.08	-0.22**	0.23**	-0.22**	0.17*
4 Negative emotions - CR	-	-	-	-0.16**	0.26***	-0.18***	-0.24**	0.20*	0.23**	0.07	0.10	0.12	-0.17*	0.19*	-0.14
5 Life satisfaction- CR	-	-	-	-	0.16**	0.24***	0.19*	-0.12	-0.12	-0.10	0.22**	-0.02	0.19*	-0.10	0.01
6 Empathy- CR	-	-	-	-	-	0.30***	-0.13	-0.06	-0.22**	-0.14	0.12	-0.12	0.12	-0.19*	-0.09
7 Self-regulation- CR	-	-	-	-	-	-	0.07	-0.09	-0.05	-0.22**	-0.29***	-0.25**	0.04	-0.09	0.15
8 Positive emotions- PR	-	-	-	-	-	-	-	-0.28***	-0.29***	-0.25**	-0.02	-0.25**	0.33***	-0.30***	0.37***
9 Negative emotions - PR	-	-	-	-	-	-	-	-	0.54***	0.35***	0.13	0.32***	-0.48***	0.50***	-0.23**
10 Emotional problems- PR	-	-	-	-	-	-	-	-	-	0.54***	0.22**	0.26**	-0.52***	0.79***	-0.32***
11 Conduct problems- PR	-	-	-	-	-	-	-	-	-	-	0.11	0.51***	-0.67***	0.82***	-0.30***
12 Hyperactivity- PR	-	-	-	-	-	-	-	-	-	-	-	0.09	-0.11	0.47***	0.01
13 Peer problems- PR	-	-	-	-	-	-	-	-	-	-	-	-	-0.54***	0.63***	-0.28***
14 Prosocial- PR	-	-	-	-	-	-	-	-	-	-	-	-	-	-0.68***	0.35***
15 Total difficulties- PR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-0.34***
16 Approaches to Learning-TR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CR, child report; PR, parent report; TR, teacher report.

games and enjoyment. Results suggest that positive and negative emotions are not always interdependent. The findings here could reflect the dominance of promoting positive emotions in the intervention program or the greater ease with which programs can facilitate positive emotions rather than reduce negative emotions. This assumption could explain the lack of change in self-regulation, although this was also a focus of the program. It is possible that management of negative emotions demands more time than was available in this particular program, especially among young children whose regulatory abilities are relatively undeveloped.

The second part of the hypothesis predicted a greater pre- to post-intervention decrease in children's mental health difficulties in the intervention as compared to the control group. This part of the hypothesis was not confirmed. The lack of significant findings for changing mental health difficulties fits with the above argument that this preschool intervention program was more effective in promoting strengths than in reducing difficulties. This accords with recent models that conceptualize mental health as being comprised of the two distinct factors of mental illness and difficulties and subjective well-being (Greenspoon and Saklofske, 2001). The presence of high levels of subjective well-being does not automatically imply the absence of mental health difficulties (Sin and Lyubomirsky, 2009). Possibly, interventions that aim to address both dimensions necessitate more therapeutic elements and much more involvement of the family and other caretakers. Nonetheless, the value of successfully enhancing positive emotions and life satisfaction should not be underestimated, given the importance of these aspects in children's mental health.

The third part of the hypothesis predicted a greater pre- to post-intervention increase in children's adaptive preschool functioning than the control group participants. Our findings indicated significant increases in children's empathy, prosocial behavior, and positive approaches to learning in the intervention group with no significant changes over time in these measures in the control group. These results indicate that, beyond the personal emotional changes that occurred, the effects of the intervention program extended to the interpersonal sphere. The program included an emphasis on identification of feelings and interpersonal discussions about feelings. This component possibly increased the ability to understand the other's feelings and opened opportunities for giving and for prosocial behavior.

Another extended effect related to approaches to learning and general preschool functioning. Preschool functioning was measured as enthusiasm for learning, attention, persistence, autonomy, flexibility, organization, and adherence to rules, all of which form the base for a sense of achievement and acquisition of personal goals. These aspects lay the foundation for learning skills and engagement with learning, which are important qualities that will influence subsequent academic success (Seligman, 2011).

Analyses also revealed some age and gender baseline differences in the study variables. For example, children's age was positively related to higher subjective well-being and lower mental health problems at the beginning of the study. In addition, boys had more behavioral problems and this corresponds to the

TABLE 3 | The intervention and control groups' scores on the study measures before and after the intervention.

	Control (<i>n</i> = 155)					Intervention (<i>n</i> = 160)				
	T1		T2		<i>d</i>	T1		T2		<i>d</i>
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Positive emotions- CR	12.59	2.33	12.64	2.21	0.02	12.19	2.35	13.03	2.11	0.38
Negative emotions – CR	9.48	2.90	10.27	3.08	0.26	9.73	2.90	9.89	2.96	0.05
Empathy- CR	9.08	5.23	9.65	4.55	0.12	8.91	5.25	10.92	6.55	0.34
Self-regulation- CR	23.38	13.29	25.62	12.31	0.18	20.12	15.97	23.12	15.30	0.19
Life satisfaction- CR	3.88	0.81	3.95	0.80	0.09	3.82	0.74	4.28	0.63	0.67
Positive emotions- PR	19.44	4.62	19.31	4.09	0.03	19.39	3.91	22.11	2.72	0.81
Negative emotions – PR	11.37	3.41	11.33	3.04	0.01	11.63	3.52	11.29	3.29	0.10
Hyperactivity- PR	5.74	1.95	5.22	0.90	0.34	5.92	1.95	5.21	0.89	0.47
Peer problems- PR	6.04	1.49	5.36	0.76	0.58	5.76	1.13	5.21	0.70	0.59
Emotional problems- PR	7.00	1.53	6.50	1.18	0.37	7.11	1.91	6.64	1.22	0.29
Conduct problems- PR	5.57	1.47	6.33	0.99	0.61	5.74	1.50	6.43	1.33	0.49
Total difficulties- PR	24.35	4.01	23.42	2.63	0.28	24.53	4.37	23.49	2.96	0.28
Prosocial- PR	12.06	1.91	11.50	2.28	0.27	12.14	1.87	13.29	1.61	0.66
Approaches to Learning-TR	3.20	0.34	3.07	0.38	0.36	3.12	0.43	3.39	0.45	0.62

CR, child report; PR, parent report; TR, teacher report; Cohen's *d* effect sizes are considered as large ≥ 0.8 ; medium 0.5–0.7; small ≤ 0.4 .

higher levels of externalizing symptoms attributed to preschool-age boys (Zahn-Waxler, 2000), and less positive and negative emotions than girls. The lack of studies on subjective well-being in preschool children makes it difficult to interpret these gender and age variances and suggests that much more research needs to be conducted in this area of positive psychology in early childhood. However, despite these differences, there were no significant interactions between the demographic variables examined in this study and the intervention. This finding possibly implies that the program is relevant and meets the needs of children of different genders, ages, and socioeconomic backgrounds.

Limitations

A study of this type involves multiple challenges including development of appropriate positive education contents adjusted for this young age group, logistic difficulties in applying the program, and utilization of suitable instruments and strategies for measurement of positive psychology-based variables. This study met these challenges by using multi-informant agents and innovative program activities and assessment tools.

However, there are several limitations that must be recognized in this study. This study did not include an evaluation of the effects of the program effects for teachers who had participated in the positive psychology training. Possibly teachers' personal connection to the program content could have effected the intervention by exceeding merely adhering to the guidelines and ensuring fidelity.

The positive effects may also be explained by a Hawthorne effect, which refers to the possibility the participants in the intervention group showed positive changes as a result of being treated differently and receiving more attention (Adair, 1984). The absence of an active control group complicates determination of the influence of additional components, beyond

the special attention and close relationships with the teachers, that may have been responsible for the effects. In addition, the intervention could be vulnerable to the issue of demand characteristics (Nichols and Maner, 2008), especially given the emphasis on positive factors that were included in the self-report measures.

The present study used a repeated measures design at only two time points with no delayed post-test follow-up. In addition, in view of the potential for later developing effects, as posited in positive psychology (Seligman et al., 2009) there is a necessity to trace the long-term effects of the seeds sown in early childhood positive education interventions with longitudinal studies.

Implications

Kindergarten teachers are in a unique position to apply interventions that can strengthen children's well-being at a young age. At the practical level, the intervention in this study equipped preschool teachers and children with practices and materials aimed at promoting well-being. Although there are multiple pathways to promote well-being (Seligman, 2011), the Maytiv program was constructed as an integrative intervention that applies to children with varying needs and from diverse backgrounds.

This research is unique in being the first efficacy study of a positive psychology program for preschool children worldwide. Many preschool interventions have been developed and studied. However, the present program contains many elements proven as valuable to well-being in the youth and adult literature, but not emphasized in preschool education. Gratitude, virtues, character strengths, perseverance, kindness and positive social relationships are valuable and foundational qualities for well-being from the earliest ages and across all ages.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the Herzliya Interdisciplinary Center Academic Ethics Committee and the Israeli Ministry of Education with informed consent from all participants. Parents gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the

Israeli Ministry of Education's ethics committee and the Herzliya Interdisciplinary Center Academic Ethics Committee.

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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Being Eager to Prove Oneself: U-Shaped Relationship between Competence Frustration and Intrinsic Motivation in Another Activity

Hui Fang^{1,2}, Bin He^{1,2}, Huijian Fu^{1,2} and Liang Meng^{3,4,5*}

¹ School of Management, Guangdong University of Technology, Guangzhou, China, ² Laboratory of Managerial Psychology and Behavior, Guangdong University of Technology, Guangzhou, China, ³ School of Business and Management, Shanghai International Studies University, Shanghai, China, ⁴ Laboratory of Applied Brain and Cognitive Sciences, Shanghai International Studies University, Shanghai, China, ⁵ Neuromanagement Lab, Zhejiang University, Hangzhou, China

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Netherlands

*Correspondence:

Liang Meng
promise_land@zju.edu.cn

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Competence frustration has been consistently found to undermine one's intrinsic motivation in the same activity. However, the relationship between competence frustration in a preceding activity and one's intrinsic motivation in a subsequent one remains unclear. In order to explore this relationship, self-reported data were collected from 617 undergraduate students of a large comprehensive university in southern China, who took varied courses immediately before taking a less-demanding one. Results suggested a U-shaped relationship between students' competence frustration in a preceding course and intrinsic motivation in a subsequent one. To be specific, for students whose competence frustration reached the inflection point, a restoration process would be activated if the current course would help restore their competence. Importantly, these students' competence frustration in a preceding course was found to positively predict their intrinsic motivation level in a subsequent course. As far as we are concerned, this is the first study to reveal a potential positive effect of need frustration outside of its primary thwarting context, which complements and extends existing literatures on the dynamics between need frustration and intrinsic motivation.

Keywords: competence, competence frustration, need restoration, intrinsic motivation, self-determination theory

INTRODUCTION

Intrinsic Motivation and Self-Determination Theory

Intrinsic motivation is commonly accepted to refer to one's internal interest, curiousness, perceived challenge and enjoyment when performing an activity (Deci and Ryan, 1985). In order to explain effects of varied social and contextual factors on intrinsic motivation, self-determination theory (SDT), a motivation theory taking a cognitive perspective, was proposed a few decades ago, which has become one of the most influential theories on intrinsic motivation now. SDT conceptualizes that individuals have three basic psychological needs, which are autonomy, competence and relatedness, respectively (Deci and Ryan, 2000). The need of autonomy refers to one's need to act with a sense of ownership, to feel psychological free and to have choices. While competence is defined as the need to feel effective and mastery, relatedness concerns the need to feel socially connected, loved and cared for by other individuals (Deci and Ryan, 2000).

Self-determination theory aims to explain how social and contextual factors support or frustrate individuals' thriving through satisfaction or frustration of basic psychological needs. The benefits of basic need satisfaction have been illustrated in studies across nations, cultures and a multitude of fields, such as education, work, sport, and healthcare (Milyavskaya and Koestner, 2011). When it comes to intrinsic motivation, a recent meta-analysis showed that satisfaction of each basic need positively predicts intrinsic motivation (Van Den Broeck et al., 2016). Besides examining positive effects of need satisfaction, recent studies have begun to explore the "darker side" of need frustration or need dissatisfaction (Gunnell et al., 2013; Bartholomew et al., 2014; Costa et al., 2015). While these two terms seem to be similar, they have significant differences. While need frustration always involves low need satisfaction (need dissatisfaction), low need satisfaction does not necessarily involve need frustration. Importantly, unfulfilled need may not correlate with malfunctioning as robustly as frustrated need does (Vansteenkiste and Ryan, 2013). For instance, if plants could not obtain adequate sunshine or water (i.e., low need satisfaction), they might fail to grow and die over time. However, if salt water was poured to plants (i.e., need frustration), they would wither quickly. In a word, compared with low need satisfaction which may hinder growth, need frustration is more detrimental (Vansteenkiste and Ryan, 2013). Recent studies have demonstrated that need frustration leads to negative outcomes, including ill-being (Bartholomew et al., 2014), job burnout (Gillet et al., 2015a), counter-productive work behavior (Van Den Broeck et al., 2014), cynicism and turnover intentions (Gillet et al., 2015b), and disengagement (Jang et al., 2016). While findings of these pioneering studies are illuminating, most of existing studies only examined the relationship between need frustration and its negative outcomes in the same activity, ignoring the potential long-term impact of need frustration on a subsequent activity. Recently, a group of researchers took the lead to explore the effect of autonomy frustration outside of its primary thwarting context, and it was found to positively predict one's intrinsic motivation in the subsequent activity (Radel et al., 2014). However, up to now, effects of the frustration of other basic psychological needs, including competence, remain elusive.

Competence frustration refers to the feelings of inadequacy or failure (Bartholomew et al., 2011). The sense of competence wanes in contexts in which challenges are too high, negative feedback is received, and/or the sense of mastery is undermined by person-focused criticism and social comparisons (Ryan and Deci, 2017). When it comes to the educational setting, competence frustration in the classroom was found to be detrimental, and was negatively correlated with vitality while positively correlated with disengagement (Earl et al., 2017). Disengagement is one of the greatest problems that teachers face in classrooms, which accompanies negative classroom conduct and detachment from learning activities (Fredricks, 2014). Every coin has two sides. While some researchers suggested competence frustration to be harmful, other studies suggested that individuals would be better prepared to seek for competence satisfaction when their competence had been frustrated (Sheldon and Gunz,

2009; Radel et al., 2011). According to this line of studies, while competence satisfaction is critical for the maintenance and promotion of intrinsic motivation (Billitz, 2014), competence frustration may also give rise to a motive that pushes an individual into action. Given that autonomy frustration has been found to boost one's intrinsic motivation in learning the next course (Radel et al., 2014), how students would behave in a subsequent course once their competence had been frustrated beforehand is worth investigating, which is the goal of this study.

The Restoration Process for Basic Psychological Needs

A predominant view in motivation literatures suggested that the frustration of fundamental needs would lead to a restoration process (Fiske, 2004; Aarts, 2009). In other words, individuals would actively respond to need frustration, with the aim of readjusting their need satisfaction levels. In a pioneering study, the deprivation of autonomy was found to lead to a restoration process, as a controlling context led to the subsequent approaching behavior toward autonomy-related stimuli (Radel et al., 2011). It is worth noting that autonomy-deprived participants were prepared to regain their autonomy only when their perceived competence in the subsequent task was high enough. If perceived competence was low, participants would keep away from autonomy restoration (Radel et al., 2013). In a follow up study conducted in an educational setting, autonomy deprived students were found to show greater intrinsic motivation in the subsequent course if they could exercise autonomy in it (Radel et al., 2014). To sum up, for human beings, the existence of a restoration process for thwarted autonomy has been well-established in previous literatures.

Besides autonomy, experiencing competence is also important for one's optimal functioning. As a consequence, it is unlikely that an individual would passively accept competence frustration without activating a restoration process. While the restoration process of competence frustration has not been systematically examined, previous studies have begun to observe that competence satisfaction is negatively associated with the desire to experience competence-fulfilling situation. Interestingly, participants whose competence was less satisfied were found to be more likely to strive for competence-enhancing experiences (Sheldon and Gunz, 2009). Based on findings of existing studies, we suggested that one strategy to be adopted to restore competence satisfaction could be to engage in another less demanding activity, which would compensate the thwarted competence in a preceding activity. In other words, if an individual is in a state of competence deprivation and comes upon an activity that offers him/her a sense of competence satisfaction, his/her intrinsic motivation in this activity would get enhanced. Thus, we hypothesized that the prior competence frustration might have a paradoxical effect on one's intrinsic motivation in a subsequent task. By depriving individuals of their perceived competence, it might provide a motivational force that leads them to engage in a subsequent activity with heightened intrinsic motivation if this activity can bring them a sense of competence. In line with this reasoning, in this study,

we proposed that experiencing competence frustration in the preceding course might strengthen students' intrinsic motivation in the subsequent one.

MATERIALS AND METHODS

Participants and Research Design

To test our hypotheses, we carried out a survey study in a real educational setting. Participants were 617 freshmen (307 females, mean age = 18.5 years) from a large comprehensive university in southern China. This study was reviewed and approved by the Internal Review Board of School of Management, Guangdong University of Technology. Participants nested in 11 different classrooms came from 10 different majors. Students voluntarily participated in this study upon invitation from their Chinese modern history (hereafter referred to as history course) teachers. All participants gave oral consent after having the purpose of the study described by the researchers. In Chinese universities, history is a public-based compulsory course for college students. Compared with other courses, it is much easier to understand for all students. In this university, history courses took place once a week for a whole semester. Moreover, it was preceded by another course for all the participants (this preceding course may vary for students from different classes), as the teaching schedule had been planned ahead before the semester started. Participants were asked to fill in a questionnaire regarding their competence frustration and intrinsic motivation in both the history course and its preceding course. Collected data demonstrated that competence frustration in the history course is significantly lower compared with its preceding course ($p = 0.001$).

Procedure

In Chinese universities, courses of undergraduates (including history and its preceding course) include two consecutive sessions. This study took place before the start of the first history session in the middle of the semester. Eight history teachers were contacted to help organize this study. Following their agreement and support, the paper questionnaires were handed out to students who voluntarily participated in this study. Before the study formally started, the researchers briefly introduced the questionnaire. Students were told that their teachers would not have any knowledge of their answers, and were emphasized the importance to respond according to their true feelings. The questionnaire consisted of two parts. One part asked questions about the students' experience in the history course and the other part measured their experience in the course that preceded history. The order of distributed questionnaires was counterbalanced so that half of the participants answered items on the history course first, while the rest participants firstly filled out items regarding the preceding course. The questionnaire took about 3 min to fill out and was completely anonymous. It should be pointed out that the research assumptions were not communicated to these teachers so that they could not convey any expectation to their students. The adopted questionnaire can be found in Supplementary Table 1. Completed questionnaires were collected by the researchers directly.

Measurement

Intrinsic motivation was assessed with the Interest/Enjoyment subscale of the Intrinsic Motivation Inventory (IMI; McAuley et al., 1989). The six original items were modified to assess the students' intrinsic motivation toward the target course (e.g., "I really like taking this course."; "This course is one of my favorite subjects."). Participants were asked to rate on a seven-point scale ranging from 1 (Do not fully agree) to 7 (Totally agree). The modified items demonstrated high internal consistency ($\alpha = 0.89$ for the history course and $\alpha = 0.89$ for the preceding one).

We measured one's perception of competence frustration by adapting the basic psychological need satisfaction and frustration scale – work domain (Chen et al., 2015; Schultz et al., 2015). Three items were adapted to assess the students' perception of competence frustration toward the target course (e.g., "When I am attending this class, I have serious doubts about whether I can learn things well."). Answers were given on a seven-point scale ranging from 1 (Do not fully agree) to 7 (Totally agree). The three items demonstrated high internal consistency ($\alpha = 0.91$ for the history course and $\alpha = 0.9$ for the preceding course).

ANALYSES AND RESULTS

Because adopting individual as the unit of analysis when there is a hierarchically nested design (i.e., students nested into classrooms) may influence the results (Kashy and Kenny, 2000), it is necessary to first check whether there are significant between-group differences. If there were significant between-class differences, then a hierarchical linear model (HLM) analysis would be appropriate. Intra-class correlation coefficient (ICC) was adopted to quantify the degree of similarity among classes. Results suggested that there were no significant between-group differences. Thus, there is no need to conduct a cross-level analysis (James et al., 1984).

To examine the effect of competence frustration on one's intrinsic motivation in the same course, for both the history course and its preceding course, one's intrinsic motivation was regressed on the level of competence frustration, the presentation order of the questionnaire, class, and major. Results from regression analyses showed that competence frustration was negatively correlated with intrinsic motivation in the preceding course of history ($\beta_1 = -0.472$, $p < 0.001$), and that competence frustration accounted for 23.2% of the total variance. For the history course, competence frustration was negatively correlated with intrinsic motivation ($\beta_1 = -0.351$, $p < 0.001$), and competence frustration accounted for 16.7% of the total variance. Effects of the presentation order of the questionnaire, class, and major on intrinsic motivation did not achieve significance ($p > 0.05$). Taken together, these findings indicated that competence frustration negatively predicted one's intrinsic motivation in the same course.

Based on the actual scatterplot depicting the relationship between competence frustration in the preceding course and intrinsic motivation in current course (see Supplementary Figure 1), we constructed a quadratic regression to explore the

effect of competence frustration in the preceding course (PCF) on one's intrinsic motivation in the subsequent course (the history course):

$$Y = \beta_0 + \beta_1 \text{PCF} + \beta_2 (\text{PCF} * \text{PCF})$$

Regression analysis showed that $\beta_1 = -0.523$, $p < 0.001$; $\beta_2 = 0.058$, $p < 0.01$. Interestingly, we found that there existed a U-shaped curvilinear relationship between competence frustration in the preceding course and intrinsic motivation in the history course, which was not exactly in line with our prediction. From **Figure 1**, we can see that there was an inflection point. Before that point, competence frustration in the preceding course was negatively correlated with one's intrinsic motivation in history. Beyond that point, it was positively correlated with one's intrinsic motivation in the history course instead. According to the calculation, the value of the inflection point is 4.7.

Table 1 presents the means, standard deviations, and internal reliability coefficients of research variables, as well as correlations between the variables when $\text{PCF} > 4.7$. According to the data, competence frustration in the preceding course was positively correlated with intrinsic motivation in the history course ($r = 0.254$, $p < 0.05$), while competence frustration in the history course was negatively correlated with intrinsic motivation in the same course ($r = -0.273$, $p < 0.05$). This provides the necessary prerequisites for subsequent analysis.

When $\text{PCF} > 4.7$, the level of intrinsic motivation in the history course was regressed on competence frustration in the preceding course, the level of intrinsic motivation in the preceding course, and the perception of competence frustration in the history course. The structure of regression model is based on a previous study which examined the effect of autonomy frustration (Radel et al., 2014). The regression analysis results are shown in **Table 2**. According to **Table 2**, this model was tenable ($F_{3,77} = 3.133$, $p < 0.01$) and accounted for 20% of the total variance. Competence frustration in the history course was negatively associated with intrinsic motivation in the same course ($\beta_3 = -0.218$, $p < 0.05$). Intrinsic motivation in the

preceding course was also a vital predictor of intrinsic motivation in the history course ($\beta_2 = 0.275$, $p < 0.05$). More importantly, competence frustration in the preceding course turned out to positively predict one's intrinsic motivation in the history course ($\beta_1 = 0.386$, $p < 0.05$).

Table 3 shows the correlation results between research variables when $\text{PCF} \leq 4.7$. It is worth noting that competence frustration in the preceding course was negatively correlated with intrinsic motivation in history ($r = -0.171$, $p < 0.01$). Regression results are displayed in **Table 4**. It was found that competence frustration in the preceding course did not have a significant impact on intrinsic motivation in the history course ($r = -0.056$, $p = 0.245$). At first glance, results from the correlation analysis and the regression analysis seemed to be in conflict. We suggested that inclusion of additional predictors in the regression analysis may account for the discrepancy in these results. To be specific, we proposed that: when $\text{PCF} \leq 4.7$, competence frustration in the preceding class may negatively influence intrinsic motivation in the history class through the mediated roles of intrinsic motivation in the preceding class and competence frustration in the history class. We adopted Mplus 6.11 to analyze the mediation effects, and the sizes of the indirect (i.e., mediated) effects are presented in Supplementary Table 2. The hypothesized model showed an acceptable fit to the data, with $\chi^2(539) = 333.28$, CFI = 1.0, TLI = 1.002, RMSEA = 0.001, and SRMR = 0.012. As shown in Supplementary Table 2, the two indirect effects were significant. Specifically, both competence frustration in the history class (Estimate = -0.173 , $p < 0.001$) and intrinsic motivation in the preceding class (Estimate = -0.05 , $p < 0.05$) mediated the effect of competence frustration in the preceding class on intrinsic motivation in the history class.

DISCUSSION

As a basic psychological need, competence is critical for the maintenance and promotion of one's intrinsic motivation (Billitz, 2014). Thus, when faced with competence frustration, individuals may take active actions to restore it. In our daily life, people frequently participate in a series of activities, and their psychological experience in a preceding activity may affect that in the current one. For instance, a recent study conducted in the educational setting suggested that autonomy-frustrated students would show greater intrinsic motivation in a subsequent course if they could exercise autonomy in it and then regain their perceived autonomy (Radel et al., 2014). We predicted that this would also be true for competence, and assumed that individuals would be more intrinsically motivated for a subsequent activity when it followed one in which they experienced greater competence frustration. To examine our hypotheses, we conducted a survey study in an educational context, findings of which provided partial support for our assumptions.

Previous studies consistently reported that when a task thwarts an individual's need of competence, his/her intrinsic motivation in the task will decline (Ryan and Deci, 2000; Tsai et al., 2008).

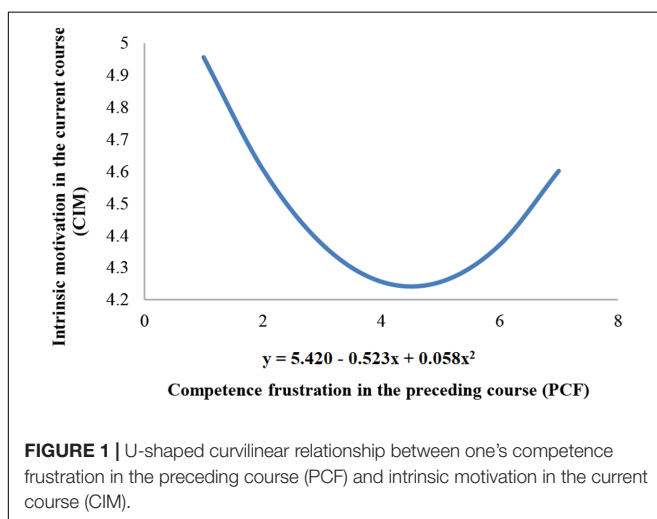


TABLE 1 | Means, standard deviations, and correlations between research variables (PCF > 4.7).

Variables	<i>M</i>	<i>SD</i>	1	2	3	4
(1) Competence frustration in the preceding course	5.68	0.73	1			
(2) Intrinsic motivation in the preceding course	3.66	1.13	−0.036	1		
(3) Competence frustration in the history course	3.35	1.58	−0.05	0.139	1	
(4) Intrinsic motivation in the history course	4.2	1.2	0.254*	0.194	−0.273*	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. $N = 78$.

TABLE 2 | Regression analysis of the students' intrinsic motivation in the history course (PCF > 4.7).

Model	Non-standardized coefficient		Standardized coefficient	<i>T</i>	Significance
	<i>B</i>	The standard error	Beta		
Constant	2.227	1.22		1.825	0.072
Major	−0.083	0.13	−0.2	−0.637	0.526
Class	0.003	0.012	0.089	0.28	0.781
Presentation order of the questionnaire	−0.144	0.261	−0.06	−0.553	0.582
Competence frustration in the preceding class	0.386*	0.184	0.235	2.099	0.039
Intrinsic motivation in the preceding course	0.275*	0.118	0.258	2.329	0.023
Competence frustration in the history course	−0.218*	0.083	−0.285	−2.617	0.011

Dependent variable: intrinsic motivation in the history course; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. $N = 78$.

TABLE 3 | Means, standard deviations, and correlations among the study variables (PCF ≤ 4.7).

Variables	<i>M</i>	<i>SD</i>	1	2	3	4
(1) Competence frustration in the preceding course	2.61	1.18	1			
(2) Intrinsic motivation in the preceding course	4.67	1.17	−0.452**	1		
(3) Competence frustration in the history course	2.52	1.35	−0.407**	0.158**	1	
(4) Intrinsic motivation in the history course	4.55	1.2	−0.171**	0.155**	−0.422**	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. $N = 539$.

TABLE 4 | Regression analysis of the students' intrinsic motivation in the history course (PCF ≤ 4.7).

Model	Non-standardized coefficient		Standardized coefficient	<i>T</i>	Significance
	<i>B</i>	The standard error	Beta		
Constant	4.919	0.338		14.559	0.000
Major	−0.075	0.049	−0.184	−1.519	0.129
Class	0.005	0.004	0.137	1.134	0.257
Presentation order of the questionnaire	0.011	0.094	0.005	0.118	0.906
Competence frustration in the preceding class	0.056	0.048	0.055	1.164	0.245
Intrinsic motivation in the preceding course	0.111*	0.045	0.108	2.471	0.014
Competence frustration in the history course	−0.373***	0.038	−0.419	−9.763	0.000

Dependent variable: intrinsic motivation in the history course. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. $N = 539$.

In line with these findings, we also observed that competence frustration undermined students' intrinsic motivation in the same course. This result is also consistent with a previous research conducted in the education domain concerning the effect of competence frustration on disengagement (Jang et al., 2016). When it comes to the relationship between competence frustration in a preceding course and intrinsic motivation in a subsequent one, we predicted this effect to be linear, and more specifically, positive. Interestingly, our hypothesis was

not fully supported, as we discovered a U-shaped curvilinear relationship between competence frustration in a preceding course and intrinsic motivation in a subsequent one. Before reaching the inflection point, there was no significant direct effect of competence frustration in a preceding course on one's intrinsic motivation in a subsequent one. Only after reaching the inflection point (when competence frustration in a preceding course is high enough) would the influence of competence frustration be positive. These results provided preliminary

evidences for the paradoxical effect of competence frustration in a given activity on one's intrinsic motivation in a subsequent activity.

Findings of our study complement and extend existing findings on intrinsic motivation. Most of previous studies examined either characteristics of the activity itself or the context of the activity on one's intrinsic motivation (Dysvik and Kuvaas, 2011; Abuhamdeh et al., 2014; Baranes et al., 2014; Hofferber et al., 2016). This study went a step further as it argued that one's experience in a preceding activity could also be an important predictor of his/her intrinsic motivation in the current task. Here, we took into account the role of competence frustration. Previously, the impact of competence frustration has mostly been measured and observed immediately (Bartholomew et al., 2014; Earl et al., 2017). This research widened the research scope and explored its potential effect outside of the primary thwarting context. Our results suggested that, the impact of competence frustration could go beyond the context where the threat occurred and further affect individuals' psychological status in subsequent activities. While findings of this study seemed to suggest that competence frustration could lead to positive outcomes, this conclusion needs further verification and should be utilized with caution. For instance, previous studies have argued that, while compensation for need frustration in another life domain may occur, the total effect (need frustration + compensation) may be less positive than the situation wherein this need has been satisfied in the first place (Milyavskaya et al., 2009; Emery et al., 2015).

A contribution of our findings is that competence as a basic psychological need gets further confirmed, as one was found to actively seek for competence satisfaction when he/she perceived severe competence frustration beforehand. Future research may follow this line of work (Radel et al., 2011, 2013, 2014) to further clarify the need restoration process over time. Besides competence, other psychological needs could well be analyzed in a similar manner. For example, frustrating one's relatedness in a prior activity may have a similar impact on his/her intrinsic motivation in a subsequent irrelevant activity if the second activity can satisfy one's relatedness. While results from the manipulation check suggested that the history course was significantly less competence-frustrating compared with its preceding courses, a limitation of this study is that competence frustration was not directly manipulated. Thus, at the current stage, we cannot be conclusive on the causal relationship between competence frustration in the preceding course and the level of intrinsic motivation one displays in the current course. Experimental studies in which competence frustration is directly manipulated by the researchers are required to establish this causal link. Besides, given that the present study only measured intrinsic motivation through self-report, it will be interesting to resort to behavioral measurement and/or neural indicators of intrinsic motivation to further clarify the long-term consequence of competence frustration triggered by the overwhelming challenge, demanding tasks, or negative feedbacks (Meng et al., 2016; Domenico and Ryan, 2017; Ma et al., 2017; Meng and Yang, 2018). Another limitation of this study is that only 78 students satisfied the criteria of

PCF > 4.7. Thus, the sample size of the high competence frustration group is relatively small. The fact that difficulty of the curriculum normally matches abilities of general students in the university may partially account for the current situation. Since the instructor may flexibly tailor difficulty of his/her course according to performances and responses of the students, normally few students would report their perceived competence to be frustrated to a great extent. To replicate findings of this study, future studies with larger sample sizes are highly recommended.

Findings of this study may bear important implications for the educational practice. As students' competence frustration was found to have a negative influence on their intrinsic motivation in the same class, instructors (especially those teaching a difficult course) should pay special attention to protect competence of their students. For instance, they may consider giving timely positive feedbacks whenever possible so as to boost the students' sense of competence. In addition, because the restoration process for competence frustration exists, when scheduling courses for the next semester, educational administration personnel should try to make sure that a highly difficult and challenging course is to be followed by a relatively easy one. Indeed, scientific and reasonable course arrangement can enhance students' intrinsic motivation and improve their overall academic achievements.

CONCLUSION

Based on a survey study conducted in a real educational setting, it was found that competence frustration would decrease students' intrinsic motivation in the same activity. Interestingly, if competence frustration in this activity was high enough, which exceeded a critical point, a restoration process would be activated to help individuals regain competence in the subsequent less demanding activity, and participants would show enhanced intrinsic motivation in it. Through exploring effects of the frustration of a basic psychological need (competence frustration) outside of the primary thwarting context, we complement and extend existing studies on the dynamics between need frustration and intrinsic motivation.

AUTHOR CONTRIBUTIONS

LM and HF conceived and designed the study. HF collected and analyzed the data. HF and LM interpreted the data and drafted the manuscript. LM, HF, BH, and HJF reviewed and edited the manuscript. LM administered the project.

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SUPPLEMENTARY MATERIAL

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The Influence of Personal Well-Being on Learning Achievement in University Students Over Time: Mediating or Moderating Effects of Internal and External University Engagement

Lu Yu^{1*}, Daniel T. L. Shek^{1,2,3,4,5} and Xiaoqin Zhu¹

¹ Department of Applied Social Sciences, The Hong Kong Polytechnic University, Hong Kong, China, ² Department of Social Work, East China Normal University, Shanghai, China, ³ Kiang Wu Nursing College of Macau, Macau, China, ⁴ Hong Kong Institute of Service Leadership and Management Limited, Hong Kong, China, ⁵ Division of Adolescent Medicine, Department of Pediatrics, Kentucky Children's Hospital, University of Kentucky College of Medicine, Lexington, KY, United States

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*Correspondence:

Lu Yu
lu.yu@polyu.edu.hk

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The current study examined the relationship between students' personal well-being and their learning achievement during university study, and whether such relationship would be mediated or moderated by university engagement. A total of 434 university students from one public university in Hong Kong participated in the study. The participants completed an online survey consisting of personal well-being (cognitive behavioral competence and general positive youth development), university engagement, and learning achievement measures (personal growth, and accumulated GPA as academic achievement) at four time points with a 1-year interval. Results showed that personal well-being measured at the beginning of university study positively predicted students' personal growth and academic achievement after 3 years' study. While the internal dimensions of university engagement (academic challenge and learning with peers) showed longitudinal significant mediational effect, the external dimensions (experience with faculty and campus environment) did not have significant longitudinal moderating effect. Nevertheless, external dimensions of student engagement also showed direct effect on personal growth and academic achievement. The long-standing positive effects of personal well-being on university engagement and subsequently, learning achievement during university years call for more attention to the promotion of holistic development among university students in Hong Kong.

Keywords: university engagement, personal growth, academic achievement, GPA, Chinese student

INTRODUCTION

University students have been identified as an "at-risk" population, because the age at which most young people start higher education coincides with the age of onset of a range of problem behaviors (e.g., substance abuse and internet addiction) and mental health problems (e.g., depression and anxiety; Wynaden et al., 2013). These psychosocial problems have been progressively highlighted

for not only their increased incidence and severity, but also the close link to negative quality of life, such as poor academic performance, decreased life satisfaction, and even suicidal thoughts (Eisenberg et al., 2009). In addition, the transition to higher education itself is a great challenge, which may cause physical and psychological distress and negatively affect the quality of university students' academic life (Tobolowsky, 2008; Wynaden et al., 2013).

Yet, students who can cope effectively and function adaptively in university would flourish amidst these challenges (Stamp et al., 2015). Whether students can function optimally in challenging circumstances is a result of complex interactions between individual (e.g., personal attributes and biological condition), social, environmental, and cultural factors. Most importantly, protective factors can modify students' response to challenges and buffer them from the negative influences (Bouteyre et al., 2007; Burris et al., 2009). Thus, to help students deal with developmental and transitional difficulties in university, and to promote their gains from higher education, it is very important to explore such protective factors. At a personal level, previous studies have shown that personal well-being such as interpersonal confidence, social and emotional skills, and self-esteem were associated with better adjustment and learning achievement (Eisenberg et al., 2009; Stamp et al., 2015). Hence, focusing on these attributes represents a promising approach to enhance university students' learning gains.

Personal Well-Being and Student Learning Achievement

Positive psychologists focus on the bright sides of adolescents and perceive all adolescents as "resources to be developed" (Lerner et al., 2003, p. 172). In particular, a positive youth development (PYD) framework has been proposed which emphasizes the importance of developing multiple psychosocial competences (e.g., cognitive competence, social emotional competence, and spirituality) in constructing a good life among youth (Catalano et al., 2012). Under this paradigm, personal well-being in terms of psychosocial competencies, such as emotional competence, resilience, and moral competence have been increasingly emphasized in recent years (Roth and Brooks-Gunn, 2003), particularly for its relationship with student academic achievement. For example, self-efficacy, social competence, and emotional skills are positively related to school performance and negatively associated with problem behaviors among adolescents and university students (Caprara et al., 2011; Polan et al., 2013). Similarly, recent meta-analytic studies concluded that intervention and prevention programs (e.g., service learning programs and social emotional learning programs) fostering students' competencies have shown positive effects on students' academic success, with small to large effect sizes (Sklad et al., 2012; Gutman and Schoon, 2015).

Despite these consistent findings, four limitations exist in the extant literature regarding the relationship between personal well-being and students' learning achievement. First, most of the findings were obtained from cross-sectional studies, which could not provide a full picture about how personal well-being

may contribute to their learning effectiveness over time. Second, most research was conducted among secondary school students, while few studies focused on university students. This gap is particularly important when we realize that there are growing developmental issues and mental health problems in university students.

Third, such studies are especially scarce in the non-Western populations such as Chinese youth in Hong Kong. While adolescents are commonly taught about social, emotional, and other life skills before entering university in the Western contexts (Catalano et al., 2002; Durlak et al., 2011), systematic training on individual psychosocial competences is not well developed in Hong Kong (Shek et al., 2007a; Shek and Yu, 2011). In Chinese societies, it is commonly believed that young people will have a bright future as long as they can be admitted to a distinguished university. This traditional belief drives parents, teachers, schools, and even students themselves to place morbid emphasis on attaining high academic achievement, which is a prerequisite for students being admitted to a distinguished school at each learning stage and getting into dream university eventually.

Besides, the development of psychosocial competences among young people has been largely overlooked. In fact, with more and more psychological and behavioral problems being identified among Hong Kong youngsters (Wong et al., 2006; Song et al., 2008; Shek and Wong, 2011), we have to admit that students' prior academic development cannot guarantee their achievement in university. Although there are researchers advocating that personal well-being and psychosocial competences are critical for young people to make the most out of their university education (Shek and Wu, 2016), both public and scientific attentions to this issue have been inadequate. Therefore, to further raise the awareness of and win support for the importance of promoting holistic development among Hong Kong youth, it is essential to provide more evidence for the impact of adolescents' psychosocial competences on their subsequent learning achievement in university. Moreover, concerning the great proportion (i.e., nearly one-fifth) of Chinese people in the world's population, studying the relationship between personal well-being and student learning achievement among Chinese people is indispensable to provide answers to the universality of such relationship.

Fourth, previous literature has not fully addressed the mechanisms underlying the relationship between personal well-being and learning outcomes. It is possible that the relationship could be mediated or moderated by factors at both individual, and other ecological levels. While family factors such as parental involvement and family support have been identified as important facilitators for students' learning achievement (e.g., MacGeorge et al., 2005; Cheng et al., 2012), the role of other factors in one's undergraduate life, such as university engagement, has not been thoroughly investigated. Specifically, concerning the lack of research on university engagement in Chinese context, this question is especially relevant in the present study.

To address the above research gaps, the present study had two objectives: (1) to examine the relationship between

personal well-being and student learning achievement in one Chinese community (i.e., Hong Kong) using a longitudinal research design, and (2) to explore whether and how university engagement could possibly underlie such relationship. Sections below will focus on the elaboration on the second research objective.

Effects of University Engagement

In literature, the concept of university engagement considers dimensions at individual (i.e., students themselves) and the contextual or institutional level. For example, in a widely-cited definition given by Kuh (2009a), university engagement was regarded as “the time and effort students devote to activities that are empirically linked to desired outcomes of college and what institutions do to induce students to participate in these activities” (p. 683). Similarly, researchers framed university engagement in terms of external factors (e.g., institutional factors) and internal factors (i.e., students’ personal factors; Zhang et al., 2015).

Accordingly, in the large-scale national survey conducted annually in USA (i.e., National Survey of Student Engagement, NSSE) and Australia (i.e., Australasian Survey of Student Engagement, AUSSE), university students’ engagement was empirically indexed by engagement indicators covering both student learning and student perception on campus resources (Kuh, 2017). The structure of engagement indicators has been reviewed recently, and now there are 10 engagement indicators, which can be further categorized into four higher-order engagement themes (NSSE, 2015). The four themes include academic challenge (e.g., higher-order learning and learning strategies), learning with peers (e.g., collaborative learning), experiences with faculty (e.g., student-faculty interaction and effective teaching practice), and campus environment (e.g., supportive environment). Conceptually speaking, while the former two higher-order themes primarily highlight student personal devotion to learning, which reflects the internal dimensions of university engagement, the latter two mainly focus on the perceived support and resources provided by peers, teachers, faculty and the institution, which could be regarded as the external or contextual dimensions of university engagement.

Ample studies have demonstrated a strong positive association between university engagement and student learning achievement, such as critical thinking, cognitive development, and academic achievement, both in Western countries (Trowler and Trowler, 2010; Fuller et al., 2011) and China (Lu et al., 2014). While it is well documented that both internal factors (e.g., learning involvement) and external factors (e.g., campus resources) could serve as facilitators of university learning achievement, their different roles in students’ university study have not been systematically examined, especially for their mediating or moderating effects on the relationship between personal well-being and student learning achievement.

Mediating Effect of Internal Engagement

The critical role of internal engagement is well defined by college impact models (e.g., Inputs-Environment-Outputs Model; Astin, 2012), which have been commonly used to interpret causal

relationships of university characteristics as well as students’ diverse learning experiences to student gains and development (Pascarella et al., 2014; Kilgo et al., 2015). In general, college impact models acknowledge the influence of two types of factors on student gains. The first one was students’ background and personal situation they possessed before attending college (i.e., “input”), and the second one was students’ learning experiences such as their own involvement during college learning (i.e., “process”).

According to college impact models, student learning achievement is the “output” of college impact, and the so called “input” factors can either directly affect “output” or indirectly influence it via the “process” factor (e.g., Astin, 2012). Theoretically, students’ personal well-being in terms of competences is among the “input” factors because well-being constitutes one aspect of students’ personal situation at the beginning of university life. Likewise, student internal university engagement, which represents how they involve in and the extent they devote themselves to university learning, can in part index the “process” factor. In this sense, we could expect that students’ personal well-being as the “input” will affect their learning achievement (i.e., output) through the influence of internal engagement (i.e., process). In other words, students with a high level of personal well-being may be more engaged in university learning and thus obtain greater learning gains.

Evidence has supported the positive association between personal well-being and students’ internal learning engagement. For example, enhancing students’ self-belief was considered as one strategy to improve student engagement in higher education (Zepke and Leach, 2010). Related findings also showed that learners who had higher self-efficacy showed a higher level of engagement (Llorens et al., 2007). Furthermore, students’ self-perceived competence within learning context could facilitate their ongoing active learning (Fazey and Fazey, 2001). Therefore, students who were confident in their own competence could remain motivated and be engaged even in difficult situations.

With specific reference to the Chinese context, although the number of studies on university students’ engagement and its individual differences has increased in recent years (Lu et al., 2014; Yin and Wang, 2016), these studies primarily focused on sociodemographic variables such as gender and grade level rather than personal attributes. Among the few exceptions, Siu et al. (2014) reported that psychological capital defined by resiliency, optimism, hope, and self-efficacy positively predicted undergraduates’ study motivation and learning involvement in Hong Kong. In their qualitative study, Zhang et al. (2015) found that individual factors such as adaptation, communication skills, personality (e.g., confident) would impact students’ learning engagement in university.

The above indirect evidence suggests a positive relationship between personal well-being and internal university engagement in Chinese context as well. This finding, in conjunction with the robust predicting effect of university engagement on learning achievement (Trowler and Trowler, 2010; Lu et al., 2014), suggests that internal dimensions of university engagement may mediate the relationship between personal well-being and

learning achievement, especially when students are in a difficult transition period to higher education. This is certainly the case in Hong Kong, where the higher education reform adds extra challenges to students' transitional difficulties (Jaffee, 2012). However, little research attention has been paid to this topic. To fill this gap, the present study attempted to investigate the impact of personal well-being on student learning achievement and the potential mediating effect of internal university engagement in Hong Kong students.

Moderating Effect of External Engagement

In dealing with transitional distress, while those students possessing sufficient competences as internal resources can convert stressors into opportunities for positive development, those students lacking personal well-being may suffer from adverse consequences (Caprara et al., 2011; Polan et al., 2013). However, positive school environments as external factors related to university engagement could buffer negative influence on learning achievement of various risk factors, such as family disadvantages, transition distress, and students' disruptive behaviors (Hopson and Lee, 2011; O'Malley et al., 2015). In this sense, positive experiences with faculty and a favorable campus environment may in part complement for the insufficient personal well-being, thus attenuating the relationship between lack of personal competencies and undesirable learning achievement. In other words, external dimensions of university engagement may moderate the relationship between personal well-being and university learning achievement.

Under the framework of university engagement, the positive school environment mainly relates to resources and support provided by the faculty and institution, effective teaching practices, and constructive relationships between students and teachers and faculty members. These contextual factors, as reflected in the two external university engagement themes, constitute important parts of university students' support system, which could help students better cope with difficulties and challenges encountered in university study. To illustrate, perceived social support from professors and peers were beneficial to students' self-esteem and grades (Clifton et al., 2004). Besides, social support including peer support acted as a buffer against academic stress in university (Wilks and Spivey, 2010). Therefore, the supportive university environment may create conditions for achieving favorable learning achievement. Such a favorable context could possibly add extra increments to internal assets while simultaneously counteract the negative impact of the lack of those internal resources.

The moderating effect of external dimensions of university engagement is more likely to occur in Chinese context, given that peers, teachers and the school as external factors may play even greater roles in shaping Chinese students' learning than they do in Western societies. For instance, compared with Western counterparts, Chinese students perceive a higher level of peer support in learning, and establish friendship with each other more often by doing homework or preparing for examinations together (Jia et al., 2009), which is regarded as helpful for obtaining good marks (Zhang et al., 2015). Besides, Chinese teachers form a closer "friendship" with students and are more

likely to play the formal and authority role in helping students during their first 1–2 years' of university learning (Zhu et al., 2010). A more recent study also highlighted the pivotal role played by teachers in Chinese students' learning involvement and their learning achievement in university (Chi et al., 2017). Nevertheless, the hypothesized moderating effect of external dimensions of university engagement has not been empirically examined in Chinese context.

Influence of Social-Demographic Factors

To examine the relationship among personal well-being, university engagement, and student learning achievement, it is important to control confounding variables, such as gender and family background. Regarding gender, female students are usually found to be more engaged in learning and achieve better academic performance than male students across cultures (Lam et al., 2012). A recent study in Chinese context found that female students engaged in university learning in a more adaptive way than did their male peers (Yin and Wang, 2016). Besides, prior research found that student development varies by family characteristics. For instance, a harsh family environment (e.g., poor, non-intact family structure) were negatively associated with students' academic performance (Hopson and Lee, 2011; O'Malley et al., 2015). Furthermore, recent large-scale longitudinal studies uncovered the concurrent and longitudinal relationships between unfavorable family conditions (e.g., non-intact family structure and economic disadvantage) and poor youth development among Chinese youth (Yu and Shek, 2014; Shek and Leung, 2016). Therefore, the present study considered family intactness and family economic status as two control variables in addition to gender and age.

The Present Study

To fill the current research gaps, the present study aimed to address three research questions:

- 1) Does students' personal well-being longitudinally predict their learning achievement?
- 2) Do internal dimensions of university engagement mediate the above predicting effect?
- 3) Do external dimensions of university engagement moderate the above predicting effect?

Based on the extant literature, we had four hypotheses presented below:

- *Hypothesis 1:* University students' personal well-being would predict their learning achievement positively.
- *Hypothesis 2:* The above-hypothesized predictive effect would be partially mediated by the internal dimensions of university engagement indexed by academic challenge and learning with peers.
- *Hypothesis 3:* The external dimensions of university engagement would be positively related to students' learning outcomes.
- *Hypothesis 4:* The external dimensions of university engagement would also moderate the relationship between students' personal well-being and their learning outcomes.

Figure 1 outlines the relationships between personal well-being, learning outcomes, and university engagement.

METHODS

Participants and Procedures

The present study was part of a longitudinal project commencing in the academic year of 2012–2013, the first year when public universities in Hong Kong started implementing the 4-year undergraduate curricula. The project was approved by the Human Subjects Ethics Sub-committee (HSESC) (or its Delegate) of the authors' university. In this project, 650 first-year students in one public university in Hong Kong were randomly selected and invited via email or phone calls to join a longitudinal online survey aiming to investigate students' changes under the new undergraduate curriculum. Consent from students was obtained and they were well informed that they could withdraw from the study whenever they want, and that any information they provided would be kept strictly confidential and only used for research purposes.

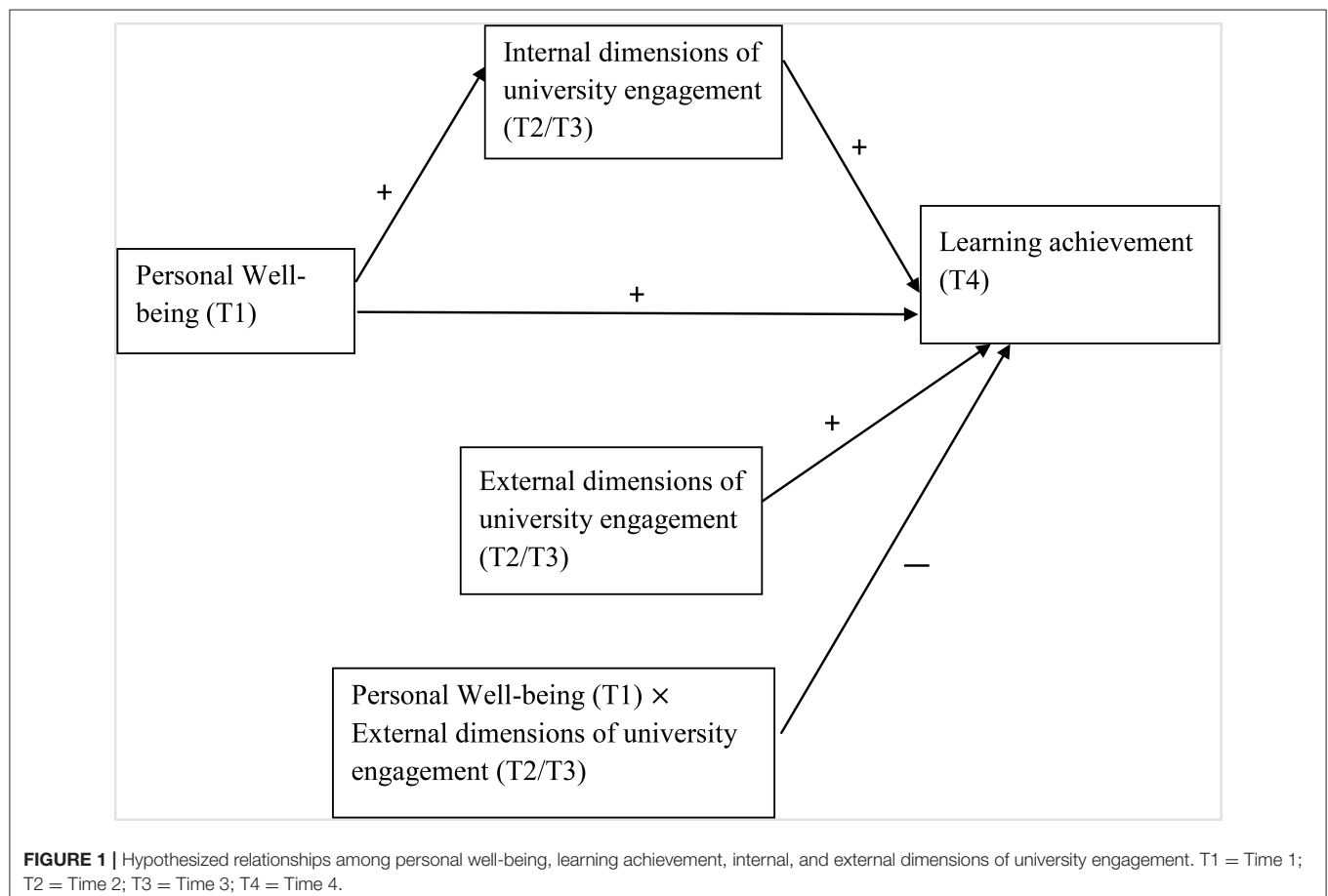
Time 1 data collection was carried out in November 2012, 2 months after students' enrollment in the university. Out of 650 invited students, 543 completed the survey suggesting a valid response rate of 83.54%. These students were followed up also in November in the following 3 consecutive years and invited

to complete the same online survey. Across four time points (i.e., Time 1, Time 2, Time 3, and Time 4), 434 participants ($M_{age} = 18.13$, $SD_{age} = 0.54$ at Time 1) were successfully matched, suggesting an acceptable total attrition rate of 20.07% across 3 years. All participants were Asian, while 316 (72.8%) were Hong Kong local students, 105 (24.3%) were mainland Chinese students, 13 (3.0%) were students from other Asian countries. There were 266 female students (61.29%) and 168 male students (38.71%).

Comparison between the matched sample ($n = 434$) and those dropouts of the survey after the first wave of data collection ($n = 109$) did not yield any significant differences regarding demographic information (i.e., gender composition, age, ethnicity, and place of birth), family background, and personal well-being measured at Time 1. Therefore, the matched sample ($n = 434$) was used as the basis of the present analyses.

Instruments

The questionnaires used in the project included multiple measures. The current study focused on the relationship among personal well-being, engagement, and learning outcomes and the related measures are described below. To facilitate students' completion of questionnaires, all items were phrased in both English and Chinese.



Learning Achievement Measures

Personal growth was measured at Time 2, Time 3, and Time 4 in the longitudinal project. In the present study, personal growth measured at Time 4 was used as one indicator of student learning achievement after 3 years of study. Participants reported their own growth since attending the university using a 10-item scale adopted from US NSSE. These items covered such aspects as written and oral communication skills, social skills, general knowledge, critical thinking, intellectual skills, problem solving, ethical development, and civic responsibility. This measure represented a value-added approach for learning outcome assessment incorporated in NSSE (Kuh, 2009b), and can be seen as an important complement to direct measures of learning, such as grade point average (GPA). Besides, the 10 items were well designed to meet certain conditions under which students' own estimates for growth are valid and reliable (Kuh, 2009b). A 4-point Likert scale (1 = strongly disagree; 4 = strongly agree) was adopted with higher scores suggesting greater growth. Student personal growth was indexed by the average score across the 10 items. Across all participants, mean score of personal growth was 2.72 ($SD = 0.52$). The 10-item scale showed good reliability with Cronbach's α of 0.90.

Academic achievement was another indicator of learning achievement. Students reported their GPA in past year since Time 2 data collection. Students' GPA in each year was recoded using the following scheme: D or lower = 1; D+ = 2; C- = 3; C = 4; C+ = 5; B- = 6; B = 7; B+ = 8; A- = 9; A = 10; A+ = 11, with a larger number representing a better score. Then an average score of GPA (i.e., accumulated GPA) across 3 years was computed for each participant. The accumulated GPA used to indicate students' academic achievement at Time 4 ranged between 3.67 and 10.33, with a mean score of 7.36 ($SD = 1.07$).

University Engagement

Engagement indicators developed in NSSE were used to measure students' engagement during the past year. In NSSE (2015), there were 47 items mapped into 10 engagement indicators to assess student involvement in high levels of learning and their perception on campus resources. Besides, these 10 engagement indicators can be further classified into 4 higher-order themes: (1) "academic challenge" which included four engagement indicators (i.e., reflective and integrative learning, higher order learning, quantitative reasoning, and learning strategies); (2) "learning with peers" that consisted of two engagement indicators (i.e., collaborative learning and discussion with diverse others); (3) "experience with faculty" which included two engagement indicators (i.e., student faculty interaction and effective teaching practice; and (4) "campus environment" which also included two engagement indicators (i.e., quality of interaction and supportive environment). As already mentioned before, "academic challenge" and "learning with peers" were internal dimensions while "experience with faculty" and "campus environment" were external dimensions of university engagement. A 4-point scale was adopted for all items, and an average score across all items in each engagement indicator was first calculated. The higher-order theme was computed as the mean score of standardized values of the

corresponding engagement indicators. In the present study, the four higher-order themes obtained at Time 2 and Time 3 were used. All engagement indicator measures demonstrated good internal reliability with Cronbach's α ranging between 0.70 and 0.90.

Personal Well-Being

Students' personal well-being was defined in terms of positive youth development competencies (Shek et al., 2017), and measured using the Chinese Positive Youth Development Scale (CPYDS) developed by Shek et al. (2007b). The original CPYDS contained 15 subscales corresponding to 15 positive development constructs (e.g., resilience, social competence, and self-determination) summarized by Catalano et al. (2002). The 90-item CPYDS has shown sound validity and reliability in measuring Chinese adolescents' personal positive attributes in previous studies (e.g., Sun and Shek, 2013). In the longitudinal project, concerning the length of the whole questionnaire, 8 subscales measuring attributes directly related to desired university graduate attributes identified in the original project were adopted (Shek et al., 2015). The eight subscales include cognitive competence, emotional competence, behavioral competence, social competence, self-determination, self-efficacy, resilience, and moral competence, which can be used to form two composite scores: cognitive-behavioral competence and general positive youth development attributes (general PYD). The cognitive-behavioral competence score was calculated as the average score of three subscales of cognitive competence, behavioral competence, and self-determination while the general PYD score was calculated based on the mean score of other four subscales of resilience, social competence, emotional competence, and moral competence (Shek and Ma, 2010). In the present study, cognitive-behavioral competence and general PYD at Wave 1 were employed as indicators of students' baseline personal well-being. A 6-point Likert scale was applied for all items with a higher score indicating a higher level of personal well-being. All scales used in the present study showed acceptable to good reliability with Cronbach's α ranging from 0.64 to 0.85.

Control Variables

Besides demographic information such as gender and age, control variables also included family intactness and family economic status. Family intactness was defined as marital status of participants' parents. A total of 370 (85.25%) participants who reported that their parents were in the first marriage were categorized into intact family group, and 64 (14.75%) participants whose parents were divorced, separated or in their second marriage were in non-intact family group. Participants' family economic status was determined by whether his/her family received Hong Kong Government welfare (i.e., Comprehensive Social Security Assistance Scheme, CSSA) before entering university. A total of 38 (8.80%) participants whose family received CSSA prior to university were categorized as having economic disadvantage and other 386 (88.9%) participants whose family did not receive CSSA were regarded as not having economic disadvantage.

Data Analysis Plan

We first conducted a correlational analysis among all related variables. To test the first and second hypotheses, the multiple mediator model (Preacher and Hayes, 2008) was utilized to examine the predictive effect of cognitive-behavioral competence and general PYD at Time 1 (i.e., independent variables) on learning outcomes at Time 4 (i.e., dependent variables), as well as the mediating effects of internal university engagement (i.e., “academic challenge” and “learning with peers”) at Time 2 or Time 3. In the current study, 5,000 bootstrap samples were used. Then, several multiple regression analyses were performed to test the third and fourth hypotheses by entering external dimensions of engagement as well as their interactions with personal well-being as predictive variables.

RESULTS

Correlation coefficients among key variables are depicted in **Table 1**. Two indicators of students’ personal well-being (i.e., cognitive-behavioral competence and general PYD) at Time 1 were both significantly and positively associated with indicators of university engagement (i.e., academic challenge, learning with peers, experience with faculty, and campus environment) at Time 2 and Time 3, as well as two learning achievement indicators (i.e., personal growth and academic achievement) at Time 4. Besides, university engagement measures were also positively related to students’ learning achievement indicators. The findings basically supported Hypothesis 1 and Hypothesis 2.

Control variables were not significantly correlated with learning achievement. Besides, there was no clear pattern of correlations between control variables and university

engagement. Specifically, age showed a negative correlation with academic challenge at Time 2, but not at other time points. Female students perceived experience with faculty and campus environment more positively than did male students, only at Time 3; and no gender difference was found at other waves. In addition, family intactness was positively associated with academic challenge and perceived campus environment only at Time 2, while family economic status was negatively related to perceived campus environment (i.e., students without family economic disadvantage perceived less supportive campus environment) at Time 2 and Time 3.

Results of mediation effect analyses are depicted in **Tables 2, 3**. Results showed significant longitudinal predicting effects of cognitive-behavioral competence and general PYD on learning achievement measures (i.e., personal growth and academic achievement) as reflected by the significant total effect of independent variables on dependent variables.

For students’ personal growth at Time 4, the longitudinal predicting effect of Time 1 cognitive-behavioral competence was partially mediated by Time 2 internal engagement dimensions of academic challenge ($B = 0.03$, 95% CI = [0.01, 0.05]) and learning with peers ($B = 0.02$, 95% CI = [0.01, 0.04]; See **Table 2**). Time 3 academic challenge ($B = 0.04$, 95% CI = [0.02, 0.08]) showed similar partial mediating effect, while Time 3 learning with peers ($B = 0.01$, 95% CI = [−0.002, 0.03]) did not (See **Table 3**). For the predicting effect of general PYD on personal growth, the internal dimensions of university engagement demonstrated a similar pattern of mediating effects. **Figures 2A,B** depict the mediating effects of internal dimensions of university engagement regarding students’ personal growth.

For students’ academic achievement at Time 4, the predicting effects of Time 1 personal well-being were partially mediated

TABLE 1 | Correlations among variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. T1 Age	–														
2. Gender ^a	−0.001	–													
3. T1 FI	−0.01	−0.01	–												
4. T1 FES	0.14**	0.01	0.28***	–											
5. T1 CBC	−0.06	0.09	0.08	−0.05	–										
6. T1 GPYD	−0.08	−0.08	0.04	−0.06	0.73***	–									
7. T2 AC	−0.10*	0.07	0.10*	−0.05	0.26***	0.25***	–								
8. T2 LWP	−0.03	0.06	0.05	−0.03	0.17***	0.22***	0.57***	–							
9. T2 EWF	−0.02	0.07	0.09	−0.07	0.17***	0.18***	0.63***	0.42***	–						
10. T2 CE	−0.06	−0.07	0.13**	−0.13**	0.30***	0.34***	0.39***	0.28***	0.41***	–					
11. T3 AC	−0.02	−0.09	0.02	−0.07	0.27***	0.27***	0.43***	0.30***	0.28***	0.31***	–				
12. T3 LWP	0.03	0.03	0.05	−0.06	0.22***	0.23***	0.26***	0.45***	0.26***	0.27***	0.56***	–			
13. T3 EWF	0.09	−0.10*	0.03	−0.03	0.17***	0.20***	0.26***	0.23***	0.35***	0.38***	0.32***	0.47***	–		
14. T3 CE	0.08	−0.11*	0.08	−0.10*	0.32***	0.37***	0.24***	0.18***	0.30***	0.56***	0.50***	0.47***	0.60***	–	
15. T4 PG	0.01	−0.05	0.05	0.01	0.25***	0.28***	0.30***	0.28***	0.32***	0.32***	0.33***	0.26***	0.35***	0.38***	–
16. T4AA	−0.08	−0.002	0.06	−0.07	0.26***	0.26***	0.30***	0.15**	0.22***	0.30***	0.32***	0.21***	0.22***	0.32***	0.23***

a: −1 = Female; 1 = male. T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4. FI, Family intactness (−1 = not intact, 1 = intact); FES, Family economic status (−1 = having economic disadvantage, 1 = without economic disadvantage); CBC, Cognitive-behavioral competence; GPYD, General positive youth development attribute; AC, Academic challenge; LWP, Learning with peers; EWF, Experience with faculty; CE, Campus environment; AA, Academic achievement; PG, Personal growth; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 2 | Mediation effect analyses with internal engagement at Time 2 as the mediator ($N = 425-427$).

Regression models summary	DV: Personal growth (Time 4)						DV: Academic achievement (Time 4)					
	IV: Time 1 Cognitive-behavioral competence			IV: Time 1 General PYD			IV: Time 1 Cognitive-behavioral competence			IV: Time 1 General PYD		
	<i>B</i>	<i>SE</i>	<i>t</i>	<i>B</i>	<i>SE</i>	<i>t</i>	<i>B</i>	<i>SE</i>	<i>t</i>	<i>B</i>	<i>SE</i>	<i>t</i>
Total effect of IV on DV	0.16	0.03	5.42***	0.21	0.03	6.11***	0.33	0.06	5.43***	0.38	0.07	5.43***
IV TO MEDIATORS												
Time 2 AC	0.22	0.04	5.16***	0.25	0.05	5.21***	0.22	0.04	5.26***	0.26	0.05	5.25***
Time 2 LWP	0.16	0.05	3.40***	0.24	0.05	4.52***	0.17	0.05	3.49***	0.24	0.05	4.53***
DIRECT EFFECTS OF MEDIATORS ON DV												
Time 2 AC	0.12	0.04	3.03**	0.12	0.04	3.13**	0.38	0.08	4.66***	0.40	0.08	4.83***
Time 2 LWP	0.10	0.04	2.82**	0.09	0.04	2.51*	-0.06	0.07	-0.74	-0.07	0.07	-1.00
Direct Effect of IV on DV	0.12	0.03	4.04***	0.15	0.03	4.57***	0.26	0.06	4.16***	0.30	0.07	4.22***
Meditation effect summary	Point estimate	Bootstrapping (BC 95% CI)		Point estimate	Bootstrapping (BC 95% CI)		Point estimate	Bootstrapping (BC 95% CI)		Point estimate	Bootstrapping (BC 95% CI)	
		Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
Total	0.04	0.02	0.07	0.05	0.03	0.09	0.08	0.03	0.14	0.08	0.03	0.15
Time 2 AC	0.03	0.01	0.05	0.03	0.01	0.06	0.09	0.04	0.15	0.10	0.05	0.17
Time 2 LWP	0.02	0.01	0.04	0.02	0.01	0.05	-0.01	-0.04	0.01	-0.02	-0.06	0.02

Age, gender, family intactness, and family economic status were controlled. IV, Independent variable; DV, Dependent variable; PYD, General positive youth development; AC, Academic challenge; LWP, Learning with peers; BC, Bias corrected; CI, Confidence interval; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

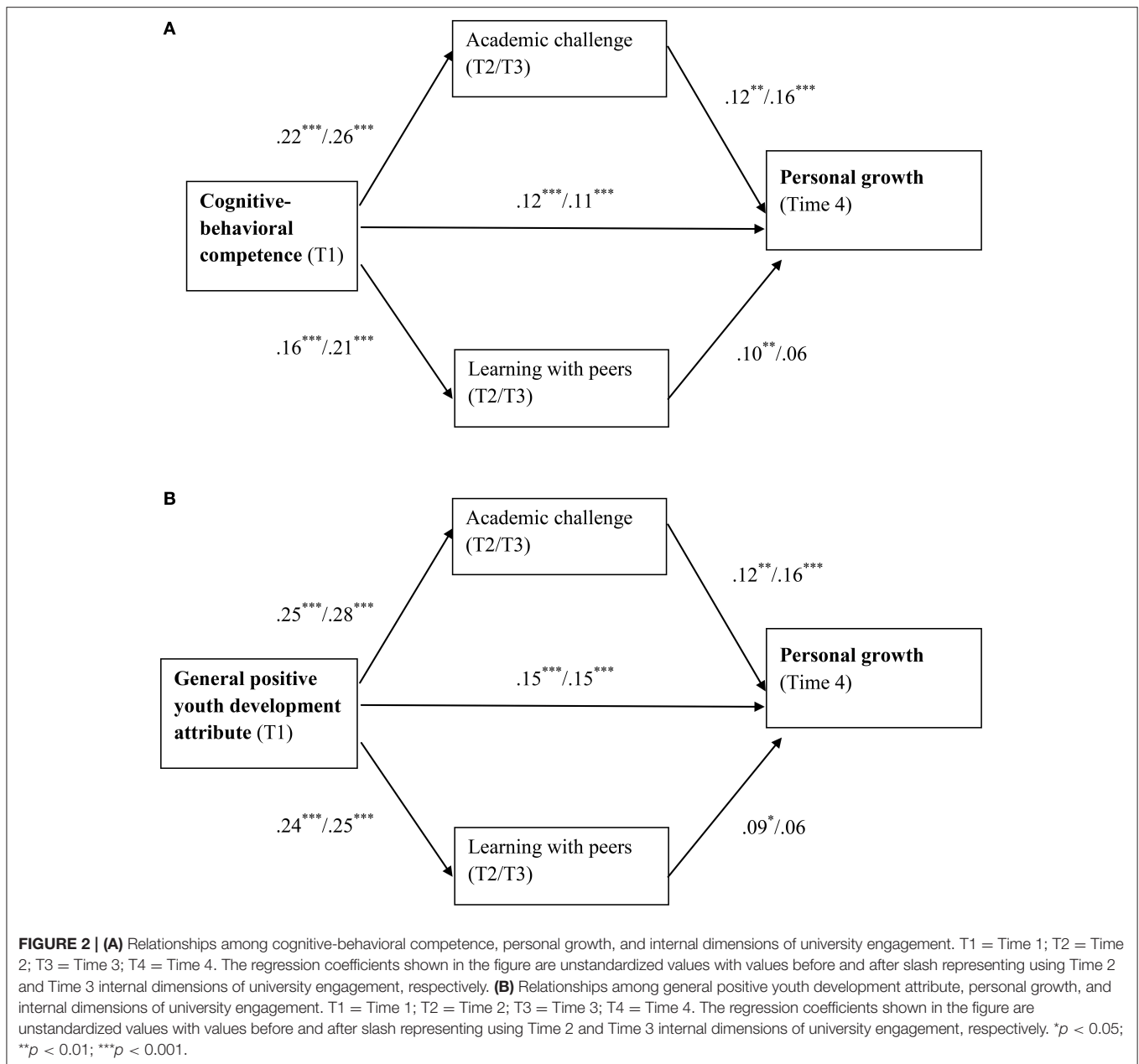
TABLE 3 | Mediation effect analyses with internal engagement at Time 3 as the mediator ($N = 425-427$).

Regression models summary	DV: Personal growth (Time 4)						DV: Academic achievement (Time 4)					
	IV: Time 1 Cognitive-behavioral competence			IV: Time 1 General PYD			IV: Time 1 Cognitive-behavioral competence			IV: Time 1 General PYD		
	<i>B</i>	<i>SE</i>	<i>t</i>	<i>B</i>	<i>SE</i>	<i>t</i>	<i>B</i>	<i>SE</i>	<i>t</i>	<i>B</i>	<i>SE</i>	<i>t</i>
Total effect of IV on DV	0.16	0.03	5.42***	0.21	0.03	6.11***	0.33	0.06	5.43***	0.38	0.07	5.43***
IV TO MEDIATORS												
Time 3 AC	0.26	0.04	6.08***	0.28	0.05	5.67***	0.26	0.04	6.03***	0.27	0.05	5.61***
Time 3 LWP	0.21	0.04	4.75***	0.25	0.08	4.92***	0.21	0.04	4.77***	0.25	0.05	4.89***
DIRECT EFFECTS OF MEDIATORS ON DV												
Time 3 AC	0.16	0.04	4.12***	0.16	0.04	4.15***	0.36	0.08	4.48***	0.37	0.08	4.59***
Time 3 LWP	0.06	0.04	1.67	0.06	0.04	1.52	0.04	0.08	0.48	0.03	0.08	0.40
Direct Effect of IV on DV	0.11	0.03	3.58***	0.15	0.03	4.38***	0.23	0.06	3.75***	0.27	0.07	3.86***
Meditation effect summary	Point estimate	Bootstrapping (BC 95% CI)		Point estimate	Bootstrapping (BC 95% CI)		Point estimate	Bootstrapping (BC 95% CI)		Point estimate	Bootstrapping (BC 95% CI)	
		Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
Total	0.05	0.03	0.09	0.06	0.03	0.09	0.10	0.05	0.16	0.11	0.06	0.18
Time 3 AC	0.04	0.02	0.08	0.04	0.02	0.08	0.09	0.05	0.16	0.10	0.05	0.18
Time 3 LWP	0.01	-0.002	0.03	0.01	-0.004	0.04	0.01	-0.03	0.04	0.01	-0.03	0.05

Age, gender, family intactness, and family economic status were controlled. IV, Independent variable; DV, Dependent variable; PYD, positive youth development; AC, Academic challenge; LWP, Learning with peers; BC, Bias corrected; CI, Confidence interval; *** $p < 0.001$.

by only academic challenge at Time 2 and Time 3, with the estimated point of effect ranging between 0.09 and 0.10, but not learning with peers at either Time 2 or Time 3.

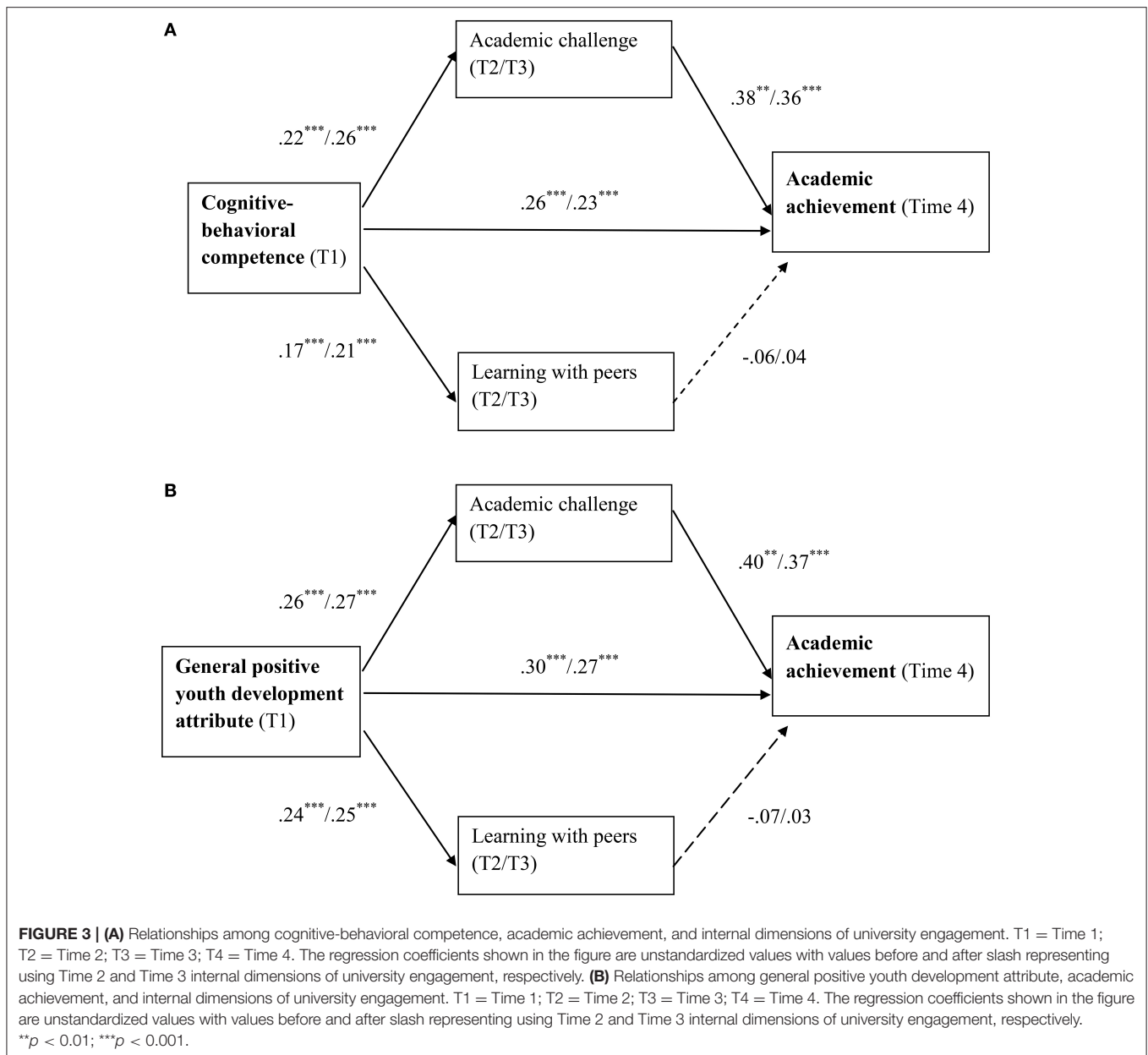
Figures 3A,B depict the mediating effects of internal dimensions of university engagement regarding students' academic achievement.



Based on these results, students' individual well-being longitudinally predicted their learning achievement both directly and indirectly through the mediating effect of one or two internal dimensions of university engagement. Thus, Hypotheses 1 and 2 were largely supported.

Table 4 showed the results of testing moderation effects. First, after controlling the effects of the control variables, general PYD ($\beta = 0.15$, $p = 0.002$) but not cognitive-behavioral competence ($\beta = 0.10$, $p = 0.169$) had unique significant longitudinal predicting effect on students' personal growth, while both general PYD ($\beta = 0.15$, $p = 0.037$) and cognitive-behavioral competence ($\beta = 0.16$, $p = 0.026$) still significantly predicted academic achievement. Second, the

two external dimensions of university engagement, experience with faculty and campus environment, at Time 2 and Time 3 both significantly predicted personal growth at Time 4 ($\beta = 0.17-0.23$, $p < 0.01$), but only campus environment at Time 2 ($\beta = 0.18$, $p < 0.01$) and Time 3 ($\beta = 0.22$, $p < 0.001$) significantly predicted academic achievement at Time 4. Hypothesis 3 was overall supported. However, the interactions between personal well-being and the two external dimensions of university engagement did not show significant effects on the two learning achievement measures. Hence, external dimensions of university engagement did not demonstrate significant moderating effects. Hypothesis 4 was not supported by the present results. **Figures 4A,B** illustrate the effect of



external dimensions of university engagement on learning achievement.

DISCUSSION

The present study tested and proved the hypothesis that students' personal well-being at the beginning of their university life significantly predicts their learning achievement in university. Results showed that students with a higher level of well-being in terms of positive youth development (PYD) competencies generally reported greater personal growth and achieved better accumulative GPA after 3 years of university study. These results echo previous findings showing that individual characteristics related to positive development are intimately associated with

better learning achievement and less psychological problems (Caprara et al., 2011). For example, Durlak et al.'s (2011) meta-analysis concluded that psychosocial competence promotes academic performance in children and adolescents. Shek and Wu's (2016) recent paper showed the positive relationship as well. In this sense, the present longitudinal study lends further support to the impact of an individual's psychosocial competencies on one's subsequent development in university study. This finding suggests that students with higher levels of competencies tend to benefit more from university education and enjoy a more productive university life.

The approach we adopted in the present study to measure personal well-being was developed based on a PYD framework that included 15 constructs (e.g., social competence, behavioral

TABLE 4 | Regression analyses on personal growth and academic achievement at Time 4 ($N = 425\text{--}427$).

Predictor	Personal growth (T4)				Academic achievement (T4)			
	<i>B</i>	<i>SE</i>	β	ΔR^2	<i>B</i>	<i>SE</i>	β	ΔR^2
Step 1				0.09***				0.08***
T1 Age	0.03	0.05	0.03		−0.10	0.10	−0.05	
Gender ^a	−0.02	0.03	−0.04		−0.003	0.05	0.00	
T1 Family intactness ^b	0.04	0.04	0.05		0.06	0.08	0.04	
T1 Family economic status ^c	0.03	0.04	0.03		−0.07	0.08	−0.04	
T1 CBC	0.06	0.04	0.10		0.19	0.09	0.16*	
T1 GPYD	0.15	0.05	0.22**		0.22	0.10	0.15*	
Step 2				0.11***				0.07***
T1 Age	0.04	0.04	0.04		−0.10	0.09	−0.05	
Gender ^a	−0.03	0.02	−0.05		0.00	0.05	0.003	
T1 Family intactness ^b	0.02	0.04	0.02		0.03	0.08	0.02	
T1 Family economic status ^c	0.04	0.04	0.05		−0.03	0.08	−0.02	
T1 CBC	0.03	0.04	0.05		0.18	0.09	0.14	
T1 GPYD	0.11	0.05	0.15*		0.11	0.10	0.08	
T2 EWF	0.16	0.03	0.23***		0.14	0.07	0.10	
T2 CE	0.12	0.04	0.17**		0.26	0.08	0.18**	
T1 CBC × T2 EWF	0.07	0.18	0.03		0.75	0.38	0.16	
T1 GPYD × T2 EWF	0.01	0.17	0.01		−0.69	0.36	−0.15	
T1 CBC × T2 CE	−0.23	0.12	−0.14		0.00	0.25	0.00	
T1 GPYD × T2 CE	0.16	0.12	0.09		0.10	0.25	0.03	
Step 2				0.11***				0.07***
T1 Age	−0.01	0.04	−0.01		−0.16	0.09	−0.08	
Gender ^a	0.00	0.03	0.00		0.03	0.05	0.03	
T1 Family intactness ^b	0.04	0.04	0.04		0.06	0.08	0.04	
T1 Family economic status ^c	0.04	0.04	0.05		−0.01	0.08	−0.01	
T1 CBC	0.03	0.04	0.05		0.16	0.09	0.12	
T1 GPYD	0.11	0.05	0.15*		0.10	0.10	0.07	
T3 EWF	0.13	0.04	0.20***		0.07	0.08	0.06	
T3 CE	0.13	0.04	0.20***		0.28	0.08	0.22***	
T1 CBC × T3 EWF	0.11	0.16	0.06		0.38	0.33	0.11	
T1 GPYD × T3 EWF	−0.13	0.15	−0.07		−0.20	0.32	−0.06	
T1 CBC × T3 CE	−0.12	0.13	−0.08		0.27	0.27	0.09	
T1 GPYD × T3 CE	0.11	0.12	0.07		−0.44	0.26	−0.14	

a: −1 = Female, 1 = male.

b: −1 = not intact, 1 = intact.

c: −1 = having economic disadvantage, 1 = without economic disadvantage. T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4. CBC, Cognitive behavioral competence; GPYD, General positive youth development attribute; EWF, Experience with faculty; CE, Campus environment; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

competence, and resilience; Shek et al., 2007b). These constructs represent essential and common components used in effective PYD programs that promote positive youth outcomes and prevent youth problematic behaviors (Catalano et al., 2002). To further investigate whether development of these PYD attributes could contribute to students' outcomes in later years, researchers have conducted empirical longitudinal studies and gained supportive findings among middle school students (Sun and Shek, 2013; Yu and Shek, 2017). The present study extends such research into higher education context and suggests that enhancing positive developmental assets could

be a promising strategy to promote student success in higher education.

In the present study, two composite indicators of personal well-being were considered: cognitive-behavioral competence and general PYD attributes. Apart from the common positive influence of these two constructs on students' learning achievement, the present study also showed a difference regarding the impacts. Specifically, after controlling the effects of other variables, the general PYD showed unique predicting effects on both self-report growth and academic achievement, whereas the cognitive-behavioral competence only demonstrated

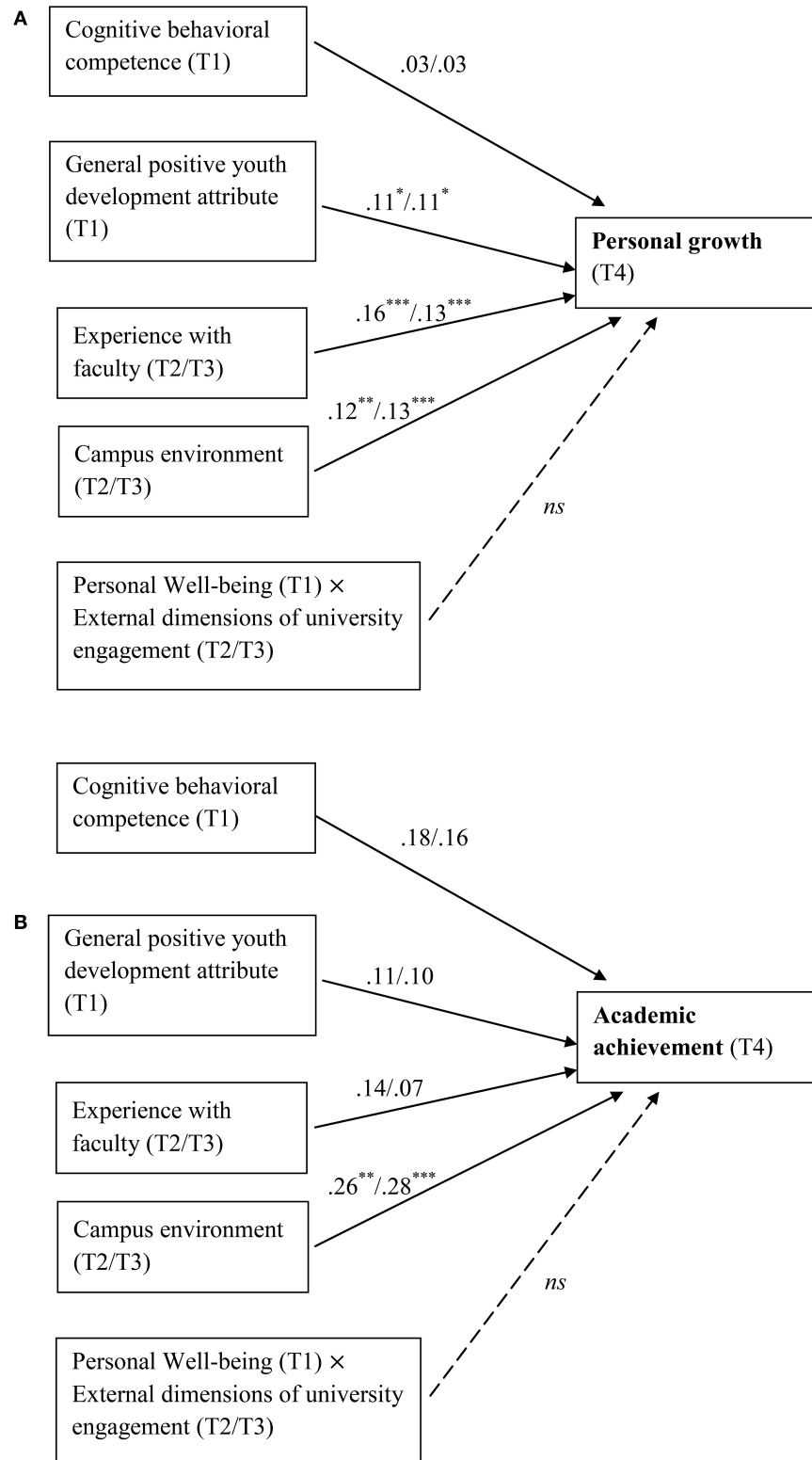


FIGURE 4 | (A) Relationships among personal well-being, personal growth, and external dimensions of university engagement. T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4. The regression coefficients shown in the figure are unstandardized values with values before and after slash representing using Time 2 and Time 3 external dimensions of university engagement, respectively. **(B)** Relationships among personal well-being, academic achievement, and external dimensions of university engagement. T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4. The regression coefficients shown in the figure are unstandardized values with values before and after slash representing using Time 2 and Time 3 external dimensions of university engagement, respectively. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

a unique predicting effect on academic achievement. Such a difference was a novel finding, because previous studies tended to calculate a global score for all positive development assets instead of using separate indicators (e.g., Sun and Shek, 2013). Our results did not suggest that cognitive-behavioral competence was not important in facilitating student learning. Instead, the results indicated that different positive attributes might have differential influences on student personal growth. Besides, as personal growth referred to not only cognitive aspects but also a broad area of social and interpersonal components (e.g., communication and civic responsibility), the general PYD that encompassed a variety of attributes might be a more effective predictor than the cognitive-behavioral competence which mainly involved cognitive attributes. Future studies need to examine these speculations by comparing the predicting effects of different positive development attributes on different aspects of student learning achievement.

The present findings regarding the longitudinal relationship between PYD competences and learning achievement have important educational application in Hong Kong. First, the findings suggest that the traditional belief held by many Chinese parents that adolescents will develop well as long as they can be admitted to a prestigious university is simply wrong. We found that students with lower level of personal well-being at the beginning of their university life showed lower learning achievements after 3 years of university study. Instead of merely focusing on adolescent academic development when preparing them for university life, more attention must be paid to adolescents' personal well-being. Second, regarding the answer to how students can actually benefit from higher education, considerable promise exists for enhancing student gains by promoting adolescent multiple psychosocial competences as suggested by the present study. While previous studies have proved that the development of multiple psychosocial competences can enhance students' academic performance in Western countries (Sklad et al., 2012; Gutman and Schoon, 2015), the present findings further support this conclusion by illustrating evidence in Chinese population. In fact, in view of the increasing trend of psychological problems among youth, scholars have suggested the establishment of multiple competences in young people through implementing curriculum-based PYD programs (Shek, 2010; Shek and Wong, 2011). Findings of the present study further consolidate the theoretical foundation for such a proposal.

Another research question of the present study was whether university engagement could mediate or moderate the longitudinal relationship between personal well-being and student learning achievement. As expected, the internal dimensions, especially academic challenge was a solid mediator. There are two significant implications of the findings. First, student internal engagement was a significant longitudinal predictor of student growth and academic achievement. In view of longitudinal impacts, the findings support an argument that being engaged in university establishes the foundation of dispositions and skills that are critical for students to live a prosperous and satisfactory life in the university and after graduation (Kuh, 2009b). In other words, students who are

more engaged in university learning also perform better in developing habits of their mind and heart that in turn enhance their capability for continuous learning and development (Kuh, 2009b).

Despite that all aspects of university engagement were important for learning and development (Upadaya and Salmela-Aro, 2013), academic challenge had strong predicting effects on both personal growth and academic achievement while learning with peers only predicted personal growth to some extent. Given that academic challenge mainly referred to student involvement in deep and independent learning and their use of different learning strategies, the effect of this engagement dimension on student learning achievement is self-evident: the more often students apply higher-order and multiple learning strategies in university learning, the more they tend to learn and the better they understand. Likewise, learning with peers, which mainly reflected students' cooperation or discussion with diverse others, may offer students opportunities to improve themselves by learning others' experiences. This is just like the positive influence of learning communities (Pike et al., 2011). Nevertheless, interaction with others may be more effective in promoting students' improvement in one area (e.g., social skills) than in another (e.g., cognitive or academic development).

The second finding related to the mediation effect was that students' personal competencies were significant longitudinal antecedents of their internal engagement during university years. This finding is consistent with previous results suggesting that students' confidence in their competence and self-efficacy were significant predictors of their university engagement (Fazey and Fazey, 2001; Llorens et al., 2007). Given that the transition year from secondary school to university is full of challenges and difficulties, the present finding implies that students who have developed important internal assets before college are more likely to cope with the transitional distress successfully, and to engage in a wide range of educationally productive activities. This would ultimately lead to a more productive university life (Trowler and Trowler, 2010; Li and Lerner, 2011). Once again, this finding highlights the importance of equipping youngsters with essential PYD competences, which has not yet received sufficient attention in Hong Kong.

While the mediating effect of internal dimensions of university engagement was significant, the moderating effect of external dimensions was not significant in the present study. There are several potential explanations. First, previous studies have found that some concepts (e.g., friend support) related to external dimensions of university engagement could significantly buffer the negative impacts of school stress while some others (e.g., global measure of social support) could not (Wilks and Spivey, 2010; Pidgeon et al., 2014). It is possible that the two external dimensions of university engagement measured in the present study (experience with faculty and campus environment), may not precisely capture the specific element that can effectively buffer the negative influence of lack of internal assets. For example, "friendship with teachers" which is of particular importance for Chinese students (Zhu et al., 2010), may not be adequately assessed by the current measure of university engagement which measures the overall interaction

between students and faculty as well as other people on campus. Future studies need to further differentiate specific components of external dimensions of university engagement, such as peer support, teacher relationship, and institutional resources, and examine their respective roles in moderating the effects of personal attributes and learning achievement.

The second plausible explanation is that the long time span of the present study (i.e., 3 years) has weakened the moderating effect. Most previous studies that reported moderating effects of school environment were cross-sectional in nature. As such, future research may examine the moderating effects of external university engagement using both cross-sectional and longitudinal approaches. Nevertheless, it was found that the external dimensions of university engagement also had direct effect on students learning achievement. This means that institutions can facilitate student learning by creating supportive contextual environment such as providing resources or utilizing effective teaching pedagogy such as experiential and reflective teaching and learning methods, which can effectively deepen students' learning and critical thinking (Kolb and Kolb, 2005; Shek and Yu, 2017).

Although the effects of control variables are beyond the scope of the present study, several interesting observations are worth noting. First, no gender difference was observed regarding their internal engagement. This is inconsistent with previous finding (Yin and Wang, 2016) and suggests that female and male Chinese students of the present sample were equally engaged in university learning. Meanwhile, it was found that male students reported a lower level of external engagement than did female students only in the third year of university life (Time 3). This finding based on one time point cannot enable us to draw a conclusion on the gender effect in university engagement, yet it reminds us to consider gender factor when providing institutional and faculty support for students. For instance, pay more attention to male students' need in senior years. Second, regarding family intactness, although students coming from intact family tended to be more engaged in university learning at the second year, such an effect did not appear at the third year. This suggests that while unfavorable family environment exerts negative influence on youth development among secondary school students (Hopson and Lee, 2011; Yu and Shek, 2014), this influence may drop as students getting independence gradually and building diverse social networks in university. Besides, the support from and relationship with family members may play a more important role in university students' learning and performance than one's parental marital status (Cheng et al., 2012; Chang and Yang, 2016). Finally, students with family economic disadvantage perceived more supportive campus environment in the second and third year of university than those without economic disadvantage. This may be because students coming from poor family make more use of campus resources or they receive some specific help or support from the university. As the present study is a preliminary exploration in Hong Kong, the above findings need further validation and replication.

Despite the significant theoretical and practical implications, the present study has several limitations. The first limitation is on the measurement of learning achievement. The present

study included a self-report measure (i.e., personal growth) and an objective measure (i.e., GPA), which produced similar results. Some researchers regarded self-report learning outcome measures as reliable as objective measures (Kuh, 2009b). In the present study, the scale used to measure personal growth was widely used in previous studies (Kuh, 2009b), and was developed to meet some conditions to ensure its validity and reliability. Besides, the scale showed good reliability (i.e., Cronbach's α was 0.90) in the current study. However, some researchers doubted that students may not always be able to accurately judge their own growth (Bowman and Green, 2013). In this sense, longitudinal assessments of student learning via objective tests would convey direct measures for personal growth, despite demanding requirements of financial and human resources. Nevertheless, to provide a full picture of student growth and improvement, future studies could apply both self-report measures and longitudinal comparisons between students' scores in objective achievement tests.

Second, the present study only involved students in one university in Hong Kong. To enhance the generalizability of findings, further research could involve students from different universities in Hong Kong and abroad (e.g., mainland China, other Asian countries). Third, the present study is quantitative research in nature, which is not able to provide in-depth information on how students differently cope with challenges and difficulties, as well as how they engage in university learning and utilize campus resources. Qualitative data could help researchers interpret and reflect on the findings. To gain a more comprehensive understanding about student development and its relationships to personal well-being and university engagement, multiple research methods including qualitative approaches should be used in future research. Nevertheless, this study is the first longitudinal study addressing several unanswered questions in the field. The findings can help educators and policy-makers to re-think about how the quality of academic life of university students can possibly be promoted.

ETHICS STATEMENT

The study has been approved by the Human Subjects Ethics Sub-committee (HSESC) (or its Delegate) of The Hong Kong Polytechnic University (Reference No.: HSEARS20130204003).

AUTHOR CONTRIBUTIONS

DS and LY: designed the project and contributed to all steps of the work; LY and XZ: contributed to the data interpretation of the work and XZ drafted the work and revised it based on the critical comments provided by LY and DS; All authors approve of the final version of the manuscript 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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Academic Well-Being, Mathematics Performance, and Educational Aspirations in Lower Secondary Education: Changes Within a School Year

Anna Widlund^{1*}, Heta Tuominen² and Johan Korhonen¹

¹ Faculty of Education and Welfare Studies, Åbo Akademi University, Vasa, Finland, ² Faculty of Educational Sciences, University of Helsinki, Helsinki, Finland

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*Correspondence:

Anna Widlund
anna.widlund@abo.fi

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It has been suggested that both performance and academic well-being play a role in adolescent students' educational attainment and school dropout. In this study, we therefore examined, first, what kinds of academic well-being (i.e., school burnout, schoolwork engagement, and mathematics self-concept) and mathematics performance profiles can be identified among lower secondary school students ($N_{\text{grade 7}} = 583$, $N_{\text{grade 9}} = 497$); second, how stable these profiles are across one school year during the seventh and ninth grades; and, third, how students with different academic well-being and mathematics performance profiles differ with respect to their educational aspirations. By means of latent profile analyses, three groups of students in seventh grade: thriving (34%), average (51%), and negative academic well-being (15%) and four groups of students in ninth grade: thriving (25%), average (50%), negative academic well-being (18%), and low-performing (7%) with distinct well-being and mathematics performance profiles were identified. Configural frequency analyses revealed that the profiles were relatively stable across one school year; 60% of the students displayed identical profiles over time. The thriving students reported the highest educational aspirations compared to the other groups. In addition, the low-performing students in the ninth grade had the lowest educational aspirations just before the transition to upper secondary school. Practical implications as well as directions for future research are discussed.

Keywords: academic well-being, school burnout, schoolwork engagement, self-concept, performance, mathematics, educational aspirations, person-centered approach

INTRODUCTION

By utilizing a person-centered approach, the aim of this study was to investigate lower secondary school students' academic well-being and mathematics performance profiles, the stability of the profiles during one school year, and their relations to educational aspirations. It has been demonstrated that performance plays a significant role in shaping students' educational experiences, aspirations, and paths but, also, that academic well-being matters for various educational outcomes. More specifically, low academic well-being has been linked with,

for example, low academic achievement, unfavorable motivational tendencies, learning difficulties, lower educational aspirations, educational delays, and dropout (e.g., Salmela-Aro et al., 2009b; Vasalampi et al., 2009; Tuominen-Soini et al., 2012; Bask and Salmela-Aro, 2013; Tuominen-Soini and Salmela-Aro, 2014; Korhonen et al., 2016; Fiorilli et al., 2017). Many of the existing studies on well-being and educational outcomes have used a variable-centered approach and, thus, focused on the whole sample averages. However, a person-centered focus is useful, whenever it is assumed that the data include heterogeneous groups of individuals. For instance, Korhonen et al. (2014) proved the person-centered approach to be advantageous for investigating the relations between academic well-being, performance (in mathematics and reading), and school dropout. Interestingly, not only students with low performance but also students with poor academic well-being were more prone to school dropout than students with high or average performance. It seems therefore reasonable to also investigate how the individual differences in students' academic well-being and performance might jointly contribute to educational aspirations. As lower secondary school students are facing the transition to upper secondary school along with the first possibility to make a decision about their own education, it seems highly relevant to explore these relations during lower secondary years.

Moreover, there is evidence of an overall decline in academic achievement, motivation, and well-being during adolescence (e.g., Roeser et al., 1999; Watt, 2004; Eccles and Roeser, 2009) but, still, surprisingly few studies have investigated the developmental dynamics of academic well-being and performance during lower secondary education, especially by means of a person-centered approach. The person-centered focus is useful also with longitudinal data to represent heterogeneity in developmental trajectories. The existing studies using this kind of an analytical approach have, in fact, uncovered that not all students experience these negative shifts (Tuominen-Soini et al., 2011, 2012; Tuominen-Soini and Salmela-Aro, 2014). Accordingly, the aim of the present study was, also, to complement prior research by examining the stability of and changes in students' academic well-being and mathematics performance profiles within one school year during lower secondary school, using two cohorts of students (i.e., seventh- and ninth-graders).

Academic Well-Being

Conceptualization of Academic Well-Being

Since well-being is an important indicator for various educational outcomes (Tuominen-Soini et al., 2012; Fiorilli et al., 2017) and, given the centrality of school in the lives of adolescents (Eccles and Roeser, 2009), it is reasonable to define well-being in relation to the educational context (i.e., academic well-being). There is no consensus on the definition of students' academic well-being, but it is often described as a multidimensional construct, comprising several sub-dimensions. In prior studies, academic well-being has been conceptualized as being comprised of, for example, academic self-concept, perceived learning difficulties, and school burnout (Korhonen et al., 2014), school burnout, schoolwork

engagement, school value, and satisfaction with educational choice (Tuominen-Soini et al., 2012), and school burnout and engagement (Fiorilli et al., 2017). Therefore, in line with previous research and as recommended by Huppert and So (2013), we conceptualized well-being as a multidimensional construct covering both negative (e.g., burnout) and positive (e.g., engagement) aspects of academic well-being in our investigation. In addition, since specifically students' math-related self-beliefs about their competencies have been found to predict educational and occupational aspirations and choices (Parker et al., 2013), we also defined and assessed well-being within a specific domain, in this case, mathematics. Consequently, school burnout, schoolwork engagement, and mathematics self-concept were chosen as indicators of academic well-being in the present study.

School burnout mirrors that of professional burnout (Maslach et al., 2001) and can be described as a psychological syndrome caused by long-term exposure to school-related stress and pressure to achieve (Schaufeli et al., 2002; Di Chiacchio et al., 2016). Salmela-Aro et al. (2009a) designed and validated the School Burnout Inventory (SBI-9), which measures three dimensions of school burnout; exhaustion due to school demands, cynical and detached attitudes toward one's school, and feelings of inadequacy as a student. This instrument has been applied to several academic populations, with the same three-factor structure being confirmed in Finland (Salmela-Aro et al., 2009a), Spain (Boada-Grau et al., 2015), France (Faye-Dumanget et al., 2017), and Italy (Fiorilli et al., 2014). These three dimensions are closely related (Toppinen-Tanner et al., 2005), but differently associated with various school-related outcomes (e.g., achievement: Salmela-Aro and Upadaya, 2014; motivation: Tuominen-Soini et al., 2008, 2012) and are therefore examined as distinct constructs in the present study.

Schoolwork engagement, also suggested to be a central indicator for well-being in school (Tuominen-Soini et al., 2012; Fiorilli et al., 2017), is defined as a positive, fulfilling, study-related feeling composed by three dimensions: vigor, dedication, and absorption (Salmela-Aro and Upadaya, 2012). Vigor is characterized by high levels of energy while studying, interest and willingness to invest in schoolwork as well as having effective strategies for coping with difficulties. Being dedicated indicates being enthusiastic and having positive attitudes toward the learning processes and outcomes, while absorption refers to being fully concentrated and involved in one's studies, finding it difficult to detach oneself from schoolwork.

Lastly, since students' self-beliefs are commonly used indicators of adolescent well-being (e.g., self-esteem and competence, Huppert and So, 2013; self-esteem, Tuominen-Soini et al., 2008; Parhiala et al., 2018; academic self-concept, Korhonen et al., 2014), mathematics self-concept was chosen as an indicator of academic well-being as well. Academically related self-concept is described as the mental representation of one's competencies in academic domains (Marsh and Craven, 1997).

The dimensions of school engagement and school burnout have been found to be negatively associated (Schaufeli et al., 2002; Salmela-Aro et al., 2009b; Cadime et al., 2016). They are, however, not two opposite ends of the spectrum, but rather, independent constructs (Schaufeli and Bakker, 2004). Despite the

negative correlation, studies investigating engagement and burnout among adolescents using person-centered approaches have found students with high engagement and low burnout, students with low engagement and high burnout, and students who are simultaneously highly engaged in school and exhausted due to school demands (Tuominen-Soini and Salmela-Aro, 2014; Salmela-Aro et al., 2016). Similarly, Parhiala et al. (2018) recently investigated profiles of motivation and well-being among adolescent students by using a person-centered approach, and found a group of students with rather negative well-being (i.e., school burnout, internalizing and externalizing problems, low self-esteem), who were still highly motivated in school. These findings also resemble those found by Daniels et al. (2008) and Tuominen-Soini et al. (2008, 2012), indicating that high-achieving, committed, and motivated students who value schoolwork might, at the same time, be receptive to emotional distress and exhaustion. Regarding academic self-concept, it has been found to be positively related to engagement (Guo et al., 2016), lower school burnout (Korhonen et al., 2014) and, also, attitudes toward school (Green et al., 2012).

Academic Well-Being and Performance

As for the relation between well-being and academic performance, it has been found that the dimensions of school burnout are associated with academic performance in various ways. Salmela-Aro et al. (2009b) found that the lower the academic achievement and the lower the school engagement, the more cynicism toward the meaning of school and sense of inadequacy at school the adolescents experienced. Then again, exhaustion has been found to occur among high-achieving and motivated students as well (Tuominen-Soini et al., 2008, 2012). Schoolwork engagement has been found to have a direct, positive effect on academic achievement and can be seen as a key resource for students as they face different school-related demands. If there is an imbalance between resources and demands, where the perceived demands exceed the personal resources, it may lead to an increase in student burnout (Salmela-Aro and Upadaya, 2014). Further, the positive link between academic self-concept and academic achievement is also well documented (Valentine et al., 2004; Möller et al., 2011), especially concerning domain-specific self-concept and achievement (Denissen et al., 2007; Guo et al., 2015b).

Stability and Change

Researchers generally regard adolescence as a period characterized by considerable biological, social, psychological, and developmental change. However, studies that have investigated school burnout throughout adolescence have found that the overall mean level of school burnout is quite stable over time, although some students seem to experience an increase in burnout during educational transitions (Salmela-Aro and Upadaya, 2014). Also, as students grow older, they seem to become progressively more at risk of burnout (Lee et al., 2013; Fiorilli et al., 2017), possibly due to increased school demands. Engagement, on the other hand, has been found to

decrease, possibly because of changes in the school environment when students transition from elementary to secondary school (Wang and Eccles, 2012). These declines could reflect an increasing misfit between students' state of development related to adolescence and the opportunities provided in the secondary school environments (Eccles et al., 1993). Similarly, although academic self-concept has been found to become increasingly stable during adolescence, educational transitions seem to have a detrimental effect on students' academic self-concept as well (Cole et al., 2001).

Gender Differences

Regarding well-being and gender differences, the overall trend seems to be that girls are more likely to report higher levels of school burnout than boys (Salmela-Aro et al., 2008; Salmela-Aro and Tynkkynen, 2012). However, although girls seem to be more receptive to school burnout, they are, at the same time, typically more engaged in schoolwork than boys (Salmela-Aro and Upadaya, 2012) and attribute greater importance to academic achievement (Murberg and Bru, 2004). These results also concur with the findings by Parhiala et al. (2018), as they found that girls were overrepresented in groups characterized by rather high motivation but negative well-being.

When investigating gender differences in the domain of mathematics, a fairly consistent finding is that boys perform a little better in mathematics and have higher mathematics self-concept than girls (Nagy et al., 2006; Watt et al., 2012). The gender difference in mathematics in favor of boys seems to be the largest among the higher performing students and absent among the lower performing students (Stoet and Geary, 2013). Interestingly, gender differences in mathematics self-concept have also been found when there is no difference in the students' mathematics performance (Pajares, 2005; Watt, 2006). These differences have often been explained in terms of gender stereotypes, that is, mathematics is commonly considered a "male" field. For example, Song et al. (2016) found that stereotypes about mathematics had both a direct and an indirect negative effect on girls' mathematics performance.

Educational Aspirations

One of the most significant predictors of actual educational and career attainment is educational aspirations (Mau and Bikos, 2000; Garg et al., 2007). There is no clear definition of or unified measurement to assess educational aspirations, but they are commonly described as students' goals and plans within an academic setting (Trebbels, 2015), which can be divided into realistic and idealistic educational aspirations. Idealistic aspirations refer to the students' desired attainment level, while realistic aspirations are described as the students' actual perceived likelihood of success as well as more pragmatic expectations of completing the aspired level of education (Rojewski, 2005). However, although previous research have included both realistic and idealistic alternatives in the operationalisation of educational aspirations, no clear distinction between them have been made (Chow et al., 2012; Guo et al., 2015a). Therefore, we combine a realistic and an idealistic component

to represent overall educational aspirations in the present study.

Educational Aspirations and Well-Being

Educational aspirations influence adolescents' overall well-being later in life (Ashby and Schoon, 2012) and have previously mostly been predicted by socioeconomic background (Garg et al., 2007), performance-related indicators (e.g., grades), and different motivational beliefs (e.g., self-concept and interest; Nagy et al., 2006; Korhonen et al., 2016). However, investigations using students' psychological well-being as a predictor of educational aspirations are scarce (for an exception, see Korhonen et al., 2016), even though well-being has been linked with several other important educational outcomes (e.g., achievement: Kiuru et al., 2008; motivational tendencies: Tuominen-Soini et al., 2012). Korhonen et al. (2014) investigated students' academic performance and well-being profiles by using a person-centered approach, and found that students with low performance (in mathematics and reading) as well as students with poor academic well-being were more prone to school dropout than students with high or average performance. Therefore, one could expect academic well-being to have an effect on educational aspirations as well.

In a recent study by Korhonen et al. (2016), school burnout was found to have a negative indirect effect on educational aspirations through interest, but also, interestingly, that higher levels of school burnout were directly related to higher educational aspirations for girls. Since girls have been found to be overrepresented in groups of students with high levels of both engagement and school burnout (Tuominen-Soini and Salmela-Aro, 2014), it is possible that ambitious and success-oriented girls, despite feeling exhausted, still hold high educational goals (Tuominen-Soini et al., 2008; Tuominen-Soini and Salmela-Aro, 2014).

Researchers have found positive relations between students' schoolwork engagement and educational and career aspirations (Kenny et al., 2006; Wang and Eccles, 2012). Hill and Wang (2015) revealed that this relation is reciprocal. Eccles (2007) suggested that students are more likely to engage in school if they understand the importance of engagement and achievement for their future. In contrast, it might be that students' engagement in school also has the potential to shape goals and aspirations, as observing one's own experiences at school provides the information needed to set up and meet educational goals (Bandura, 1991). Further, studies have found that students who are engaged with their schoolwork not only aspire for higher educational goals, but also complete higher education studies (Li and Lerner, 2011; Wang and Eccles, 2013).

Academic self-concept has consistently been found to be an important predictor of educational and career choices (Nagengast and Marsh, 2012; Parker et al., 2012) and aspirations (Korhonen et al., 2016), even when controlling for achievement (Parker et al., 2013). In a study by Guo et al. (2015a), academic self-concept was not only a key predictor of educational aspirations, but also a stronger predictor of long-term occupational aspirations and educational attainment than IQ and task values. Similarly, positive associations have been found between domain-specific

mathematics self-concept and educational aspirations (Parker et al., 2013).

Educational Aspirations and Mathematics Performance

Previous research on mathematics performance and aspirations has focused primarily on the type of aspiration (i.e., the specific kind of occupation), particularly on the connection between mathematics performance and career choices in the science, technology, engineering, and mathematics (STEM) field. Overall, mathematics performance has been regarded as a critical filter, limiting later educational and occupational aspirations, and was therefore included in the present study. Shapka et al. (2006), for example, investigated the connections between early mathematics performance, gender, and career aspirations in ninth grade students and found, that students with lower grades in math had lower career aspirations than average- and high-performing students, even when controlling for overall academic achievement. Furthermore, mathematics performance has been found to predict educational aspirations even when controlling for relevant motivational and well-being constructs like interest, academic self-concept, and school burnout (Parker et al., 2014; Guo et al., 2015a,b; Korhonen et al., 2016).

The Present Study

Given the importance of academic well-being for various educational outcomes (e.g., achievement: Fiorilli et al., 2017; motivation: Tuominen-Soini et al., 2012; educational aspirations: Korhonen et al., 2016), and considering that academic well-being fluctuates during adolescence, surprisingly few studies have investigated the development of academic well-being during lower secondary education. In fact, to our knowledge, none have examined within-year changes in academic well-being (i.e., school burnout, schoolwork engagement, and mathematics self-concept) and mathematics performance and, further, investigated the relation to educational aspirations over the course of lower secondary school. Also, many of the existing studies investigating the relation between well-being and performance, have used self-reports of students' grades or grade point average as a measure of academic achievement, whereas we addressed this limitation of prior research by using a standardized mathematics test to assess students' performance. This study advances the current knowledge base by investigating the stability of and change in students' academic well-being and mathematics performance profiles by implementing a person-centered approach in two cohorts of lower secondary students and relating these profiles to educational aspirations. The following research questions were addressed:

(1) What kinds of academic well-being and mathematics performance profiles can be found among lower secondary school students (in seventh and ninth grade)?

Based on prior work (e.g., Korhonen et al., 2014), we expected to find certain well-being and performance profiles. Based on assumed linear relations between performance and well-being measures, three distinct groups of students were expected to emerge: students with high performance and positive academic well-being, students with average performance

and moderate well-being, and students with low performance and rather negative well-being (H1). Further, since studies implementing a person-centered approach have found groups of students that are both highly engaged in their schoolwork but also perceive high levels of exhaustion (Daniels et al., 2008; Tuominen-Soini et al., 2008) and, in addition, students who show rather low levels of motivation in school but are still doing well in terms of well-being (Tuominen-Soini et al., 2008; Parhiala et al., 2018), we assumed that we might also find some sort of mixed profiles with non-linear relations between performance and academic well-being measures (H2). These apparent non-linear relationships between burnout, engagement, achievement, and aspirations might go unnoticed with traditional variable-centered methods, thus warranting a person-centered approach.

(2) How are girls and boys distributed within the profiles?

Based on prior work (Salmela-Aro et al., 2008; Salmela-Aro and Tynkkynen, 2012; Parhiala et al., 2018), we hypothesized that girls will be overrepresented in groups of students that are engaged in their schoolwork but also perceive higher levels of school burnout (H3). Also, since gender difference in mathematics among high-achieving students have been found in favor of boys (Stoet and Geary, 2013), we expected there to be more boys in the high-performing group (H4).

(3) How stable are these profiles during one school year?

As previous studies have revealed relative stability when investigating various patterns of well-being variables and performance (e.g., Roeser and Peck, 2003; Tuominen-Soini and Salmela-Aro, 2014), we expected to find some extent of stability in the profiles. In other words, that many students would stay in the same group across the school year (H5). Also, we assumed that more extreme changes in the group memberships over time would be rather rare, such as changes between the high performance and high well-being group and the low performance and low well-being group (H6), as well as changes between the high performance and high well-being group and the potential mixed performance and well-being group (H7). Further, students in the ninth grade are standing before an important decision of choosing an upper secondary education (i.e., academic or vocational track), while the seventh-graders, recently transitioned from elementary to lower secondary school, need to adjust to the new educational environment while simultaneously experiencing the turmoil of puberty. Therefore, and on the basis of previous results showing that transitional periods have an impact on students' well-being (Wang and Eccles, 2012; Salmela-Aro and Upadaya, 2014), we also expected some natural fluctuation to occur in the students' well-being and performance profiles. However, as no previous study has investigated stability and change in academic well-being and performance profiles among adolescent students, no specific hypothesis was formulated for this assumption.

(4) How do students with different academic well-being and mathematics performance profiles differ with respect to their educational aspirations?

Since previous studies have shown that educational aspirations are connected to the level of both performance and well-being (Shapka et al., 2006; Korhonen et al., 2016), we hypothesized

that students with the highest aspirations would come from the high-performing group (H8), while students with low performance and those with negative academic well-being would have the lowest aspirations (H9).

MATERIALS AND METHODS

Context

Comprehensive schooling in Finland is comprised of primary school (grades 1–6) and lower secondary school (grades 7–9). The students attend comprehensive school for 9 years until 16 years of age. At the end of grade 9, students choose between either general upper secondary school (academic track) or vocational upper secondary school (vocational track), which both last 3 or 4 years. There is also a possibility to obtain double qualification, which implies attending courses in both general and vocational upper secondary schools. After completing either general or vocational upper secondary education, students are eligible to move into higher education, which has a dual structure in Finland; higher education is provided by universities and polytechnics, also known as universities of applied sciences (Finnish National Agency for Education, 2017). Universities emphasize scientific research and instruction, whereas universities of applied sciences adopt a more practical approach.

Participants and Procedures

A total of 583 students in seventh grade (293 girls and 290 boys, mean age = 13.29 years, $SD = 0.35$) and 497 students in ninth grade (261 girls and 236 boys, mean age = 15.23 years, $SD = 0.31$) participated in the present study during one school year, 2016–2017. Participation in the study was voluntary, informed consent forms were collected from the students' parents, and the participants were assured of the confidentiality of their responses. The students came from five lower secondary schools in different Swedish-speaking areas of Finland. Swedish is the second official language in Finland, where 5.3% of the population is Swedish speaking ($N \approx 290,000$; Statistics Finland, 2016). Of the participating students, 54% had Swedish as their spoken language at home, while 28% spoke both Swedish and Finnish, 3% spoke Finnish and 4% spoke another language. The remaining participants did not report their home language. The students were followed up again at the end of the school year. The students completed self-report questionnaires on academic well-being and educational aspirations during one 45-min class session and a mathematics test during another 45-min class session.

Measures

Mathematics Performance

The students' mathematical skills were assessed with a standardized online assessment test (KTLT; Räsänen et al., 2013). The test development consisted of two steps. First, the candidate items with known difficulty level were selected from mathematical tasks originally used in the national assessments. Second, the item bank of 130 items were selected to be used in the test based on a sample of Finnish speaking students ($N = 1157$). All subjects solved subsamples of 40 items (with 10 anchor items

in each test). The Cronbach alpha reliability was 0.89 (Räsänen and Leino, 2005). In this study the Finnish-Swedish translation of the battery was used. In this version the norms (IRT-values) were calculated from a sample of Finnish-Swedish speaking students ($N = 1140$) from grade levels 7–9 representing a national sample at that age.

The online assessment has three steps. First the student is asked to evaluate a difficulty of a single calculation task (easy, average, difficult). Based on the student's answer, the system randomly selects the first item from a pool of items from easy, average, or hard items defined by their IRT delta value (difficulty parameter). In the second step, the system gives additional four items randomly from the pool of the items. In the third step, the system starts to recalculate a theta value (the estimated level of skill in the logit scale) after each given solution and selects the most informative item to be presented based on the delta and beta values (difficulty and discrimination parameters) from the remaining pool of items. The termination rule of the third step is that the theta value changes less than 2% from the current skill estimate after presenting a new item or that the subject has reached the maximum number of items (20) to be presented. To help the interpretation of the results the system transforms the student's theta value automatically into a more familiar scale for educational practitioners using the test with a mean of 100 points ($SD = 15$). Likewise, the results in this study are presented using these transformed values.

Mathematics Self-Concept

Mathematics self-concept was measured with three items from Marsh's (1992) Self Description Questionnaire I (SDQ I) scale (also see Arens and Hasselhorn, 2015). The items (e.g., *I learn things quickly in mathematics*) were assessed by a five-point Likert-type scale ranging from 1 (*completely false*) to 5 (*completely true*). The items were back-translated from English to Swedish.

Schoolwork Engagement

Schoolwork engagement was measured by the Schoolwork Engagement Inventory (EDA; Salmela-Aro and Upadyaya, 2012). The inventory consists of nine items measuring energy (e.g., *When I study I feel that I am bursting with energy*), dedication (e.g., *I am enthusiastic about my studies*), and absorption (e.g., *Time flies when I am studying*) in relation to schoolwork in general. The items were assessed through a seven-point Likert-type scale ranging from 0 (*never*) to 6 (*every day*). Both one- and three-factor solutions of schoolwork engagement are applicable when using the inventory (Salmela-Aro and Upadyaya, 2012). Accordingly, a composite score was computed from all items to indicate overall schoolwork engagement in the present study. The Swedish version of the inventory was obtained from the PISA2015 questionnaire (OECD, 2016).

School Burnout

School burnout was assessed by the nine-item School Burnout Inventory (SBI; Salmela-Aro et al., 2009a). The SBI scale is divided into three subscales: four items measuring emotional exhaustion (e.g., *I feel overwhelmed by my schoolwork*), three items measuring cynicism toward the meaning of school

(e.g., *I feel that I am losing interest in my schoolwork*), and two items measuring the sense of inadequacy at school (e.g., *I often have feelings of inadequacy in my schoolwork*). This three-factor structure has been confirmed in several previous studies (see Salmela-Aro et al., 2009a; Fiorilli et al., 2014; Tuominen-Soini and Salmela-Aro, 2014). All items were assessed using a six-point Likert-type scale ranging from 1 (*completely disagree*) to 6 (*completely agree*). The Swedish version of the inventory was obtained from the PISA2015 questionnaire (OECD, 2016).

Educational Aspirations

We measured students' idealistic and realistic educational aspirations according to two statements representing overall educational aspirations: *Highest academic degree I want to achieve* and *Highest academic degree I will probably achieve*, assessed using a 4-point ordinal scale (1 = *comprehensive education*, 2 = *vocational upper secondary education*, 3 = *polytechnic education*, and 4 = *university education*). These two items were combined to a composite score representing students educational aspirations.

Reliability coefficients and correlations between all the measures are reported in Table 1.

Procedure

This study is part of the ongoing *Ungdomars Välbefinnande och Kunskap i Framtidens Samhälle* [Students' well-being and learning in the future society] longitudinal study, following the students over a period of 4 years. The main aim of the project is to investigate the relations between well-being, achievement, and educational outcomes among adolescent students. A pilot study with 50 students was first conducted to assess the measurements. The measurements worked well in terms of length and clarity, and no changes were made based on the pilot study. Trained research assistants performed the first and the second data collection waves. Measurements were conducted with groups of students in their own schools, in intact classrooms during teacher-selected lessons.

Data Analyses

We started the analyses by examining the patterns of missing data. The proportion of missing data in the variables at both time points ranged from 8.2 to 13.5%. The missing data were handled by imputing missing values with the expectation-maximization (EM) algorithm (Dempster et al., 1977). Second, we analyzed the structural stability of each well-being measure through longitudinal confirmatory factor analysis (LCFA). Concerning students' mathematics performance, their score was based on an IRT model and not individual items, and it was therefore not possible to test for measurement invariance over time points. Third, following a person-centered approach (Bergman et al., 2003), students with similar patterns of academic well-being and mathematics performance were identified through latent profile analysis (LPA; Vermunt and Magidson, 2002). Next, configural frequency analyses (von Eye et al., 1996) were used to examine the stability of and changes in group memberships from Time 1 to Time 2. Finally, analyses of variance were conducted to examine how students within the different academic well-being

TABLE 1 | Correlations, descriptive statistics and internal consistencies for all measures at Time 1 and Time 2.

	1	2	3	4	5	6	7	Grade 7 M (SD)	Grade 9 M (SD)
1 Mathematics performance	1/1	0.50*/0.57*	0.18*/0.24*	-0.11*/-0.23*	-0.20*/-0.31*	-0.17*/-0.22*	0.32*/0.33*	100.3/102.5 (12.8/15.5)	108.5/110.2 (15.0/16.0)
2 Mathematics self-concept	0.52*/0.57*	1/1	0.35*/0.45*	-0.37*/-0.40*	-0.35*/-0.45*	-0.35*/-0.48*	0.23*/0.35*	3.7/3.5 (0.85/0.97)	3.5/3.5 (0.95/0.92)
3 Engagement	0.22*/0.25*	0.31*/0.34*	1/1	-0.28*/-0.22*	-0.55*/-0.56*	-0.37*/-0.37*	0.30*/0.32*	4.3/4.1 (1.5/1.5)	4.1/4.0 (1.4/1.5)
4 Exhaustion	-0.09/-0.18*	-0.26*/-0.34*	-0.13*/-0.22*	1/1	0.50*/0.57*	0.68*/0.70*	-0.09*/-0.03	2.7/2.8 (1.1/1.2)	2.9/2.8 (1.2/1.2)
5 Cynicism	-0.11*/-0.22*	-0.23*/-0.32*	-0.43*/-0.48*	0.58*/0.59*	1/1	0.62*/0.65*	-0.28*/-0.27*	2.5/2.6 (1.1/1.2)	2.6/2.6 (1.1/1.2)
6 Inadequacy	-0.17*/-0.21*	-0.30*/-0.39*	-0.26*/-0.34*	0.69*/0.71*	0.62*/0.65*	1/1	-0.19*/-0.12*	2.8/2.8 (1.1/1.3)	3.1/3.0 (2.2/1.3)
7 Educational aspirations	0.32*/0.35*	0.27*/0.31*	0.38*/0.32*	0.05/-0.07	-0.20*/-0.22*	-0.14*/-0.17*	1/1	3.1/3.0 (0.83/0.80)	3.2/3.3 (0.77/0.72)
Cronbach's alpha	—	0.92/0.93	0.94/95	0.80/83	0.78/81	0.60/65	—	—	—

* $p < 0.05$. Correlation coefficients above the diagonal refer to seventh grade students and under the diagonal to ninth grade students. Correlation coefficients for Time 1 and Time 2 are separated by slash.

and mathematics performance profiles differ with respect to their educational aspirations. We utilized the MPLUS (version 8) program (Muthén and Muthén, 1998–2015) to conduct the LCFA and the LPAs. ANOVAs and chi-square tests were conducted with SPSS (Version 24).

Longitudinal Confirmatory Factor Analysis

The LCFA was performed simultaneously for seventh and ninth grade data on items representing academic well-being in Times 1 and 2. A model was specified in which all items for each scale were allowed to load on the corresponding factor only. On the basis of previous research, we expected that the items from the School Burnout Inventory (SBI; Salmela-Aro et al., 2009a) would load on three separate factors: exhaustion, cynicism, and inadequacy (Salmela-Aro et al., 2009a; Tuominen-Soini et al., 2012), that the nine items from the Schoolwork Engagement Inventory (EDA; Salmela-Aro and Upadyaya, 2012) would load on a single engagement factor, and that the three items measuring mathematics self-concept from Marsh's (1992) Self Description Questionnaire I (SDQ I) would load on a single mathematics self-concept factor (Arens and Hasselhorn, 2015). We therefore specified a model with three school burnout factors (exhaustion, cynicism, and inadequacy), a schoolwork engagement factor, and a mathematics self-concept factor as factor indicators.

Due to slight non-normality in the items measuring burnout, we used maximum likelihood with robust standard errors as estimators in the analyses. We used chi-square (χ^2), the comparative fit index (CFI), the Tucker-Lewis Index (TLI) and the root mean square error of approximation (RMSEA) as model-fit indicators. The CFI and TLI vary along a 0-to-1 continuum, and values greater than 0.90 and 0.95 reflect acceptable and excellent fit to the data, respectively. RMSEA values of less than 0.05 and 0.08 reflect a close fit and a reasonable fit to the data (Marsh et al., 2004). When comparing nested models, it is suggested that support for the more parsimonious model requires a change in the CFI of less than 0.01 and in the RMSEA of less than 0.015 (Chen, 2007). A prerequisite for meaningful comparison is that the measures are invariant across time points, that is, they measure the same underlying construct(s). LCFA allows for testing measurement invariance by specifying a series of nested models, where the endpoints are the least restrictive model with no invariance constraints, and the most restrictive model constraints all parameters to be the same across time points (Bollen, 1989). As a baseline model for testing measurement invariance, we specified a model imposing no invariance constraints on the factor loadings and indicator intercepts, assuming the same factor structure (configural invariance) at both time points. This model fitted the data very well. Next, we fitted a model where the factor loadings were constrained to equality (factorial invariance) across the time points, and this did not worsen the model fit. Finally, we compared the factorial invariance model against a fully invariant model, with both factor loadings and indicator intercepts constrained to equality (scalar invariance). The fully invariant model fitted the data well and did not worsen the model fit, indicating that the levels of the underlying items are equal at both time points. Therefore, the prerequisite for meaningful

TABLE 2 | Goodness of fit statistics for alternative models.

Model	χ^2	df	CFI	TLI	RMSEA	Δ CFI	Δ RMSEA	p
Configural invariance	2229.767	753	0.945	0.937	0.043			0.001
Factorial invariance	2266.531	774	0.945	0.938	0.042	0.000	0.001	0.000
Scalar invariance	2342.657	795	0.943	0.938	0.042	0.002	0.000	0.000

CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, root mean square error of approximation.

measurement invariance was achieved. The fit indices for the models tested are presented in **Table 2**.

Latent Profile Analyses

We used a person-centered approach to investigate what patterns of academic well-being and mathematics performance students show, and how stable these patterns are during one school year. The goal in the person-centered approach is to group students into categories, containing students who are similar to each other (Muthén and Muthén, 2000). To identify the cluster memberships in longitudinal data, we used the I-States as Objects Analysis (ISOA) procedure (Bergman and El-Khoury, 1999, 2003; Bergman et al., 2003), as it is optimal for studying short-term development. The key assumption for the ISOA approach is that the same typical patterns occur at all time points, although the proportion of the sample that belongs to each typical pattern may vary across time, and that some individuals may change the typical pattern they belong to. ISOA is based on data with the same set of variables measured at all time points, and the I-state is defined as an individual's pattern of variable values at a specific time point. Since the present study consists of two time points, each person is characterized by two I-states. The I-states can therefore be identified despite of the time dimension, and the classification can be used to describe individual development.

First, our longitudinal data were reorganized in a way that the data for each student for both measurement points was coded as a separate case. Second, a series of LPAs (Muthén and Muthén, 2000; Vermunt and Magidson, 2002) was carried out on the reorganized data to identify students with similar patterns of academic well-being and mathematics performance. LPA is a probabilistic or model-based variant of traditional cluster analysis (Vermunt and Magidson, 2002). Its goal is to identify the smallest number of latent classes (groups) that adequately describe the associations among the latent continuous variables. In the analyses, one class is added in each step until the model optimally fits the data. To choose the best fitting model, Bayesian information criterion (BIC) and Vuong–Lo–Mendell–Rubin (VLMR) likelihood ratio test were used as the statistical criteria. The model with a lower BIC value is considered to provide a better fit to the data, and a resulting *p*-value of less than 0.05 for VLMR suggests that the estimated model is preferable over the reduced model (Lo et al., 2001). Furthermore, the usefulness and interpretability of the latent classes (e.g., the number of individuals in each class) were also considered to choose the best fitting model. The LPAs were performed separately for seventh and ninth grade students and, in the LPA models, covariances were allowed to vary across clusters. Finally, the data were reorganized in such a way that the data for each student at

both measurement points were again handled as two successive measurements of the same individual.

Configural Frequency Analyses

The stability of and changes in academic well-being and mathematics performance profiles (i.e., group memberships) within a school year (from Time 1 to Time 2) were examined through configural frequency analysis (CFA; von Eye, 1990). CFA compares the observed to expected frequencies in a cross-tabulation and asks whether cell frequencies are larger or smaller than could be expected by a base model. The base model selected for frequency comparison was the first-order CFA, which assumes that all variables under study may show main effects and are independent of each other (von Eye, 1990, 1996). By means of CFA, we searched for typical and atypical patterns. A type is a pattern that is observed more frequently than expected by chance, and an antitype is a pattern that is observed less frequently than expected by chance. In the present study, we focused on finding specific classes that the students tend to stay in more frequently than would be expected by chance (i.e., individual stability) as well as whether there are changes between the classes that cannot be ascribed to chance fluctuations (i.e., individual change).

Analyses of Variance

One-way ANOVAs were conducted to examine differences in academic well-being and mathematics performance between the profiles. ANOVAs were also conducted to investigate how students in the different academic well-being and mathematics performance profiles differ with respect to their educational aspirations at Time 1 and Time 2.

Chi-Square Test of Independence

A chi-square test was performed to examine the association between the academic well-being and mathematics performance profiles and gender. Then, we examined the adjusted residuals in each cell to see in which specific profile gendered differences occurred. If the residual exceeded the critical value of 1.96 in a *z*-distribution for either boys or girls, they were overrepresented in the profile.

RESULTS

Academic Well-Being and Mathematics Performance Profiles

The LPA results showed that a three-class solution described the data best for the seventh-grade students, whereas a four-class solution was supported among the ninth-grade students (see **Table 3** for fit indices). Although the BIC continued to decrease

TABLE 3 | Information criteria values for different class solutions in grade seven and nine.

Number of classes	Seventh grade			Ninth grade		
	BIC	<i>p</i> VLMR	Entropy	BIC	<i>p</i> VLMR	Entropy
1	19933.020	–	–	17019.537	–	–
2	18538.452	0.00	0.772	15961.446	0.00	0.737
3	18075.006	0.00	0.792	15557.889	0.00	0.789
4	17963.812	0.25	0.783	15454.759	0.00	0.803
5	17864.179	0.56	0.774	15367.386	0.05	0.765
6	17762.961	0.12	0.792	15290.460	0.23	0.774
7	17710.971	0.20	0.792	15240.417	0.20	0.781

BIC, Bayesian Information Criterion; *p*VLMR, Vuong-Lo-Mendell-Rubin likelihood ratio test.

within both grades, the VLMR test clearly supported the three-class solution among the seventh-graders and the four-class solution among the ninth-graders. The entropy value was 0.79 for seventh grade and 0.80 for ninth grade, indicating that the models provide clear classifications. The average individual posterior probabilities for being assigned to a specific group are reported in **Appendix A**. The groups in each grade were labeled according to the mean score of their profiles in academic well-being and mathematics performance measures (grade 7 in **Figure 1** and grade 9 in **Figure 2**). The groups in seventh grade were named as thriving, average, and negative academic well-being. Since three of the groups in ninth grade were very similar to the three groups in seventh grade, the same names were used for both grades. The fourth group in ninth grade was named as low-performing students. H1 was thus confirmed in both grades, while H2 was supported in grade 9 but not in grade 7.

ANOVAs were conducted to investigate the group differences in the mean scores of all measures (see grade 7 results in **Table 4**, grade 9 results in **Table 5**). The thriving group had the most positive performance and well-being in grade seven ($N_{I\text{-}States} = 394$, 33.8%; $N_{T1} = 206$, 35.3%; $N_{T2} = 188$, 32.2%) and grade nine ($N_{I\text{-}States} = 245$, 24.6%; $N_{T1} = 114$, 22.9%; $N_{T2} = 131$, 26.4%). The thriving students scored significantly higher in mathematics performance than the other groups and also had higher scores on mathematics self-concept and schoolwork engagement as well as relatively low scores on all dimensions of school burnout.

Students in the largest group, the average students (seventh grade: $N_{I\text{-}States} = 599$, 51.4%; $N_{T1} = 300$, 51.5%; $N_{T2} = 299$, 51.3%, ninth grade: $N_{I\text{-}States} = 501$, 50.4%; $N_{T1} = 245$, 49.3%; $N_{T2} = 256$, 51.5%) showed average scores on all measures, both in mathematics performance and in the academic well-being measures. Although the students in the average group had average scores on the measures, in comparison with the other groups, they still had the second highest score on both performance and burnout.

Students in the negative academic well-being group (seventh grade: $N_{I\text{-}States} = 173$, 14.8%; $N_{T1} = 77$, 13.2%; $N_{T2} = 96$, 16.5%, ninth grade: $N_{I\text{-}States} = 178$, 17.9%; $N_{T1} = 97$, 19.5%; $N_{T2} = 81$, 16.3%) expressed rather negative scores on all academic well-being measures. In both grades, students in the negative

academic well-being group had significantly higher scores on all dimensions of school burnout in comparison with the other groups. The negative academic well-being group in seventh grade had the lowest scores in mathematics self-concept and engagement as well, while the ninth graders' self-concept and engagement did not differ significantly from the low-performing students' scores. Both the seventh and the ninth grade students in this group performed significantly lower in mathematics than the average students, however, there was a larger difference between the average and the negative academic well-being group in seventh grade ($d = 0.6$) than in ninth grade ($d = 0.3$). Further, the ninth-graders in the negative academic well-being group still performed significantly higher in mathematics than the low-performing students.

Finally, the fourth group found in ninth grade was the low-performing students ($N_{I\text{-}States} = 70$, 7.0%; $N_{T1} = 41$, 8.2%; $N_{T2} = 29$, 5.8%). These students performed the lowest in mathematics and had low scores on mathematics self-concept as well. However, interestingly, their scores on all dimensions of school burnout were quite positive and did not differ significantly from the scores of the thriving students. Also, their engagement in school was rather average.

Gender Differences Within Academic Well-Being and Mathematics Performance Profiles

We examined the gender differences within the profiles by using a Chi-Square test, and found an association between gender and the academic well-being and mathematics performance groups in both seventh [$\chi^2(2) = 35.119$, $p = 0.000$] and ninth grade [$\chi^2(3) = 50.223$, $p = 0.000$]. A closer look at the adjusted residuals revealed that in both grades, there were significantly more girls in the negative academic well-being group (seventh grade: $N_{I\text{-}States\text{ boys}} = 56$, 32%, $N_{I\text{-}States\text{ girls}} = 117$, 68%, $z = 5.0$, $p < 0.001$, ninth grade: $N_{I\text{-}States\text{ boys}} = 47$, 26%, $N_{I\text{-}States\text{ girls}} = 137$, 74%, $z = 6.2$, $p < 0.001$), thus supporting H3. H4 was also confirmed, as boys were overrepresented in the thriving group (seventh grade: $N_{I\text{-}States\text{ boys}} = 233$, 59%, $N_{I\text{-}States\text{ girls}} = 161$, 41%, $z = 4.6$, $p < 0.001$, ninth grade: $N_{I\text{-}States\text{ boys}} = 140$, 57%, $N_{I\text{-}States\text{ girls}} = 105$, 43%, $z = 3.5$, $p < 0.001$). In ninth grade, there were more boys than girls in the low-performing group as well ($N_{I\text{-}States\text{ boys}} = 46$, 66%, $N_{I\text{-}States\text{ girls}} = 24$, 34%, $z = 3.2$, $p = 0.002$). In the remaining profiles, girls and boys were equally distributed.

Change in and Stability of Academic Well-Being and Mathematics Performance Profiles

Academic well-being and mathematics performance groups at Times 1 and 2 provided 9 configurations in seventh grade and 16 configurations in ninth grade. For each configuration, the observed frequency value was compared to the corresponding expected frequency value. To counter the inflation of Type-I error due to repeated significance testing, the Bonferroni-correction (0.05/number of tests) was applied to determine the significance of each configuration, resulting in a significance

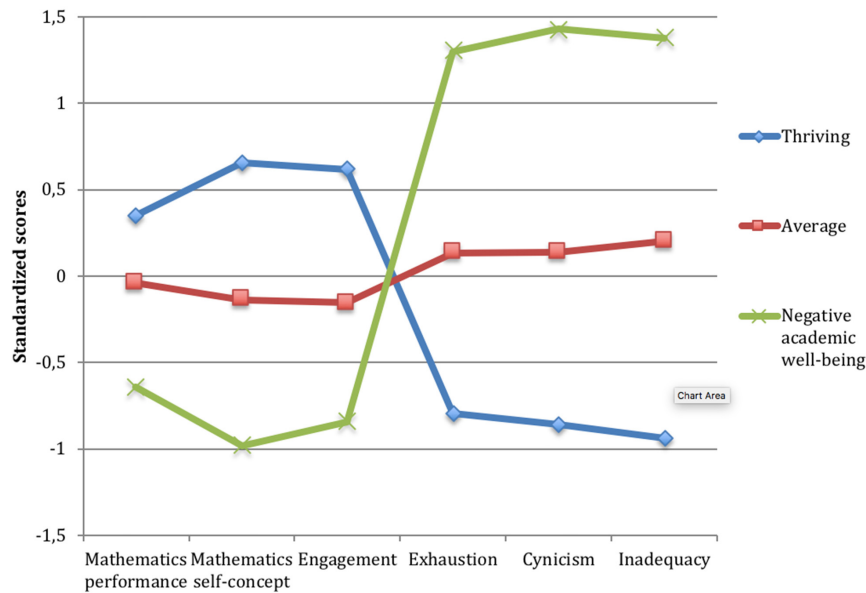


FIGURE 1 | Seventh grade students' latent mean scores on mathematics performance and academic well-being scales as a function of group membership.

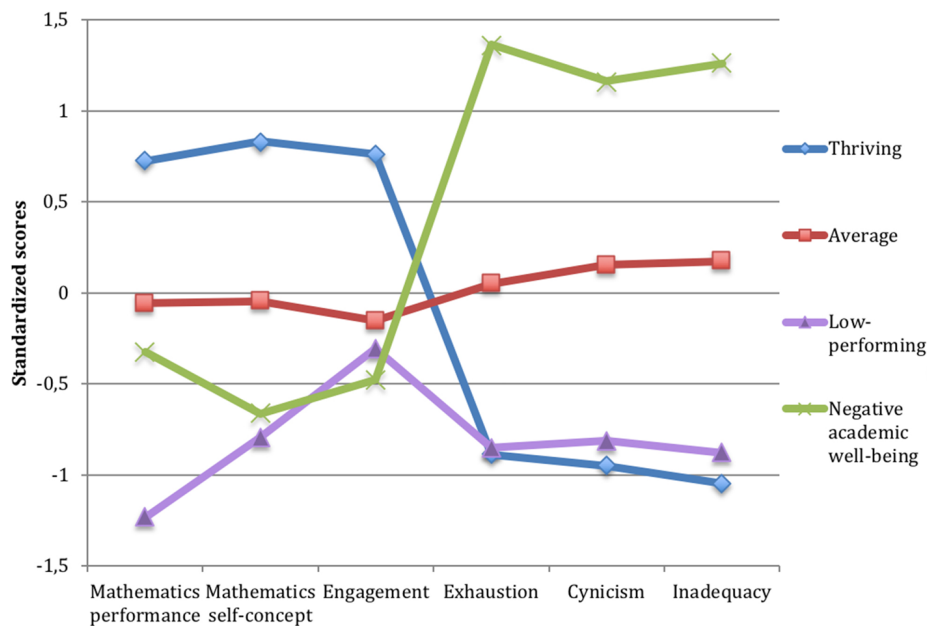


FIGURE 2 | Ninth grade students' latent mean scores on mathematics performance and academic well-being scales as a function of group membership.

level of 0.006 in seventh grade and 0.003 in ninth grade. The CFA outcome for students in seventh grade is presented in Table 6 and Figure 3, and for ninth grade in Table 7 and Figure 4. In seventh grade, the CFA revealed three types and six antitypes. The three types that were revealed in the CFA corresponded to individuals belonging to the same class across both measurement points, thus supporting H5. Approximately 64% of the students in seventh grade displayed a stable academic well-being and mathematics performance profile over time. All

remaining configurations represented antitypes, meaning that it was untypical for students in seventh grade to change between profiles during one school year. H6 and H7 were therefore supported as well.

In ninth grade, three types and three antitypes were found. Of four cells corresponding to individuals belonging to the same class across both time points, only three were significant types and H5 was therefore only partially confirmed. The one stable configuration that did not show to be a significant type,

TABLE 4 | Mean differences in mathematics performance and academic well-being measures between the profiles in grade seven.

Variable	Sample mean		Thriving		Average		Negative academic well-being		<i>F</i> (2,1163)	<i>p</i>	η^2
	<i>N</i> = 1166		<i>N</i> = 394		<i>N</i> = 599		<i>N</i> = 173				
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Mathematics performance	101.2	14.2	106.3	12.8	100.8	13.0	91.5	15.9	73.489	*	0.11
Mathematics self-concept	3.6	0.91	4.2	0.67	3.4	0.76	2.6	0.90	275.431	*	0.32
Engagement	4.2	1.5	5.1	1.2	3.9	1.3	2.9	1.4	207.173	*	0.26
Exhaustion	2.7	1.1	1.8	0.65	2.9	0.81	4.2	1.0	586.527	*	0.50
Cynicism	2.6	1.2	1.5	0.57	2.8	0.76	4.3	0.96	893.386	*	0.61
Inadequacy	2.8	1.2	1.7	0.64	3.1	0.75	4.5	0.81	1005.085	*	0.63

Academic well-being and mathematics performance profile means within a row sharing the same subscripts are not significantly different at the $p < 0.05$ level. *N* describes the *I*-States rather than the number of students * $p < 0.001$.

TABLE 5 | Mean differences in mathematics performance and academic well-being measures between the profiles in grade nine.

Variable	Sample mean		Thriving		Average		Low-performing		Negative academic well-being		<i>F</i> (3,990)	<i>p</i>	η ²
	<i>N</i> = 994		<i>N</i> = 245		<i>N</i> = 501		<i>N</i> = 70		<i>N</i> = 178				
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Mathematics performance	109.4	15.6	121.2	12.8	108.3	13.1	88.9	14.6	104.2	13.6	131.068	*	0.28
Mathematic self-concept	3.5	2.8	4.3	0.62	3.4	0.77	2.6 _a	0.80	2.9 _a	0.91	160.142	*	0.33
Engagement	4.0	1.4	5.1	1.2	3.8 _b	1.2	3.6 _{ab}	1.5	3.3 _a	1.4	90.724	*	0.22
Exhaustion	2.8	1.2	1.8 _a	0.67	2.9	0.72	1.7 _a	0.54	4.5	0.83	529.721	*	0.62
Cynicism	2.6	1.2	1.6 _a	0.59	2.8	0.79	1.6 _a	0.55	4.0	0.97	410.244	*	0.55
Inadequacy	3.0	1.3	1.7 _a	0.60	3.3	0.79	1.9 _a	0.69	4.7	0.71	654.868	*	0.66

Academic well-being and mathematics performance profile means within a row sharing the same subscripts are not significantly different at the $p < 0.05$ level. *N* describes the *I*-States rather than the number of students * $p < 0.001$.

although it was close to reaching significance ($p = 0.01$), was the average group. Overall, approximately 57% of the students in ninth grade displayed a stable academic well-being and

mathematics performance profile over time. In ninth grade, thriving students were unlikely to move to the average and the negative academic well-being group, and it was also untypical for students in the negative academic well-being group to move to the thriving group, thus, only supporting H7.

TABLE 6 | Configural frequency analysis on Time 1 and Time 2 academic well-being and mathematics performance groups in grade seven.

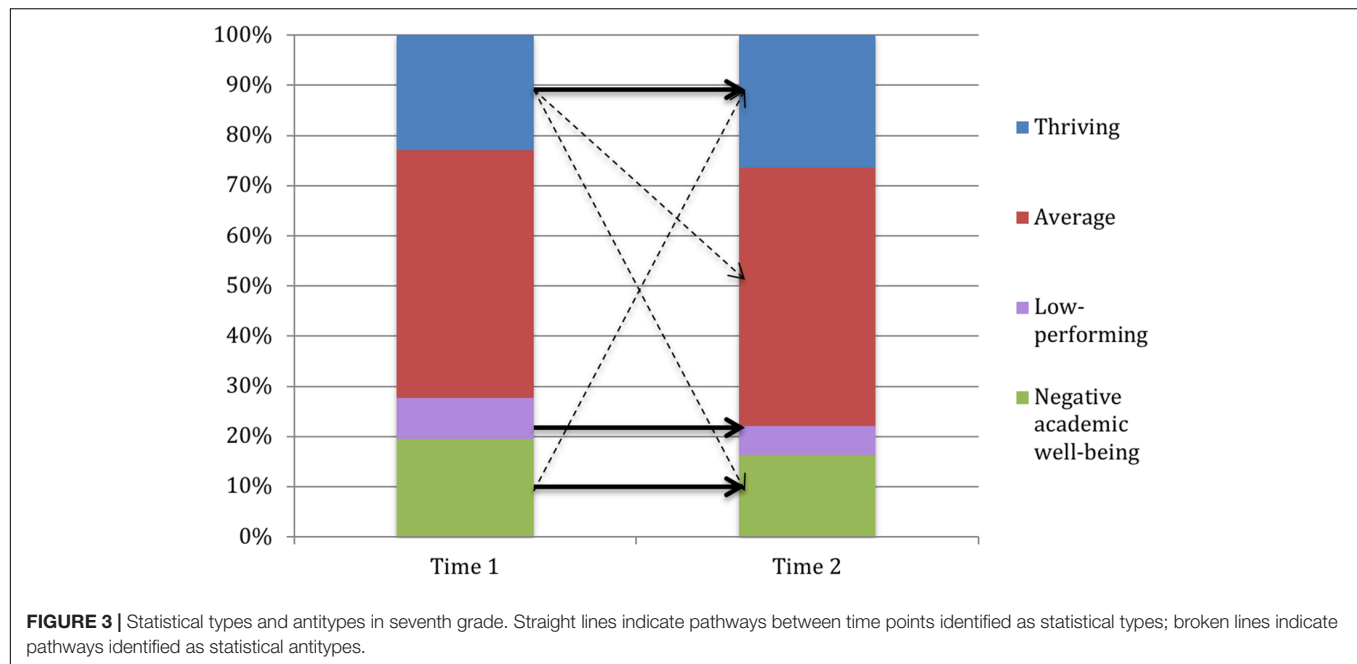
Configuration		OBS.	EXP.	<i>z</i>	<i>p</i>
T1/T2					
T	1 1	129	66.43	8.16	0.00001
A	1 2	73	105.65	−3.51	0.00001
A	1 3	4	33.92	−5.29	0.00001
A	2 1	59	96.74	−4.20	0.00001
T	2 2	197	153.86	4.05	0.00001
A	2 3	44	49.40	−0.80	0.00001
A	3 1	0	24.83	−5.09	0.00001
A	3 2	29	39.49	−1.73	0.00001
T	3 3	48	12.68	10.03	0.00001

T1, Time 1 academic well-being and mathematics performance group (1 = thriving, 2 = average, 3 = negative academic well-being). *T2*, Time 2 academic well-being and mathematics performance group (1 = thriving, 2 = average, 3 = negative academic well-being). *A*, Antitype; *T*, Type.

Profile Differences in Educational Aspirations

Two One-way ANOVAs were performed to investigate how students with different profiles differ with respect to their educational aspirations. All effects and the mean differences between academic well-being and mathematics performance profiles in seventh grade are summarized in **Table 8**, and ninth grade in **Table 9**. One-way ANOVAs revealed significant differences in educational aspirations between the groups within both grades. The pairwise comparison of means in seventh grade revealed that thriving students had the highest aspirations compared to the other groups at both time points. The students in the average and negative academic well-being groups did not differ with respect to educational aspirations.

The results for ninth grade students also showed that the thriving students had the highest educational aspirations in



comparison with the other groups. Further, no significant differences were found between the average and the negative academic well-being students in neither of the time points. Lastly, the low-performing students had the lowest educational aspirations at Time 2, but interestingly, they did not differ in educational aspirations from the negative academic well-being students at Time 1. H8 was therefore confirmed in both seventh

and ninth grade, while H9 was only partly confirmed in ninth grade, thus only at the second time point and only concerning the low-performing group but not the negative academic well-being group.

DISCUSSION

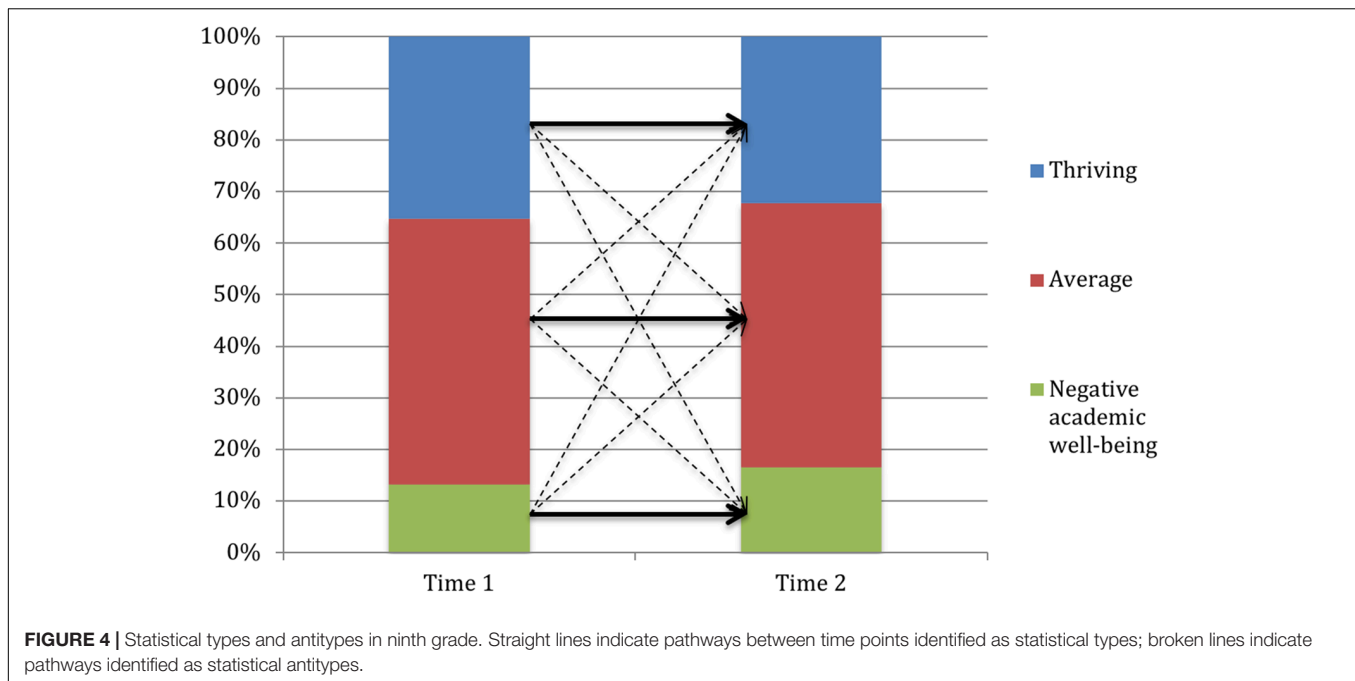
The aim of this study was to examine what kinds of profiles of academic well-being and mathematics performance can be found among students in seventh and ninth grade, if there are gender differences within the profiles, how stable the profiles are during one school year, and further, how students with different profiles differ with respect to their educational aspirations. Consistent with previous findings (Korhonen et al., 2014), in grade 9, we identified four distinct groups of students (thriving, average, negative academic well-being, and low-performing) that differed from each other in performance and well-being measures. Interestingly, we only found three groups of students in grade 7 (thriving, average, and negative academic well-being). Boys were overrepresented in the thriving group, while girls were overrepresented in the negative academic well-being group in both grades. The profiles were relatively stable during the school year, and it was highly unlikely, for example, for students to move between the thriving and negative academic well-being groups. Finally, in line with previous findings, students belonging to the thriving group held higher educational aspirations compared to the other groups. Contrary to our expectations, students belonging to the negative academic well-being group did not exhibit lower educational aspirations compared to the average group.

Regarding our first research question, we expected to find three groups of students based on the assumption that there is a linear relationship between academic well-being and

TABLE 7 | Configural frequency analysis on Time 1 and Time 2 academic well-being and mathematics performance groups in grade nine.

Configuration		OBS.	EXP.	z	p
T1/T2					
T	1 1	75	30.05	8.46	0.00001
A	1 2	36	58.72	-3.16	0.001594
	1 3	2	6.65	-1.82	0.069524
A	1 4	1	18.58	-4.16	0.000032
	2 1	48	64.58	-2.21	0.027036
	2 2	151	126.20	2.56	0.010588
	2 3	10	14.30	-1.15	0.24891
	2 4	36	39.93	-0.65	0.516985
	3 1	3	10.81	-2.40	0.01635
	3 2	17	21.12	-0.92	0.359667
T	3 3	16	2.39	8.82	0.00001
	3 4	5	6.68	-0.66	0.512468
A	4 1	5	25.57	-4.18	0.00003
	4 2	52	49.96	0.30	0.761356
	4 3	1	5.66	-1.97	0.048838
T	4 4	39	15.81	5.93	0.00001

T1, Time 1 academic well-being and mathematics performance group (1 thriving, 2 = average, 3 = low-performing 4 = negative academic well-being). T2, Time 2 academic well-being and mathematics performance group (1 thriving, 2 = average, 3 = low-performing 4 = negative academic well-being). A, Antitype; T, Type.



performance (H1) but, also, that students with some sort of mixed profile, showing non-linear relations between well-being measures and performance, would emerge (H2). Three of these expected profiles were found within both seventh and ninth grade: a thriving, an average, and a negative academic well-being group. These profiles largely concur with the profiles found by Korhonen et al. (2014), even despite the use of slightly different indicators for academic well-being. A vast majority (approximately 80%) of students belonged to the thriving and the average profiles, displaying relatively positive mathematics performance and academic well-being. It is, however, notable that although the general assumption is that engagement and burnout are negatively associated (Schaufeli et al., 2002; Salmela-Aro et al., 2009b; Cadime et al., 2016), the average students seemed, as hypothesized based on previous results from studies using a person-centered approach (Tuominen-Soini and Salmela-Aro, 2014), to exhibit simultaneously average levels of both engagement and burnout.

The students in the third group identified in both grades, the negative academic well-being group, performed significantly lower in mathematics than the average students. However, the gap between the average and the negative academic well-being students' mathematics performance was larger in seventh grade, while also, the negative academic well-being students in ninth grade performed significantly higher in mathematics than the low-performing group. In fact, the link between performance and well-being among the negative academic well-being students in seventh grade, resembles our assumptions made in our first hypothesis (H1), and is consistent with previous, linear findings suggesting that low performance is connected to higher levels of burnout (Salmela-Aro et al., 2009a), disengagement in school (Salmela-Aro and Upadaya, 2014), and low academic self-concept (Valentine et al., 2004; Guo et al., 2015b). In turn,

interestingly, the negative academic well-being profile in ninth grade has also some similar characteristics as the one we described in our second hypothesis (H2), as their mathematics performance is only slightly lower than the average students'. This association between performance and well-being has been found also in previous studies implementing a person-centered approach (Korhonen et al., 2014), and supports our assumption that there are non-linear relations between well-being and performance as well. As only three profiles were identified in seventh grade, it seems as if the negative academic well-being group in seventh grade represented students with both negative academic well-being and low performance, whereas these students were more separated in ninth grade (negative academic well-being, and low-performing). A plausible explanation for these findings is that negative well-being and low performance are not as clearly separated in the earlier years of adolescence, as they are later in ninth grade.

The profile representing low-performing students, only found in grade 9, showed somewhat ambiguous results with respect to the academic well-being measures. Regarding self-concept, the results are in line with previous research (Valentine et al., 2004; Guo et al., 2015b) and our hypothesis (H1), indicating that students with low performance report low academic self-concept as well. Indeed, these students performed the lowest in mathematics and their low performance was coupled with rather low mathematics self-concept. However, interestingly, the low-performing students still exhibited rather positive academic well-being. In fact, they did not differ significantly from the thriving students in school burnout nor did they differ from the average students in engagement. Overall, it seems like the students' low mathematics performance and self-concept does not make them feel stressed out over, or overwhelmed by, schoolwork in general. It might be that

TABLE 8 | Summary statistics and mean differences in educational aspirations between academic well-being and mathematics performance profiles in grade seven.

Variable	Thriving		Average		Negative academic well-being		<i>F</i> (2,580)	<i>p</i>	η^2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Educational aspirations T1	3.37	0.77	2.91 _a	0.81	2.80 _a	0.82	25.140	0.000	0.08
Thriving			<i>d</i> = 0.46		<i>d</i> = 0.57				
Average					<i>d</i> = 0.11				
Educational aspirations T2	3.33	0.80	3.04 _a	0.76	2.90 _a	0.83	11.859	0.000	0.04
Thriving			<i>d</i> = 0.29		<i>d</i> = 0.43				
Average					<i>d</i> = 0.14				

Means within a row sharing the same letters are not significantly different at the $p < 0.05$ level (with Bonferroni correction). T1, Time 1; T2, Time 2.

TABLE 9 | Summary statistics and mean differences in educational aspirations between academic well-being and mathematics performance profiles in grade nine.

Variable	Thriving		Average		Low-performing		Negative academic well-being		<i>F</i> (3,493)	<i>p</i>	η^2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Educational aspirations T1	3.54	0.65	3.13 _a	0.75	2.87 _b	0.84	3.13 _{ab}	0.79	11.790	0.000	0.07
Thriving			<i>d</i> = 0.41		<i>d</i> = 0.67		<i>d</i> = 0.41				
Average					<i>d</i> = 0.26		<i>d</i> = 0.00				
Low-performing							<i>d</i> = 0.26				
Educational aspirations T2	3.63	0.53	3.19 _a	0.68	2.60	0.84	3.11 _a	0.78	25.131	0.000	0.13
Thriving			<i>d</i> = 0.44		<i>d</i> = 1.03		<i>d</i> = 0.52				
Average					<i>d</i> = 0.59		<i>d</i> = 0.08				
Low-performing							<i>d</i> = 0.51				

Means within a row sharing the same letters are not significantly different at the $p < 0.05$ level (with Bonferroni correction). T1, Time 1; T2, Time 2.

the students in the low-performing group do not attach so much value to mathematics performance and, therefore, the domain-general constructs, engagement and school burnout, might not be as affected by the students' low mathematics performance. This pattern resembles the one Tuominen-Soini et al. (2008) identified, in which students, despite their rather low academic achievement and motivation, still displayed less general distress and stress with their future aspirations than their more committed peers. Parhiala et al. (2018) also identified a similar group of students that, despite their low motivation, still had rather positive well-being. Although it is suggested that positive performance, motivation and well-being often go together, these results indicate that this is not always the case. It might be that some students are more psychologically detached from school than others, and that their well-being is more affected by experiences outside of school.

Next, with respect to our second research question, we investigated the distribution of gender within the profiles, and as hypothesized (H3), we found that girls were overrepresented in the negative academic well-being group, while there were more boys than expected among the thriving students (H4), within both seventh and ninth grade. In addition, boys were overrepresented in the low-performing group in ninth grade. Taken that girls have consistently been found to report higher levels of burnout than boys (Salmela-Aro et al., 2008;

Salmela-Aro and Tynkkynen, 2012), our findings concur with these previous results, as the students in the negative academic well-being group indeed were characterized by high levels of exhaustion, cynicism, and inadequacy. This might also explain why boys were overrepresented in the groups displaying the lowest levels of burnout. Another explanation for the gendered differences within the profiles, could be that we only investigated well-being in relation to one domain, that is, mathematics. Boys have consistently been found to perform slightly better in mathematics than girls (Nagy et al., 2006; Watt et al., 2012), possibly due to gender stereotypes in mathematics, as they have been found to have a direct and indirect negative effect on girls' mathematics performance (Song et al., 2016).

Regarding our third research question, we investigated the change in and stability of academic well-being and mathematics performance profiles. As all stable configurations in seventh grade, and three out of four stable configurations in ninth grade turned out to be significant types, H5 was, for the most part, supported. Further, changes between the thriving and the negative academic well-being groups were, as we expected (H7), untypical in both grades, whereas the assumption that changes between high-performing and low-performing students would be untypical as well (H6), was only supported among the seventh grade students. These findings resemble the results of previous investigations regarding the stability of and change in patterns of

school burnout and engagement (Tuominen-Soini and Salmela-Aro, 2014) as well as patterns of perceived competence, academic value, and mental health (Roeser and Peck, 2003), suggesting continuity in adolescents' academic and emotional functioning. In total, approximately 60% of the students displayed a stable academic well-being and mathematics performance profile over the course of one academic year and, although the remaining proportion of students in both grades showed a change in their academic well-being and mathematics performance profile, the majority of the changes that did occur were directed toward groups with fairly similar profiles. Also, only less than 10% of the students in each grade showed a considerably negative change (i.e., from the thriving or average group to the negative academic well-being or the low-performing group).

As for our final research question, regarding educational aspirations, our expectations came true regarding the thriving students in both seventh and ninth grade (H8), as they aspired for higher educational goals than students in the other groups. Previously, researchers have found that students with similar patterns of high engagement and low burnout not only have higher achievement (Fiorilli et al., 2017) and educational aspirations, but also, complete higher education studies (Tuominen-Soini and Salmela-Aro, 2014). Regarding the remaining groups, contrary to what we hypothesized (H9), no differences in educational aspirations were found between the negative academic well-being and the average students. One possible explanation is that students from both of these groups hold relatively high educational aspirations compared to their competence level and therefore have to invest more effort in schoolwork and consequently experience higher levels of school burnout (Tuominen-Soini and Salmela-Aro, 2014; Korhonen et al., 2016). In addition, the low-performing students only showed significantly lower aspirations than the other groups at the second time point. It might be that the students' low mathematics performance and self-concept are affecting their educational aspirations negatively when they become faced with the decision of choosing an upper secondary education, possibly as they realize the demands of their initial aspirations, for example, the amount of schooling required or the enrollment criteria (Parker et al., 2013). Similar declines in educational aspirations over time have been found previously as well (Gottfredson, 1981, 1996).

As for practical implications, approximately 15% in seventh grade and 18% in ninth grade belonged to the negative academic well-being group. Since school burnout has been shown to have maladaptive consequences (Korhonen et al., 2014) and might even lead to later depressive symptoms (Bakker et al., 2000; Salmela-Aro et al., 2009b) it would be important to detect signs of poor academic well-being in an early stage. Also, because these students, despite their poor well-being, still have rather average performance, their potential problems might easily go unnoticed. Therefore, and since supporting students' well-being plays a key role in the prevention of later health problems (van Uden et al., 2014), schools should screen students for well-being as well. There is also a need to provide and develop adequate coping skills for students and advise them on how to prevent and address their exhaustion and feelings of inadequacy as early

as possible. Another interesting finding was that, although the negative academic well-being group in ninth grade performed significantly better in mathematics than the low-performing students, these groups shared the same level of low mathematics self-concept. It seems like the students in the negative academic well-being group might rate their performance lower than it actually is, therefore, it would be important to put more focus on improving students' self-concept, for example, through praise and feedback, as these have been identified as very effective in enhancing self-concept (Craven et al., 2003; O'Mara et al., 2006). Also, since there is a strong, positive connection between academic self-concept and performance, findings indicate that interventions targeting both skills and self-concept within an academic domain (e.g., math) simultaneously are more effective (O'Mara et al., 2006).

Previous investigations have concluded that student's engagement in schoolwork is significantly affected by teachers' support in their efforts, as they play an important role in shaping students' engagement through emotional, instructional, and organizational support embedded in the classroom processes (Anderson et al., 2004; van Uden et al., 2014). Our results illustrate that not only academic performance but, also, positive self-beliefs, engagement toward school and lack of school burnout matter for students' educational aspirations. This should be recognized in an early stage, in order to help students set up challenging educational goals. This is also important, as we found that low-performing students' educational aspirations were significantly lower than the other students', just before the transition, at the time they were making the decision about their educational track in upper secondary education. As the last year of comprehensive school has been found to be a demanding phase for students (Salmela-Aro and Upadaya, 2014), more attention and support should be given when the students are facing these important educational choices. Resources should be focused on, for example, the availability of school counselors and implementations of mental health-promotion programs in school, as they have been found to make positive changes in student's social- and emotional skills, attitudes, and academic performance (e.g., Durlak et al., 2011; Sklad et al., 2012).

Limitations and Future Research

Our study has several limitations that need to be taken into account. The three-class solution did not differentiate between students with low-performance and negative academic well-being. This might indicate that the students' performance and well-being are not as clearly separated in the early years of adolescence. Future studies should investigate the relation between well-being and performance in younger students. Also, future research should incorporate different variables when investigating the relation between performance and well-being, for example, domain-specific task values, as they have revealed to be important predictors of students' educational aspirations (Wigfield and Eccles, 2000). Of course, the applicability of the typology obtained in this study with Finnish adolescents should be tested in other cultures as well.

Further, since the measurement period in the present study was one year, it would be useful for future studies to investigate

the development of academic well-being and performance over a longer time period. It would, for example, be important to follow the students to further education and working life, and investigate whether students with different patterns of well-being and performance differ later in their actual educational attainment level and career choices as well. Also, as we found that groups of students who experience both high and moderate levels of exhaustion, also hold relatively high educational goals compared to their competence level, it would be important to gain further insight into the sustained effects of academic well-being on young people's educational aspirations and attainment. Future studies should, for example, investigate the reciprocal relationships between performance, well-being and educational aspirations over time.

CONCLUSION

In conclusion, the present study contributes to the research on students' academic well-being and performance in several ways. First, we demonstrated the added value of employing a person-centered approach when investigating the relation between academic well-being and mathematics performance among adolescent students, as we found both linear and non-linear relations between student's academic well-being and performance. However, as only three profiles were identified in seventh grade, our results indicate that students' well-being and performance are not as clearly separated in the earlier years of adolescence. Further, although our results show that the majority of students seem to perform quite well in mathematics and express a rather positive pattern of academic well-being and hold relatively high educational aspirations, it should be noted, that the proportion of students belonging to the negative academic well-being group was more than 15%. This, clearly, is something that should not be ignored as it has been suggested that school burnout may predict subsequent depressive symptoms later on (Salmela-Aro et al., 2009b). The present study also added to the existing research by investigating the stability of and change in academic well-being and mathematics

performance profiles over one school year, and found that students' academic well-being profiles are relatively stable. In our view, taking into account students' mathematical skills as well as various aspects of academic well-being simultaneously, enables a more comprehensive understanding of students' academic and emotional functioning and of the way it is linked with educational aspirations during critical transition periods, when adolescents are making choices regarding their future education and occupation. With this understanding, we might be able to identify the at-risk students and even to discover ways how to best support students to find suitable educational pathways for themselves and to thrive in school.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of Finnish Advisory Board on Research Integrity guidelines, The Board for Research Ethics at Åbo Akademi University. The protocol was approved by The Board for Research Ethics.

AUTHOR CONTRIBUTIONS

Each author has made substantial contributions to the work. AW, HT, and JK designed this study. AW drafted the manuscript. HT and JK served as critical reviewers. AW and JK performed the research. AW analyzed the data. All authors approved the final version of the manuscript for submission.

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APPENDIX

Appendix A | Average latent class probabilities for most likely latent class membership by latent class in seventh and ninth grade.

Most likely latent class membership	Latent class			
	(1) Thriving	(2) Average	(3) Low-performing	(4) Negative academic well-being
(1) Thriving	<i>0.904/0.899</i>	0.096/0.074	−/0.027	0.000/0.000
(2) Average	0.063/0.037	<i>0.900/0.896</i>	−/0.020	0.037/0.046
(3) Low-performing	−/0.078	−/0.124	<i>−/0.797</i>	−/0.000
(4) Negative academic well-being	0.000/0.000	0.088/0.103	−/0.000	<i>0.912/0.897</i>

Values in italics represent the average posterior probability associated with the clusters to which students were assigned. Probabilities in seventh and ninth grade are separated by slash.



Cyberbullying Victimization, Self-Esteem and Suicidal Ideation in Adolescence: Does Emotional Intelligence Play a Buffering Role?

Natalio Extremera^{1*}, Cirenía Quintana-Orts², Sergio Mérida-López¹ and Lourdes Rey²

¹ Department of Social Psychology, Universidad de Málaga, Málaga, Spain, ² Department of Personality, Evaluation and Psychological Treatment, Universidad de Málaga, Málaga, Spain

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Dipartimento di Psicologia, Università
degli Studi di Torino, Italy
Laura Badenes-Ribera,
Universitat de València, Spain

*Correspondence:

Natalio Extremera
nextremera@uma.es

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Cyberbullying has been linked to social, physical and psychological problems for adolescent victims but there has been no analysis of the specific role of emotional intelligence in protecting against the negative symptoms associated with cyberbullying victimization. This study examined the interaction between cyberbullying victimization and emotional intelligence (EI) as predictors of psychological maladjustment (operationalized as high suicidal ideation and low self-esteem) in 1,660 Spanish adolescents. We also investigated whether levels of EI moderated the relationship between cyberbullying victimization and mental health problems. The cyberbullying victimization x EI interaction contributed to variance in suicidal ideation and self-esteem in our sample of adolescent victims. Adolescent victims of cyberbullying with high EI scores reported lower suicidal ideation and higher self-esteem than their less emotionally intelligent counterparts. Thus, our data provide empirical support for theoretical and conceptual work connecting victimization, EI abilities and mental health associated with cyberbullying. This suggests that alone, but also in combination, EI may be particularly relevant in leading to increased levels of mental health issues in cyberbullying victims. Finally, the theoretical implications of our findings on the relationship between these variables and the mental health issues of adolescent victims of cyberbullying are discussed.

Keywords: cybervictimization, adolescence, emotional intelligence, suicide ideation, self-esteem

INTRODUCTION

Internet and electronic devices have given adolescents novel ways of socializing but have also made possible new kinds of negative interactions, known as cyberbullying (Tokunaga, 2010; Palermi et al., 2017). Although various definitions of cyberbullying have been proposed, it is commonly defined as “an aggressive, intentional act carried out by a group or individual, using electronic forms of contact, repeatedly and over time against a victim who cannot easily defend him or her-self” (Smith et al., 2008, p.376). In particular, cyberbullying involves harassing, intimidating, threatening or otherwise harming others by sending or posting threatening or humiliating texts, pictures or videos over the Internet without permission (Patchin and Hinduja, 2010). Compared with traditional bullying, the relationship between perpetrator and adolescent victim is more

complex, due to the anonymity that is possible on electronic media, as well as the rapid social dissemination, lack of supervision, permanence of the material and the easy access that bullies have to their victims (Juvonen and Gross, 2008; Della Cioppa et al., 2015). Globally, a significant proportion of young people are victims of cyberbullying, with prevalence ranging from as low as 6.5 or 10% (Ybarra and Mitchell, 2004; Mishna et al., 2011) to as high as 72% (Juvonen and Gross, 2008). However, there seems to exist some gender differences with regard to prevalence, with higher victimization rates among girls in 70% of the countries and showing decline with age in about two thirds of the countries (Craig et al., 2009).

Although the psychological consequences of cyberbullying appear to be very similar to those of traditional bullying, being a victim of cyberbullying has a greater negative effect on adolescents' psychosocial adjustment than traditional bullying (Mishna et al., 2011; Campbell et al., 2012). Victims of cyberbullying report more social and emotional problems, such as isolation and emotion regulation problems, than victims of traditional bullying (Ak et al., 2015; Elipe et al., 2015). Research has also shown that cyberbullying has negative consequences for both the physical health and psychological adjustment of victims (Tsaousis, 2016). Young people who were victims of cyberbullying reported higher levels of sleep problems and bed wetting than their non-victimized peers (Monks et al., 2009). Student victims of cyberbullying are at increased risk of depression, anxiety and substance abuse (Takizawa et al., 2014; Palermi et al., 2017).

Cyberbullying also has a negative effect on victims' self-esteem (Patchin and Hinduja, 2010; O'Brien and Moules, 2013). Self-esteem, often defined as "a favorable or unfavorable attitude toward the self" (Rosenberg, 1965, p.15), is critical during adolescence, when identity development is heavily influenced by one's social relationships (Leary and Downs, 1995). Scholars have shown that a low self-esteem, among other relevant variables, is both a strong predictor of cyberbullying victimization and also a negative consequence after a cyberbullying experience (Egan and Perry, 1998). Recent studies investigating the relationship between cyberbullying and self-esteem have found that victims of cyberbullying report lower self-esteem (Chang et al., 2013; Cénat et al., 2014). While the causal link is not clear, some authors suggest that victims of bullies who use the Internet to harass and mock may be more likely to develop low self-esteem which, in turn, can have severe consequences for young people's well-being and psychological adjustment (Palermi et al., 2017), including increasing the risk of suicide. Suicide is the second most frequent cause of death amongst those aged between 15 and 29 years old (World Health Organization, 2014). Although few studies have investigated the relationship between cyberbullying and suicide, existing results suggest that the risks of suicidal behavior and suicidal ideation are higher in those who have been victimized (Hinduja and Patchin, 2010; van Geel et al., 2014). If cyberbullying is not handled appropriately, it may lead to negative emotional responses and poor psychological adjustment (Ortega et al., 2012). Cyberbullying has a negative

effect on adolescent development and is typically associated with multiple psychological problems. Some researchers have begun to study personal resources that facilitate coping with cyberaggression by peers and are therefore protective (Chen et al., 2017). These personal resources might ameliorate the potentially negative effects of cyberbullying and may include emotional intelligence (EI).

EI is defined as a set of cognitive-emotional skills for processing emotional information in order to promote emotional and intellectual growth (Mayer and Salovey, 1997). EI encompasses the ability to perceive and express emotion, the ability to use emotional information to facilitate thought, the ability to use emotional reasoning and understanding and the ability to regulate emotions (Mayer et al., 2008). Research has shown that people high in EI are more likely to be aware of their own emotions and to express and regulate emotions more effectively than their lower EI peers and that they also have lower rates of psychopathologies related to emotional difficulties (for a review see Mayer et al., 2008; Martins et al., 2010; Resurrección et al., 2014). An emerging body of research shows that EI seems to play a key role in psychological adjustment in adolescence (Baroncelli and Ciucci, 2014; Resurrección et al., 2014). Several studies have shown that adolescents with greater EI are more likely to experience positive social relationships and better psychological adjustment (e.g., better coping strategies, fewer internalizing problems) than their lower EI peers (Lomas et al., 2012; Baroncelli and Ciucci, 2014), so EI is a potential target for school-based interventions aimed at weakening the link between cyberbullying victimization and psychological maladjustment during adolescence.

To date, there has been relatively little research directly investigating whether EI helps to mitigate the negative consequences associated with cyberbullying. One study found that adolescents with low IE were more likely to be victims of cyberbullying than their higher EI peers; in other words, adolescents who are poor at perceiving, expressing and regulating emotions are more likely to be cyberbullied (Baroncelli and Ciucci, 2014). Research has also pointed out EI as an important protective factor against the negative consequences of cyberbullying victimization as it might buffer mental health problems by promoting positive ways of coping (e.g., Davis and Humphrey, 2012b). Indeed, earlier studies have found that, in university students, EI skills moderate the relationship between cyberbullying victimization and its emotional impact, suggesting that developing emotional skills might be a way of minimizing the negative consequences of victimization (Elipe et al., 2015). Finally, Davis and Humphrey (2012a) found that, in a sample of adolescents, EI moderated the relationship between various negative life stressors and mental health. These authors have also highlighted that pathways linking EI to better mental health are complex and suggested further research on those pathways to the prediction, understanding and attenuation of maladjustment in youth. In this case, despite the increasing interest in the association between EI and psychological problems during adolescence, the role of EI as a potential buffer against the influence of cyberbullying on psychological problems has not yet been examined. This study addresses this gap.

This Study

The aim of this study was to provide further evidence on the potential moderation of the relationship between cyberbullying victimization and psychological adjustment by EI in adolescence. Three specific objectives were defined. First, to explore the relationship between cyberbullying victimization, EI, self-esteem and suicide risk in a relatively large sample of adolescents in order to extend our understanding of the correlates of cyberbullying victimization experiences in adolescence. Second, to test whether sociodemographic factors (i.e., gender, age and grade levels) and EI showed differential patterns in predicting our main variables (i.e., cyberbullying victimization, self-esteem, and suicide risk). Finally, to investigate EI as a potential moderator of the relationship between cyberbullying victimization and positive (e.g., self-esteem) and negative (e.g., suicide risk) psychological outcome variables.

Based on previous research, we expected to find cyberbullying victimization to be positively related to suicide risk and negatively associated with self-esteem, whereas we expected to find EI to be negatively related to suicide risk and positively associated with self-esteem. Furthermore, as an important and positive factor associated with psychological adjustment (e.g., Davis and Humphrey, 2012b), we hypothesize that EI might serve as a buffer between cyberbullying victimization and psychological maladjustment in adolescents. More specifically, we hypothesize that those adolescents with higher levels of EI would report lower levels of suicide risk and greater self-esteem.

MATERIALS AND METHODS

Participants

The sample consisted of 1,660 adolescents (50.4% female) studying in six public high schools in Málaga (Andalusia, Spain). The mean age was 14.10 years ($SD = 1.54$; range 12–18). Participation in the study was voluntary and confidential. The study was carried out in accordance with the Declaration of Helsinki (2013) and was approved by the Research Ethics Committee of the University of Malaga (Spain).

Procedure

As the implementation and evaluation of the research fell under the discretion of the head teachers, written consent for individual participants was provided by school authorities, who were responsible for consulting and reporting to the parents about the research and made the final decision on their research participation. No parents refused the adolescents' participation as they believed that this research for detection of potential bullying in their educational center was a beneficial initiative for school quality of life of students, parents and teachers. Therefore, the assessment was carried out in classrooms during the normal school schedule, with guarantees of the participants' voluntariness and anonymity and with the written approval of the school authorities. The questionnaires were completed during a 1-h lesson during the last two trimesters of the 2016/2017 academic year, with the exact time dependent on the schedule of individual schools. In addition, students, parents and school authorities were fully aware that by completing the

questionnaires they were in fact providing informed consent to use this data anonymously in the present research. The questionnaires were administered to the classes in sessions with one of the researchers and at least one teacher from the school present. All participants were encouraged to provide honest answers.

Cyberbullying Victimization

Cyberbullying victimization was measured by using the cybervictimization subscale of the European Cyberbullying Intervention Project Questionnaire (ECIP-Q; Brighi et al., 2012). The ECIP-Q is a 22-item self-report measure dealing with cyberbullying in the previous 2 months. It includes items about insults addressed directly to the respondent, insulting comments made to others about the respondent; threats; identity theft; use of the respondent's identity without permission; theft of private information; displays of private information; embarrassing videos and pictures; manipulation of pictures; social exclusion; spreading of rumors (Elise et al., 2015). The cybervictimization subscale comprises 11 items to which responses are given using a 5-point Likert scale ranging from 0 (never) to 4 (more than once a week). The scale was used in the Spanish version by Ortega-Ruiz et al. (2016), which has been reported to have adequate reliability and validity. In our sample, Cronbach's alpha for the cybervictimization subscale was 0.86.

Emotional Intelligence

EI was measured with the Wong and Law Emotional Intelligence Scale (WLEIS; Wong and Law, 2002), which consists of 16 items, four items for each subscale: self-emotion appraisals (SEA), others' emotion appraisals (OEA), regulation of emotion (ROE), and use of emotion (UOE). Each item is rated on a seven-point Likert scale ranging from 0 (totally disagree) to 6 (totally agree). As we were interested in the overall construct, we summed the subscale scores to yield a global perceived EI score, with higher scores indicating greater EI. Previous research has supported score reliability (e.g., Mérida-López et al., 2017). In the present study, the Spanish version of the WLEIS had acceptable reliability, with the internal consistency coefficient for the total WLEIS score of 0.88 and the composite reliability of 0.83. The average variance extracted and McDonald's Ω was of 0.82 for both indexes.

Suicidal Thoughts and Behaviors

Suicidal thoughts and behaviors were assessed with the Suicidal Behaviors Questionnaire-Revised (SBQ-R; Osman et al., 2001) which provides an indication of overall suicidality. It comprises four items to which responses are given using a Likert scale: lifetime suicidal ideation and suicide attempts, frequency of suicidal ideation in the past year, communication of suicidal intent and likelihood of future suicidal behavior; higher scores indicate greater suicidality. The SBQ-R was translated from English into Spanish using back-translation. Research has supported score reliability (Extremera and Rey, 2016). In this research, the Spanish version of the SBQ-R showed acceptable reliability, with an internal consistency coefficient of 0.87 and a

composite reliability of 0.93. The average variance extracted and McDonald's Ω was of 0.90 for both indexes.

Self-Esteem

Self-esteem was measured using the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). The RSES is a self-report measure which was designed to assess global self-esteem. The RSES consists of 10 items, 5 positively worded and 5 negatively worded, to which responses are given using a Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). We used the Spanish version (Martín-Albo et al., 2007), for which adequate reliability and validity have been reported. In our sample the internal consistency coefficient was 0.87.

Data Analyses

First, we computed descriptive statistics and calculated Pearson's product moment correlations (two-tailed) between cyberbullying victimization (independent variable), EI (moderator), self-esteem and suicide risk (dependent variables). We used SPSS (version 22) for these analyses. Second, we carried out moderation analyses with self-esteem and suicide risk as dependent variables to explore potential moderation of the relationship between cyberbullying victimization and adolescents' psychological adjustment by EI. The SPSS PROCESS macro was used to conduct these analyses (Hayes, 2013). Standard procedures were followed, with the number of bootstrap resamples set to 5,000 with 95% confidence intervals.

RESULTS

Descriptive Analyses

Descriptive statistics (mean, standard deviations, and reliabilities) and bivariate correlations among the study variables are displayed in **Table 1**. As the table shows, there were correlations among cyberbullying victimization, EI and two indicators of psychological adjustment (self-esteem and suicide risk) in the expected directions. First, cybervictimization was negatively related to EI and self-esteem, but positively associated with suicide risk. In addition, EI was positively related to self-esteem and negatively linked to suicide risk. Lastly, self-esteem was negatively associated with suicide risk. Both the total score of EI and the subscales were linked to self-esteem and suicide risk in the expected directions. In particular, use of emotion was the dimension with the strongest link to self-esteem, whereas regulation of emotion showed the highest association with suicide risk.

Multivariate Statistical Analysis

Multivariate statistical analysis was used to examine the influence of gender, age, grade levels and EI on self-esteem, suicide risk and cybervictimization. First, age was coded as a dummy variable (younger group = 0; older group = 1). In short, the younger group was made up with those adolescents between 12 and 14 years, and the older adolescent group was comprised of individuals aged between 15 and 18 years. Similarly, grade level was coded as a dummy variable: grades 7 and 8 were labeled as the lower grade levels (0), whereas grades 9–11 were classified as

the higher grade levels (1). With respect to EI levels, the same procedure was followed (low EI = 0; high EI = 1). With the aim of dividing the sample into two groups, one with high and one with low EI levels, the adolescents who scored a standard deviation above the mean were included in the group with high EI, while the adolescents who had a standard deviation below the mean were included in the group with low EI. Therefore, gender, age, grade levels and EI levels were included as independent variables in order to test for its potential main and interaction effects.

The main effect for gender was significant [Wilks' $\lambda = 0.97$, $F_{(3, 484)} = 5.93$, $p < 0.001$, partial $\eta^2 = 0.035$]. With respect to EI levels, similar results were found [Wilks' $\lambda = 0.77$, $F_{(3, 484)} = 48.94$, $p < 0.001$, partial $\eta^2 = 0.23$]. However, no significant differences were found concerning age [Wilks' $\lambda = 0.99$, $F_{(3, 484)} = 0.68$, $p = 0.57$] nor grade level [Wilks' $\lambda = 0.99$, $F_{(3, 484)} = 1.91$, $p = 0.13$]. The interaction effects were not significant for gender x age [Wilks' $\lambda = 0.99$, $F_{(3, 484)} = 0.31$, $p = 0.82$], gender x grade [Wilks' $\lambda = 0.99$, $F_{(3, 484)} = 2.07$, $p = 0.10$], age x grade [Wilks' $\lambda = 0.99$, $F_{(3, 484)} = 0.38$, $p = 0.77$], gender x EI [Wilks' $\lambda = 0.99$, $F_{(3, 484)} = 2.17$, $p = 0.09$], age x EI [Wilks' $\lambda = 0.99$, $F_{(3, 484)} = 0.50$, $p = 0.68$] nor grade x EI [Wilks' $\lambda = 0.99$, $F_{(3, 484)} = 2.35$, $p = 0.07$].

In order to further test the overall gender and EI differences in cybervictimization, self-esteem and suicide-risk, several one-way ANOVAs were used. In addition, the effect sizes were calculated to describe the magnitude of gender and EI differences (Cohen, 1988). Effects sizes of 0.20, 0.50 and 0.80 were considered small, medium and large, respectively. Significant differences between boys and girls were found regarding the three indicators. In comparison to girls, boys reported lower cybervictimization [$t_{(1614)} = -2.78$, $p < 0.010$; $d = -0.16$], lower suicide risk [$t_{(1450)} = -7.76$, $p < 0.001$; $d = -0.38$] and higher self-esteem [$t_{(1614)} = 5.75$, $p < 0.001$; $d = 0.28$]. Similarly, significant differences were found between groups regarding low and high EI. Adolescents with low EI reported lower self-esteem [$t_{(500)} = -18.40$, $p < 0.001$; $d = -1.63$], higher cybervictimization [$t_{(350)} = 4.52$, $p < 0.001$; $d = 0.40$] and higher suicide risk [$t_{(500)} = 11.61$, $p < 0.001$; $d = 1.01$] in comparison to their high EI counterparts.

Moderation Analyses

We conducted moderation analyses to examine whether EI moderated the effect of cybervictimization on two indicators of psychological adjustment (self-esteem and suicide risk). Age, grade and gender were included as covariates in our models (steps 1, 2, and 3). Cybervictimization was entered in the fourth step as our independent variable, whereas the total score in EI was included in the fifth step. Lastly, the interaction of cybervictimization with EI was entered in the sixth step. Furthermore, to illustrate the effect of the interaction between cybervictimization and EI on self-esteem and suicide risk in adolescents, we plotted the regression following the procedures outlined by Hayes (2013).

With respect to self-esteem, a total of 28% of the variance was explained by the final model (see **Table 2**). First, we found that sociodemographic factors predicted 4% of the total variance.

TABLE 1 | Descriptive statistics and intercorrelations among study variables.

	1	2	3	4	5	6	7	8
1. Cybervictimization	-							
2. Emotional Intelligence	-0.13** [-0.19 to -0.07]	-						
3. SEA	-0.14** [-0.20 to -0.08]	0.83** [0.81 to 0.85]	-					
4. OEA	0.02 [-0.04 to 0.08]	0.63** [0.59 to 0.67]	0.41** [0.36 to 0.46]	-				
5. ROE	-0.15** [-0.21 to -0.09]	0.81** [0.79 to 0.83]	0.62** [0.58 to 0.66]	0.26** [0.20 to 0.32]	-			
6. UOE	-0.11** [-0.17 to -0.05]	0.81** [0.79 to 0.83]	0.54** [0.49 to 0.58]	0.38** [0.33 to 0.43]	0.54** [0.49 to 0.58]	-		
7. Self-esteem	-0.22** [-0.28 to -0.16]	0.49** [0.44 to 0.54]	0.41** [0.36 to 0.46]	0.13** [-0.19 to -0.07]	0.43** [0.38 to 0.48]	0.51** [0.46 to 0.56]	-	
8. Suicide risk	0.35** [0.29 to 0.40]	-0.36** [-0.41 to -0.30]	-0.33** [-0.39 to -0.27]	-0.03 [-0.09 to 0.03]	-0.37** [-0.42 to -0.32]	-0.33** [-0.39 to -0.27]	-0.51** [-0.56 to -0.46]	-
M	0.20	4.82	5.04	5.13	4.36	4.77	2.94	5.55
SD	0.38	0.98	1.22	1.12	1.41	1.32	0.64	3.89
α	0.86	0.88	0.75	0.72	0.80	0.77	0.87	0.87

$N = 1,660$. ** $p < 0.01$. SEA, Self-emotion appraisals; OEA, Others' emotion appraisals; ROE, Regulation of emotion; UOE, Use of emotion.

After controlling for these factors, cybervictimization was found to explain 4% of the variance in self-esteem scores. In addition, EI was found to account for an additional amount of self-esteem (20%) even after controlling the variance attributable to sociodemographic factors and cybervictimization. Finally, the cybervictimization \times EI interaction explained a significant amount of the variance in self-esteem scores.

As can be seen in **Figure 1**, the relationship between cybervictimization and self-esteem weakened as EI increased. Specifically, the above-mentioned negative relationship between cybervictimization and self-esteem was significant at low levels of EI [$b = -0.20$, $t_{(1653)} = -4.64$, $p < 0.001$]. Quite interestingly, at higher levels of EI, the association between cybervictimization and self-esteem was also significant and even more intense [$b = -0.34$, $t_{(1653)} = -6.02$, $p < 0.001$].

Regarding suicide risk, a total of 24% of the variance in this variable was explained by the model (see **Table 2**). First, sociodemographic factors were found to predict 4% of the variance in suicide risk. In addition, cybervictimization was found to explain 11% of the variance in self-esteem scores even after controlling for these factors. Additionally, EI accounted for 9% of the variance in self-esteem, even after controlling the variance attributable to sociodemographic factors and cybervictimization. Lastly, we found that the cybervictimization \times EI interaction explained a significant, unique component of variance in suicide risk.

As **Figure 2** shows, the association between cybervictimization and suicide risk weakened as EI increased. In particular, the positive association between cybervictimization and suicide risk was significant at low levels of EI [$b = 3.58$, $t_{(1653)} = 13.40$, $p < 0.001$]. At higher levels of EI, this relationship decreased although it remained significant [$b = 2.14$, $t_{(1653)} = 5.80$, $p < 0.001$].

DISCUSSION

Being a victim of cyberbullying has been linked to social, physical and psychological problems (Tokunaga, 2010; Palermi et al., 2017). Although a meta-analytic study identified some key predictors of cyberbullying victimization by peers (Chen et al., 2017), more research is needed into factors that mitigate the negative consequences of cyberbullying victimization in adolescence. This study corroborates previous empirical research showing that cyberbullying (van Geel et al., 2014; Tsaousis, 2016) and EI (Elipé et al., 2015) influence mental health in adolescents. Our results also extend recent findings on the role of emotional abilities in buffering the negative consequences of cyberbullying victimization (Baroncelli and Ciucci, 2014; Hemphill et al., 2014), as they show that EI may also moderate the association between cyberbullying victimization and psychological maladjustment, operationalized as low self-esteem and high suicidal ideation.

Regarding our hypothesis on the expected relationship between variables, in line with prior work, we found that cyberbullying victimization was positively associated with suicide risk (van Geel et al., 2014) and negatively related to self-esteem (Tsaousis, 2016). These results confirm earlier research suggesting that being a victim of cyberbullying has a negative impact on both physical and psychological health (Takizawa et al., 2014; Tsaousis, 2016; Palermi et al., 2017). In general, individuals have a fundamental psychological need to belong to a peer group and to be accepted by their peers (Baumeister and Leary, 1995). Therefore, being cyberbullied in adolescence may cause psychological maladjustment and reduced well-being (Parker et al., 2006). Our results also suggest that being cyberbullied has a considerable impact on the development of negative emotional responses that can lead to reduced

TABLE 2 | Moderated hierarchical regression analyses for self-esteem and suicide risk.

	R ²	F	B	SE	β	95% CI	f ²	ΔR^2
SELF-ESTEEM								
Step 1	0.020	33.40					0.02	0.020***
Gender			−0.18	0.03	−0.14***	−0.24 to −0.12		
Step 2	0.039	34.05					0.04	0.020***
Age			−0.06	0.01	−0.14***	−0.08 to −0.04		
Step 3	0.042	24.41					0.04	0.003*
Grade			0.05	0.02	0.10*	0.01 to 0.09		
Step 4	0.082	36.92					0.09	0.040***
Cybervictimization			−0.34	0.04	−0.20***	−0.42 to −0.26		
Step 5	0.279	128.30					0.39	0.198***
Emotional Intelligence			0.30	0.01	0.45***	0.27 to 0.32		
Step 6	0.282	108.00					0.39	0.002*
Cybervictimization × Emotional Intelligence			−0.03	0.01	−0.05*	−0.06 to −0.003		
SUICIDE RISK								
Step 1	0.035	59.89					0.04	0.035***
Gender			1.45	0.19	0.19***	1.09 to 1.82		
Step 2	0.041	35.27					0.04	0.006***
Age			0.20	0.06	0.08***	0.08 to 0.31		
Step 3	0.043	24.68					0.04	0.002
Grade			−0.24	0.13	−0.08	−0.49 to 0.02		
Step 4	0.154	75.28					0.18	0.111***
Cybervictimization			3.45	0.23	0.34***	2.99 to 3.91		
Step 5	0.240	104.21					0.32	0.086***
Emotional Intelligence			−1.19	0.09	−0.30***	−1.36 to −1.02		
Step 6	0.244	89.09					0.32	0.005***
Cybervictimization × Emotional Intelligence			−0.27	0.08	−0.07***	−0.44 to −0.11		

B, Unstandardized beta; SE, Standard error of unstandardized beta; 95% CI = 95% Confidence Interval. * $p < 0.05$ and *** $p < 0.001$.

levels of psychological adjustment such as increased suicidal ideation and behaviors and decreased self-esteem (Mishna et al., 2011; Campbell et al., 2012). Moreover, in line with previous research, the results showed that girls reported higher levels of cybervictimization (Craig et al., 2009), as well as more adverse psychological maladjustment compared to boys (e.g., Zych et al., 2015). One plausible explanation might be related to the definition of cybervictimization, which could be understood as an indirect type of bullying who often girls are more likely to experience (Beckman et al., 2013). However, further studies are needed to provide a more nuanced picture of gender and other sociodemographic differences in mental health indicators (Zych et al., 2015).

Regarding our hypothesis about the buffering role of EI in the cybervictimization-mental health link, drawing on prior meta-analytical research (Chen et al., 2017), our results indicate that EI might also be a personal resource that might alleviate the negative psychological symptoms in adolescents at risk of cybervictimization. Earlier work has suggested that EI can buffer against the negative effects of stressful life events on self-reported mental health (Davis and Humphrey, 2012a), our results extend this finding by showing that cyberbullying is associated with increased suicidal ideation and low self-esteem at all levels of EI, which indicates

that cyberbullying has a severely deleterious effects on the health of its victims. Adolescent victims of cyberbullying may experience negative psychological symptoms as a result of repeated cyberaggression against which they are unable to defend themselves. However, independently of cyberbullying victimization, adolescents with greater EI were less likely to report symptoms of suicidal ideation and low self-esteem than their lower EI peers. It is, therefore, possible that cyberbullying has less impact on the suicidality of adolescent victims and self-esteem if they have high EI. Possessing the emotional abilities grouped together as EI - perception of emotions, understanding of the causes and consequences of emotions and the ability to manage the emotions of oneself and others-may reduce the risk that adolescent victims of cyberbullying might experience psychological problems as a consequence.

LIMITATIONS AND FUTURE RESEARCH

Our study presents several limitations, which provide an avenue for further research. We used a self-report measure of EI, but future studies should use EI performance tests such as the Mayer-Salovey-Caruso Emotional Intelligence Test (Mayer et al., 2003) in order to generalize our findings. In addition, although the

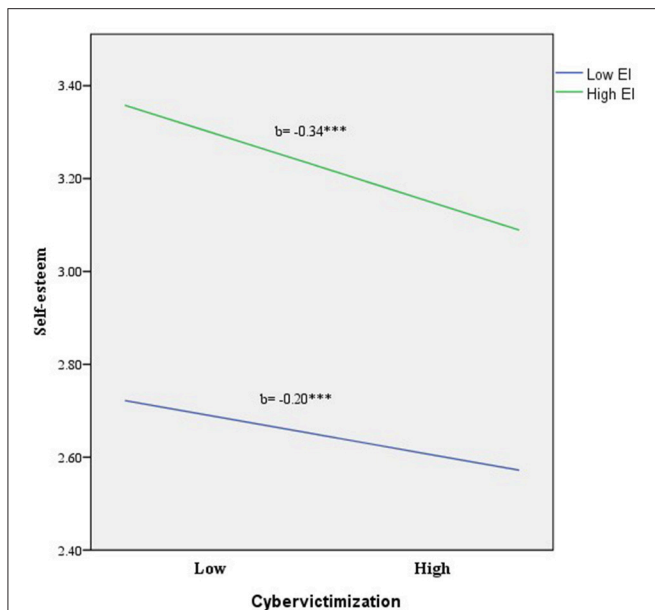


FIGURE 1 | Relationship of cybervictimization and EI for predicting self-esteem, *** $p < 0.001$.

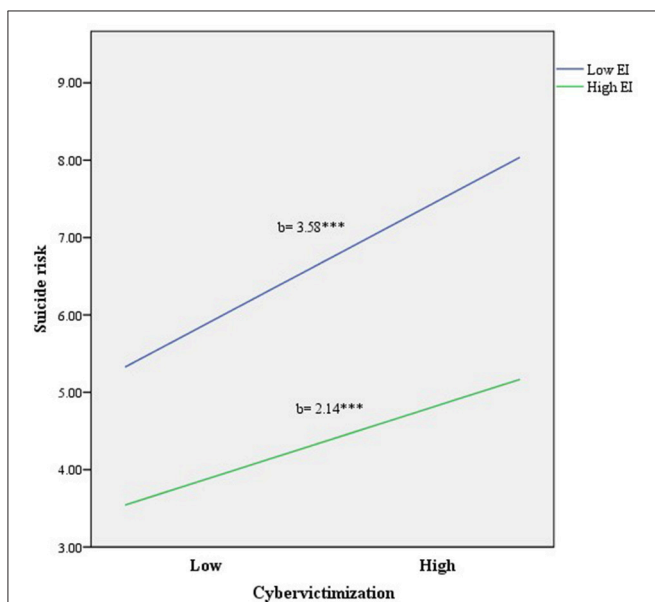


FIGURE 2 | Relationship of cybervictimization and EI for predicting suicide risk, *** $p < 0.001$.

and negative psychological symptoms are measured at a later date would provide further insights to the causal relationships among EI, cyberbullying victimization and mental health. It is also important to underline that our adolescent participants were healthy and that our findings may not generalize to victims of cyberbullying diagnosed with post-traumatic stress disorder. Also, our study used pencil and paper. Further studies, especially in the field of cyberbullying, might be conducted online which would save time in measuring a large sample and some bias might be reduced. Relatedly, future studies should examine differential profiles of personal resources such as EI regarding experiences of cybervictimization. Finally, further research is needed to examine the potential buffering role of EI considering specific samples of cybervictimized adolescents.

Theoretical and Practical Implications

These limitations notwithstanding, there are several implications of these findings for research and practice. Theoretically, our findings suggest that being a victim of cyberbullying has a greater effect on adolescents' self-esteem and suicidal ideation. Such effects might also be more negative if victims do not believe that their emotional resources are adequate for coping with being cyberbullied. It is, therefore, plausible that stressful experiences such as being cyberbullied might have a cumulative negative impact on young people, leading to low self-esteem and high suicidal ideation. However, one's level of EI may influence how one interprets and reacts to cyberbullying, thus high EI may mitigate some of the negative consequences (Eliepe et al., 2015). In other words, while cyberbullying victimization may be a risk factor for negative psychological symptoms in adolescence, EI could be an important moderator of this association. Although theoretical models of cyberbullying have consistently documented the detrimental effect on mental health (Mishna et al., 2011; Campbell et al., 2012), identifying the protective factors (i.e., EI) that shield victims from the adverse health consequences of cyberbullying is an important avenue and might offer a more comprehensive theoretical framework. Regarding practice, prevention and intervention programs should incorporate not only a whole-school anti-bullying policy and curriculum-based activities to prevent cyberaggression, but also a variety of EI-based strategies to reduce the adverse symptoms associated with being cyberbullied by peers. Cyberbullying prevention programs are currently available online, so parents and caregivers should use the websites associated with such programs as a source of information about how to discuss cyberbullying with young people. Moreover, school practitioners might draw on these websites to teach students how to identify electronic forms of aggression, to recognize potential psychosocial symptoms of cyberbullying victimization, to resolve conflicts and to use nonviolent problem-solving techniques in order to increase the personal resources at their disposal and thus reduce the likelihood of psychological maladjustment or interpersonal dysfunction arising in adolescence. Accordingly, since electronic forms of adolescent aggression have been shown to be linked to psychological problems, and may indirectly influence the

learning environment at school (Zimmerman et al., 1997), educators and school psychology practitioners should make preventing these forms of aggression a priority, even when the incidents occur off-campus. For example, parents should be contacted and students should be disciplined if their behavior threatens the academic and psychological outcomes of other students. Thus, the EI of adolescents is another potential intervention target for initiatives to reduce the incidence and impact of cyberbullying. School practitioners might be able to mitigate some of the negative consequences of cyberbullying by developing the EI of potential adolescent victims so that they are better able to manage negative emotions such as worry, fear, helplessness and anxiety. Similarly, EI training might make adolescents more resilient to the negative effects of electronic aggression on self-esteem by helping to cognitively restructure how it is perceived and increasing their awareness of the emotional impact of hurtful messages on self-concept and giving them better strategies for coping with cyberbullying. Improving the EI of adolescents may not only help victims of cyberbullying to cope, but also it may also help bystanders and perpetrators to recognize cyberbullying, to understand its emotional impact on victims and the importance of preventing it from happening. As we found that EI acted as a buffer against the negative impact of cyberbullying on suicidal ideation and self-esteem, future research could include investigating whether teaching adolescents EI skills reduces the psychological symptoms associated with being cyberbullied by peers and changes the status of victims in their peer group. EI interventions might also have a positive impact on school climate and interpersonal relationships between peers (Durlak et al., 2011), academic performance (Perera and DiGiacomo, 2013) and wellbeing (Sánchez-Álvarez et al., 2016) which are key factors for school success.

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CONCLUSION

Despite these limitations, our research provides further empirical evidence that EI should be considered as a personal resource that is relevant to the negative symptoms associated with cyberbullying victimization. Our findings contribute to the theoretical literature on cyberbullying and its negative consequences in adolescence, but they could also be used to develop school-based, integrated bullying prevention programs aimed at increasing the emotional abilities of adolescents in order to protect against, or at least mitigate, the negative consequences of being a victim of cyberbullying.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of Ethics Committee of the University of Málaga (Spain), with informed consent from all participants. Directors' institute gave informed consent in accordance with the Declaration of Helsinki. The protocol was approved by Research Ethics Committee of the University of Málaga (62-2016-H).

AUTHOR CONTRIBUTIONS

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

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The Effect of Parental Involvement and Socioeconomic Status on Junior School Students' Academic Achievement and School Behavior in China

Wenjie Duan^{*†}, Yuan Guan^{*†} and He Bu[‡]

Wuhan University, Wuhan, China

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Edited by:

Puri Checa,
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Reviewed by:

Xiao Zhou,
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Francesca Marina Bosco,
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*Correspondence:

Wenjie Duan
duan.w@outlook.com
Yuan Guan
whatsongy@163.com

[†]These authors have contributed
equally as joint first authors.

[‡]Present address:

He Bu,
City University of Hong Kong,
Hong Kong, Hong Kong

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A survey was conducted on 19,487 Chinese junior school students to elucidate the moderating role of socioeconomic status (SES) in the relationship between parental involvement (i.e., home-based involvement and academic socialization) and junior school students' performance in school (i.e., academic achievement and school behavior). The data includes 10,042 males and 9,445 females (mean age = 14.52, $SD = 1.24$). It was taken from the 2013–2014 Chinese Educational Panel Survey (CEPS), that was administrated by the National Survey Research Center at Renmin University of China. The results demonstrate that SES negatively moderates both the relationship between academic socialization and academic achievement, and the relationship between home-based involvement and school behavior. Findings imply that parental involvement activities are highly beneficial for junior school students in families with low SES. Academic socialization is generally associated with academic success, whereas home-based involvement closely relates to school behavior. Future home-based interventions can be developed to promote parental involvement activities in low-SES families. The results also showed important implications for the development of family education in China.

Keywords: parental involvement, home-based involvement, academic socialization, academic achievement, school behavior, socioeconomic status

INTRODUCTION

Previous studies have shown that parental involvement impacts on the academic achievement and behavior of adolescents (Fan and Chen, 2001; Jeynes, 2016). This brief study aims to promote the development of children and adolescents by examining the relationship between parental involvement, socioeconomic status (SES), and junior school students' performance (e.g., academic achievement and school behavior). A survey that took a national representative sample for China was considered in this work.

Parental involvement generally includes three aspects: home-based involvement; school-based involvement; and academic socialization (Fan and Chen, 2001; Hill and Chao, 2009; Hill and Tyson, 2009). Home-based involvement entails parents' involvement activities at home such as supervising homework, checking homework, and talking about school life; school-based involvement includes some activities implemented at school such as communicating with teachers,

attending the class meeting, and participating in school activities; academic socialization mainly includes parents' expectations and faith about their children's education (Hill and Tyson, 2009; Benner et al., 2016). This framework was usually used in American culture (Wang and Sheikh-Khalil, 2014). For example, using data for 15,240 middle school students in America, Benner et al. (2016) tested the relationship between parental involvement (i.e., home-based involvement, school-based involvement, and academic socialization) and academic achievement. With the American data of Education Longitudinal Study 2002–2013, Day and Dotterer (2018) assessed the connection between parental involvement (i.e., home- and school-based involvement and academic socialization) and academic achievement. However, such framework should be modified in the Chinese context (Lau et al., 2011). By using a data of 310 kindergartens, elementary schools and secondary schools from Home-School Cooperation Committee of the Education Department in Hong Kong, Ng (1999) found that Chinese parents didn't like to get involved in school, and teachers didn't like to get parents involved in school either. Using a sample of 431 students in Hong Kong, Lau et al. (2011) demonstrated that when compared with home-based involvement, school-based involvement had less influence on children's educational performance. In interviews with 30 migrant children (*mean age* = 13) in Zhejiang, China, Fang et al. (2017) found that school-based involvement was less mentioned. In this case, the current studies only focus on home-based involvement and academic socialization in the Chinese context. Previous studies have demonstrated that home-based involvement and academic socialization positively influenced academic achievement and school behavior (Fan and Chen, 2001; Chen and Gregory, 2009; Hill and Tyson, 2009; Benner et al., 2016). For example, Manz et al. (2014) found that a mother's home-based involvement increased children's interpersonal skills and decreased the incidence of negative classroom behaviors. Hayes (2012) found that home-based involvement increased adolescents' academic achievement. Hill and Tyson (2009) further claimed that academic socialization was positively related to academic achievement.

Nevertheless, socioeconomic status significantly affects the relationship between parental involvement and adolescent performance (Stevenson and Baker, 1987; Byun et al., 2012). Parents with low SES typically practice low levels of academic socialization with their children (Carolan and Wasserman, 2015). By contrast, families with high SES usually engage in high-quality activities of home-based involvement (Fantuzzo et al., 2004). For instance, Conger and Donnellan (2007) found that parents with high SES had better communication with their children. In an expansion study on children's communicative-pragmatic ability, with a sample of 390 Italian-speaking children (Bosco et al., 2013) found that family SES has small yet significant positive effect on children's pragmatic ability, and the effect was still existed during the middle part of their childhood. In addition, other studies suggested that SES is linked with the academic achievement of adolescents (Hill and Tyson, 2009; Byun et al., 2012). Adolescents from families with high SES tend to display good academic achievement (Sirin, 2005; Reardon, 2011).

According to the theory of cultural reproduction, a high SES family provides more educational resources to their offspring, and promotes adolescents' educational achievement (Bourdieu, 1973; Bourdieu and Passeron, 1990). Coleman (1988) considered that a family with high SES can provide a better living environment and more educational resources for their child or children. For example, with a longitudinal data of 2744 adolescents, Morris et al. (2018) found that children from low SES families tended to live in low SES neighborhoods, causing a higher tendency for them to take up smoking. With the Independent Freshman Admission administrative data from an elite university (i.e., Peking University in China), Liu et al. (2014) found that adolescents in high SES families had more chances to pass the selection process to enter these universities. In such circumstances, with less social capital, parental involvement is more important for adolescents in low SES families. According to the cultural mobility model, Dimaggio (1982) argued that a low SES environment acted as an incentive for parents to invest in their children to make up for other factors that disadvantaged them. Parental involvement acts as a support mechanism for children, whereas adolescents in high SES families had better living conditions and more educational resources. This meant that the effect of parental involvement was greatly reduced. Thus, parental involvement is more effective for adolescents in low SES families than for adolescents in high SES families.

The preceding literature review implies that the moderating role of SES varies among different aspects of parental involvement (i.e., home-based involvement and academic socialization) and adolescent school performance (i.e., academic achievement and school behavior). For instance, with the data taken from National Education Longitudinal Study 88–94, Kim and Schneider (2005) further claimed that adolescents from low-SES families benefited more from parental involvement in academic activities. With the data from the National Longitudinal Survey of Youth-Children and Young Adults in America, Jaeger (2011) found that socioeconomic status played a moderating role in the relationship between cultural capital (which contained partial content of parental involvement) and adolescent academic achievement. Using data from 10 public high schools in America, Wang and Sheikh-Khalil (2014) found that home-based involvement was more strongly correlated with school academic behavior in low-SES families. However, both Wang and Sheikh-Khalil (2014) and Jaeger (2011) tested the moderation effect of family SES in the American context. Yet few studies have tested the moderating effect of SES between parental involvement and adolescent performance in other specific culture, such as in the Chinese culture.

As a result, we hypothesize that socioeconomic status negatively moderates the relationship between parental involvement and junior school students' performance in the Chinese context. Data from China Education Panel Study of 2013–2014 would be used to validate this hypothesis. The meaning of the current study may be as follows. First, the current study highlights the importance of parental involvement and may serve to upgrade the importance of family education in China. Second, the current study can be regarded as a suggestion

for a family intervention project to focus on promoting parental involvement.

MATERIALS AND METHODS

Participants and Procedures

Data for the present study was adopted from the Chinese Educational Panel Survey 2013–2014 (CEPS), which was conducted by the National Survey Research Center at Ren-min University of China. CEPS 2013–2014 is available openly (CEPS, 2015). CEPS is a nationally representative survey. Data collecting procedures were designed in multi-stage stratified probability proportional sampling (PPS). Four stages were included: 438 classes in 112 schools from 28 country level units were sampled in probability proportionality, and all of the junior school students in the sampled classes were selected (CEPS, 2014). The data comprised 19,487 students (10,042 males and 9,445 females; mean age = 14.52, $SD = 1.24$). According to the implementation report of CEPS, the valid response rate was 100%. A human ethics approval was obtained from Renmin University of China. A written informed consent was obtained from the participants and their parents.

Measures

Parental Involvement

In the current study, home-based involvement and academic socialization were measured to reflect parental involvement. Home-based involvement entailed the parental involvement activities in the home with adolescents (e.g., supervising studies and daily life, talking about school life and engaging in activities with them) that improved their school performance (Benner et al., 2016). The following four items were used to assess home-based involvement: (a) on a four-point scale (1 = never, 4 = almost daily), how often did your parents supervise your studies (i.e., checked your homework and gave advice on the problems of homework) in the past week? (b) on a three-point scale (1 = do not care, 3 = very strict), were your parents strict about your daily behavior (i.e., the time you left home to go to school, the time you came back home after school, the time you spent on surfing the Internet and the time you spent on watching TV?) (c) on a three-point scale (1 = never, 3 = often), how often did your parents chat about the following topics with you (i.e., your relationship with your friends, your relationship with your teachers, and incidents that took place in school)? (d) on a six-point scale (1 = never, 6 = more than once a week), how frequently did you and your parents engage in activities together (i.e., played sports, read books, watched TV, went to museums, and watch sports games)? The mean values of the scales were calculated and then standardized. The Cronbach's alpha of the items above for the current study is 0.68, which is above 0.60 and is acceptable (Kline, 2000; George and Mallery, 2003). Academic socialization mainly includes parents' expectations and their faith about their children's education (Hill and Tyson, 2009; Benner et al., 2016). Therefore, parents' educational expectation and parents' confidence in junior school students can be used to measure their academic socialization. To assess academic

socialization, students were asked to indicate the years of their parents' educational expectation and the level of their parents' confidence in them by using a four-point scale (1 = no confidence, 4 = very confident). The Cronbach's alpha of the items above for the current study is 0.36. It is appropriate to estimate the inter-item correlation with short scales (Pallant, 2010). Inter-item correlation was 0.22, which was acceptable for the optimal range of inter-item correlation was from 0.20 to 0.40 (Briggs and Cheek, 1986). Confirmatory factor analysis demonstrated that the two-factor model of parental involvement showed acceptable goodness-of-fit index ($\chi^2 = 1353.229$, $df = 8$, $\chi^2/df = 169.154$, $p < 0.001$, CFI = 0.917, TLI = 0.783, RMSEA = 0.093) (Hu and Bentler, 1999).

Junior School Students' Performance

School performance includes academic achievement and school behavior (Santor et al., 2000). In this study, academic achievement was calculated on the basis of mid-term examination grades of the three main subjects: Chinese, Mathematics, and English. The Cronbach's alpha of the three examination grades for the current sample is 0.85, which is above 0.60 and is acceptable (Kline, 2000; George and Mallery, 2003). The data of the examination grades was collected directly from schools' administrations and was standardized. School behavior means the manner of acting in school, such as school attendance and trouble avoidance (Bowen and Bowen, 1999). Similarly, in current study, the school behavior of junior school students were estimated by four items (i.e., "I am seldom late for classes", "I seldom skip classes", "I am easy to get along with", and "My teacher often praises me") on a four-point scale (1 = completely disagree, 4 = completely agree). The first two items were related to the school attendance, and the latter two items were related to trouble avoidance. The mean value of the four items were standardized. The Cronbach's alpha of the scale in the current sample is 0.67, which is above 0.60 and is acceptable (Kline, 2000; George and Mallery, 2003). Similarly, a confirmatory factor analysis demonstrated that the two-factor model of parental involvement showed acceptable goodness-of-fit index ($\chi^2 = 3110.881$, $df = 13$, $\chi^2/df = 239.299$, $p < 0.001$, CFI = 0.924, TLI = 0.837, RMSEA = 0.111) (Hu and Bentler, 1999).

TABLE 1 | Correlation statistics.

	Descriptive		Pearson Correlation				
	M	SD	1	2	3	4	5
1. Home-based involvement	0.02	0.71	–				
2. Academic socialization	0.00	0.78	0.370***	–			
3. Socioeconomic status	0.01	0.76	0.264***	0.230***	–		
4. Academic achievement	0.00	8.77	0.023	0.204***	0.073***	–	
5. School behavior	0.00	1.00	0.330***	0.251***	0.192***	0.172***	–

*** $p < 0.001$.

Socioeconomic Status

According to Ingels et al. (2005), socioeconomic status was measured by a composite variable based on the parents' educational attainment, household income, and parents' occupational prestige (Bradley and Corwyn, 2002; Noble et al., 2012; Jiang et al., 2018). The Cronbach's alpha of the scale in the present study is 0.63, which is above 0.60 and is acceptable (Kline, 2000; George and Mallery, 2003).

Data Analysis

Primarily, as the items described in the above section are not in the same range of scales, all data was standardized before analysis. The pairwise method was adopted to handle missing data. The descriptive statistics and correlation matrix were calculated. Secondly, hierarchical regressions were performed using the entry method to explore the roles of parental involvement and SES on junior school students' performance.

Secondly, four hierarchical regressions were constructed. In the first and second hierarchical regression, academic achievement acted as the dependent variable; in the third and fourth hierarchical regression, school behavior acted as the dependent variable. In the first hierarchical regression, the demographic variables (i.e., sex and age; coded: 1 = male, 0 = female) were entered in step 1, followed by home-based involvement in step 2 and academic socialization in step 3, and SES in step 4. In the second hierarchical regression, the

demographic variables were entered in step 1, followed by academic socialization in step 2 and home-based involvement in step 3, and SES in step 4. In the third hierarchical regression, the demographic variables were entered in step 1, followed by home-based involvement in step 2 and academic socialization in step 3, and SES in step 4. In the fourth hierarchical regression, the demographic variables were entered in step 1, followed by academic socialization in step 2 and home-based involvement in step 3, and SES in step 4.

Thirdly, the moderation effect was examined using Model 1 in PROCESS macro (Hayes, 2013). A total of four models were constructed with the moderator of socioeconomic status (M). In Model 1, home-based involvement was set as predictors (X) and academic achievement as outcome (Y); in Model 2, academic socialization was set as predictors (X) and academic achievement as outcome (Y); in Model 3, home-based involvement was set as predictors (X) and school behavior as outcome (Y); in Model 4, academic socialization was set as predictor (X) and school behavior as the outcome (Y). Finally, the simple slope tests were conducted to further validate the moderation effects.

RESULTS

The results of the descriptive and correlation analyses are shown in **Table 1**. Both home-based involvement and academic

TABLE 2 | Hierarchical regressions of demographic variables, home-based involvement, academic socialization, socioeconomic status and academic achievement.

	Dependent variable: Academic achievement							
	Step 1		Step 2		Step 3		Step 4	
	β	t	β	t	β	t	β	t
Constant		12.28***		12.02***		-5.01***		-5.50***
Sex	-0.24	-29.65***	-0.24	-29.65***	-0.24	-30.80***	-0.24	-30.98***
Age	-0.07	-8.84***	-0.07	-8.68***	0.08	7.87***	0.082	8.35***
Home-based involvement			-0.00	-0.31	-0.07	-8.23***	-0.08	-9.14***
Academic socialization					0.28	26.94***	0.27	26.56***
Socioeconomic status							0.044	5.29***
R^2		0.06		0.06		0.11		0.11
F		487.54***		325.04***		437.54***		356.29***
ΔR^2				0.00		0.05		0.00
ΔF				0.10		725.69***		28.01***
Constant		12.28***		-5.13***		-5.01***		-5.50***
Sex	-0.24	-29.65***	-0.24	-30.55***	-0.24	-30.80***	-0.24	-30.98***
Age	-0.07	-8.84***	0.08	7.95***	0.08	7.87***	0.08	8.35***
Academic socialization			0.25	25.59***	0.28	26.94***	0.27	26.56***
Home-based involvement					-0.07	-8.23***	-0.08	-9.14***
Socioeconomic status							0.04	5.29***
R^2		0.06		0.11		0.11		0.11
F		487.54***		558.19***		437.54***		356.29***
ΔR^2				0.04		0.00		0.00
ΔF				654.97***		67.77***		28.01***

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

socialization were positively related to school behavior ($r = 0.25-0.33$, $p < 0.001$). The association between home-based involvement and academic achievement was insignificant. Academic socialization was positively related to academic achievement ($r = 0.20$, $p < 0.001$). Socioeconomic status was positively related to parental involvement ($r = 0.23-0.26$, $p < 0.001$) and junior school students' performance ($r = 0.07-0.19$, $p < 0.001$).

Hierarchical regressions were shown in Table 2 and Table 3. All regression equations were statistically significant ($F > 68.21$, $p < 0.001$). Home-based involvement had a significant explained variance to junior school student's school behavior ($t = 31.44$, $p < 0.001$). As home-based involvement was not related to academic achievement in the correlation matrix, the negative influence of home-based involvement on academic achievement was spurious in the regression equations. Academic socialization had significant explained variance to academic achievement ($t = 26.56$, $p < 0.001$) and school behavior ($t = 21.46$, $p < 0.001$). SES was entered in step 4 in each regression equation, and the results showed that SES had significant explained variance to junior school students' performance ($t > 5.29$, $p < 0.001$). These results proved that home-based involvement positively affected school behavior; academic socialization and SES positively affected junior school students' performance.

The results of moderating analyses are summarized in Table 4, showing that socioeconomic status negatively moderated the relationship between home-based involvement and school

behavior, as well as the relationship between academic socialization and academic achievement. Other interactions were insignificant. In order to further examine the simple slope effects, we tested two significant two-way interactions that

TABLE 4 | Moderation analysis.

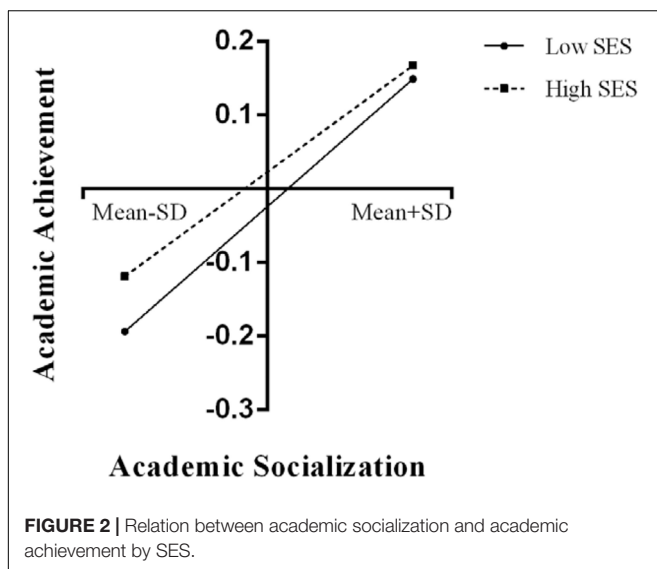
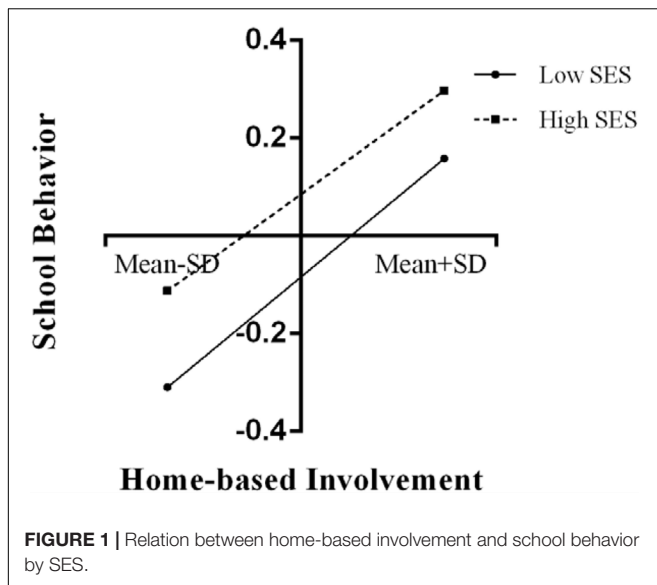
	Coeff	SE	t	p	LLCI	ULCI
Model 1 (Academic Achievement)						
SES	0.69	0.09	7.27	<0.001	0.50	0.88
HBI	0.08	0.10	0.76	0.449	-0.12	0.27
HBI × SES	0.01	0.13	0.06	0.953	-0.24	0.26
Model 2 (Academic Achievement)						
SES	0.28	0.09	3.13	0.002	0.10	0.45
AC	2.18	0.08	25.87	<0.001	2.02	2.35
AC × SES	-0.30	0.11	-2.87	0.004	-0.51	-0.10
Model 3 (School Behavior)						
SES	0.13	0.01	12.83	<0.001	0.11	0.15
HBI	0.43	0.01	39.06	<0.001	0.41	0.45
HBI × SES	-0.05	0.01	-3.23	0.001	-0.07	-0.02
Model 4 (School Behavior)						
SES	0.18	0.01	17.99	<0.001	0.16	0.20
AC	0.28	0.01	28.72	<0.001	0.26	0.29
AC × SES	-0.01	0.01	-0.46	0.644	-0.03	0.02

SES, socioeconomic Status; HBI, home-based involvement; AC, academic socialization.

TABLE 3 | Hierarchical regressions of demographic variables, home-based involvement, academic socialization, socioeconomic status, and school behavior.

Dependent Variable: School behavior								
	Step 1		Step 2		Step 3		Step 4	
	β	t	β	t	β	t	β	t
Constant		9.07***		-0.26		-12.68***		-13.77***
Sex	-0.07	-8.53***	-0.07	-8.28***	-0.07	-8.77***	-0.07	-9.14***
Age	-0.06	-7.67***	0.01	1.49	0.13	13.75***	0.14	14.82***
Home-based involvement			0.34	42.05***	0.28	34.29***	0.27	31.44***
Academic socialization					0.22	22.16***	0.22	21.46***
Socioeconomic status							0.09	11.44***
R^2		0.01		0.12		0.15		0.16
F		68.21***		640.34***		619.43***		526.23***
ΔR^2				0.11		0.03		0.01
ΔF				1767.78***		491.09***		130.96***
Constant		9.07***		-11.73***		-12.68***		-13.77***
Sex	-0.07	-8.53***	-0.07	-9.16***	-0.07	-8.77***	-0.07	-9.14***
Age	-0.06	-7.67***	0.13	12.90***	0.13	13.75***	0.14	14.82***
Academic socialization			0.32	32.52***	0.22	22.16***	0.22	21.46***
Home-based involvement					0.28	34.29***	0.27	31.44***
Socioeconomic status							0.09	11.44***
R^2		0.01		0.08		0.15		0.16
F		68.21***		401.24***		619.43***		526.23***
ΔR^2				0.07		0.07		0.01
ΔF				1057.23***		1175.48***		130.96***

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



contained the conditional links between parental involvement and junior school students' performance by SES. In **Figure 1**, home-based involvement was stronger relevant to school behavior in low-SES families ($\beta = 0.34, p < 0.001$), whereas home-based involvement was weaker relevant to school behavior in high-SES junior school students ($\beta = 0.29, p < 0.001$). In **Figure 2**, academic socialization was stronger relevant to academic achievement for low-SES junior school students ($\beta = 0.22, p < 0.001$), whereas academic socialization was weaker relevant to academic achievement for high-SES junior school students ($\beta = 0.18, p < 0.001$).

DISCUSSION

This study aims to identify the different moderating roles of SES in the relationship between parental involvement and junior

school student performance in Chinese culture by replicating and extending previous findings in American culture (Jaeger, 2011; Wang and Sheikh-Khalil, 2014). The results demonstrated that SES negatively moderated both the relationship between academic socialization and academic achievement, and that between home-based involvement and school behavior. The findings imply that parental involvement activities are highly beneficial for children and junior school students in families with low SES. Academic socialization is generally associated with academic success, and home-based involvement closely relates to school behavior.

However, the moderating effect of SES between academic socialization and academic achievement is inconsistent with the findings of Benner et al. (2016), which implies a stronger relationship between academic socialization and academic performance in high-SES families. Benner et al. (2016) claimed that the concerted cultivation of high-SES families contributes to better adolescents' academic performance. With concerted cultivation, parents provide children with a more advantageous involvement (Lareau, 2003). However, the parenting styles may be different between the United States and China (Lau et al., 2011). Concerted cultivation not only affects the improvement of adolescent school performance, but also improves the other social skills of adolescents (Lareau, 2003). Compared with American parents, Chinese parents pay more attention to learning-related involvement with their children, which results in valuing educational achievement over social functioning (Pomerantz et al., 2014). Moreover, with fewer educational resources, children in low-SES families face more environmental stresses and greater challenges (Shumow et al., 1999). Therefore, parenting practice is particularly crucial for children in low-SES families in China (Wang et al., 2016), and the result of the current study can be interpreted within the current situation in China. Also, the results of the current study were consistent with some of the findings in some aspects (Jaeger, 2011; Roksa and Potter, 2011; Wang and Sheikh-Khalil, 2014), which can also be explained by concerted cultivation in Chinese culture. Youths from low-SES family benefited more from parental involvement in concerted cultivation, which can reduce the gap with youths from high-SES families (Lareau, 2003).

Compared with earlier studies, the current study provides more evidence and proves that concerted cultivation exists in different cultural environments. The negative moderating effects of SES between home-based involvement and junior school student's school behavior were examined, which was a relatively new finding. Besides, compared with some western studies, the current study mainly focuses on the home-based involvement and academic socialization, providing reasonable results which fit the Chinese parenting culture.

In summary, junior school students in families with low socioeconomic status gain numerous benefits from parental involvement activities. Academic socialization is generally more associated with academic success, and home-based involvement is more closely related to school behavior in low-SES families.

The current study raises important implications for Chinese family education and family intervention policies. Based on the results of the current study, it is known that the intervention program should focus on low-SES families to improve parental involvement, especially for low-SES families, since junior school students benefit more from home-based involvement in low-SES families in China. Secondly, as school-based involvement is less popular in Chinese culture (Lau et al., 2011), the school intervention should promote communication between the school and family to improve school-based involvement, especially for low-SES families in order to increase adolescent school performance.

Some limitations of the current study should be noted. Firstly, there were limitations on the measures of parental involvement. Data for parental involvement with more comprehensive measures are needed to promote the current study. There were validated measurements in the prevailing literature, such as the measurement in the research of Wang and Sheikh-Khalil (2014) or Day and Dotterer (2018). However, as a national representative investigation, the number of items should be taken into account. Future studies may adopt other measurements to further verify the current results. Secondly, the current study only focused on the junior school students' performance in school, while various aspects of junior school students' development were exclusive, such as mental health. Thirdly,

most of the variables in the model were transformed into standardized z-scores. Therefore, the incremental of variance in regression analysis might be relatively low. Fourthly, various factors should be kept in consideration as predictors of academic achievement in future research. Social cognition, or Theory of Mind (ToM) develops during the child and adolescence period (Bosco et al., 2014), influencing adolescents' development in many aspects (Brizio et al., 2015). Therefore, ToM is one of the considerable predictors for future research on adolescent school performance. Fifthly, as the cooperation between school and family improves in China, future studies should focus on school-based involvement as well. In addition, the national sample only included junior school students rather than adolescents at all ages. Only one year of data was included in the model. Panel data should be used, and the long-term effects of parental involvement should be discussed in subsequent studies.

AUTHOR CONTRIBUTIONS

WD administered the project and contributed to all steps of the work. WD and YG interpreted the data and drafted the manuscript. WD reviewed the manuscript and YG revised it based on the critical comments provided by WD. WD and HB finalized the final submission.

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Effects of Mindfulness-Based Stress Reduction on Depression in Adolescents and Young Adults: A Systematic Review and Meta-Analysis

Xinli Chi^{1,2}, Ai Bo³, Tingting Liu^{4*}, Peichao Zhang⁵ and Iris Chi⁶

¹ College of Psychology and Sociology, Shenzhen University, Shenzhen, China, ² Shenzhen Key Laboratory of Affective and Social Cognitive Science, Shenzhen University, Shenzhen, China, ³ Silver School of Social Work, New York University, New York, NY, United States, ⁴ Department of Sociology, Wuhan University, Wuhan, China, ⁵ Research Center of Modern Psychology, Department of Philosophy, Wuhan University, Wuhan, China, ⁶ Suzanne Dworak-Peck School of Social Work, University of Southern California, Los Angeles, CA, United States

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Curtin University, Australia
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Universidad de Zaragoza, Spain

*Correspondence:

Tingting Liu
liutingtinghku@163.com

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Background: Mindfulness as a positive mental health intervention approach has been increasingly applied to address depression in young people. This systematic review and meta-analysis evaluated the effects of mindfulness-based stress reduction (MBSR) in the treatment of depression among adolescents and young adults.

Methods: Electronic databases and references in articles were searched. Randomized controlled trials (RCTs) evaluating MBSR and reporting outcomes for depressive symptoms among young people aged 12 to 25 years were included. Data extraction and risk of bias assessment were conducted by two reviewers independently. Hedges' g with a 95% confidence interval was calculated to represent intervention effect.

Results: Eighteen RCTs featuring 2,042 participants were included in the meta-analysis. Relative to the control groups (e.g., no treatment, treatment as usual, or active control), MBSR had moderate effects in reducing depressive symptoms at the end of intervention (Hedges' $g = -0.45$). No statistically significant effects were found in follow-up (Hedges' $g = -0.24$) due to a lack of statistical power. Meta-regression found that the average treatment effect might be moderated by control condition, treatment duration, and participants' baseline depression.

Conclusion: MBSR had moderate effects in reducing depression in young people at posttest. Future research is needed to assess the follow-up effects of MBSR on depressive symptoms among adolescents and young adults.

Keywords: mindfulness-based stress reduction, adolescents, young adults, randomized controlled trials, depressive symptoms, meta-regression

INTRODUCTION

Depression among adolescents and young adults is a serious public health problem. Depression affects approximately 8 to 20% of adolescents before the age of 18 worldwide (Naicker et al., 2013). The mean prevalence of depressive symptoms among college students is 30.6% globally (Ibrahim et al., 2013). Recent studies found that major depressive episodes have increased significantly

among U.S. adolescents aged 12 to 17, from a 12-month prevalence of 8.7% in 2005 to 12.7% in 2015 (Mojtabai et al., 2016; National Institution of Mental Health, 2017). In China, the prevalence of depressive symptoms among university students aged 16 to 35 years was estimated to be 11.7% (Chen et al., 2013). Depression is a serious threat to the physical and psychological health of adolescents and young adults and may result in negative social and behavioral consequences, including academic failure (Quiroga et al., 2013), social disorders (Verboom et al., 2014), drug use (Curry et al., 2012), and suicide (Tuisku et al., 2014). Furthermore, depression in adolescence may have a continuous effect that causes physical and mental disorders and behavioral problems in adulthood (Dunn and Goodyer, 2006).

Given this disturbing situation, the problem of youth depression has attracted attention from practitioners and scholars. Many intervention methods have been implemented to prevent and reduce depression in young people. While antidepressant medication is reserved for treating severe depression, psychotherapy has been widely used to treat mild to moderate depression (Cheung et al., 2007; McDermott et al., 2010). Established psychotherapies such as cognitive behavioral therapy and interpersonal psychotherapy were found to be the most effective for treating adolescent depression (Zhou et al., 2015). Emerging treatments such as mindfulness-based interventions have also gained popularity and a supportive evidence base regarding treating youth depression in the last decade (Kallapiran et al., 2015; Zoogman et al., 2015; Felver et al., 2016).

Mindfulness is derived from Eastern meditation practices and Buddhist philosophy. It refers to “bringing one’s complete attention to the present experience on a moment-to-moment basis” (Marlatt and Kristeller, 1999, p. 68). Mindfulness-based interventions aim to help individuals be aware of their present emotion, pay attention to the present task at hand, and promote inner peace and happiness. Mindfulness-based interventions were initially designed for adults and have been extended and adapted to children, adolescents, and young adults for a variety of clinical problems and to promote youth well-being. Well-established standardized mindfulness-based interventions include mindfulness-based stress reduction (MBSR), mindfulness-based cognitive therapy (MBCT), acceptance and commitment therapy (ACT), and dialectical behavior therapy (DBT; Hunot et al., 2010; Chiesa and Malinowski, 2011). Among these interventions, MBSR was the earliest to be developed and is the most frequently used intervention method.

MBSR was originally developed to help patients with physical illness to deal with pain, stress, and negative emotions in behavioral medicine settings (Kabat-Zinn, 1982, 1990). Nowadays, MBSR is widely used in the general population for stress, anxiety, and depression mitigation (Virgili, 2015). By cultivating self-awareness and an attitude of openness and acceptance, MBSR may help individuals calm their mind and body, make better judgments in life, and enhance self-capability to cope with various stressful situations (Carmody et al., 2009). The standard MBSR program features an

8-week course with a 2- to 2.5-h weekly session; a 1-day retreat (6-h mindfulness practice) between Sessions 6 and 7; and 45-min of daily homework. MBSR provides formal mindfulness practice training, including mindfulness meditation, body scans, and yoga movement (Zainal et al., 2013). Additionally, MBSR has been adapted for adolescents to practice mindfulness. For example, Learning to BREATHE (L2B) with six sessions (50-min course, 1 week) is a universal school-based prevention program designed specifically for adolescents to deal with multiple emotional problems, including depression, and strengthen emotional regulation (Broderick, 2013).

Many studies found promising results of mindfulness in reducing individuals’ psychological distress and improving emotional reactivity, behavioral regulation, subjective well-being, and quality of life among young adults (Keng et al., 2011). Additionally, mindfulness-based interventions for adolescents and young adults often take place in school settings, serving as a tool for positive education (Shapiro et al., 2008; Meiklejohn et al., 2012). Existing intervention studies showed that mindfulness-based intervention was associated with students’ increased positive emotion and decreased negative affect (Huppert and Johnson, 2010; Nidich et al., 2011; Maynard et al., 2017). In addition to general school settings, mindfulness-based interventions were also applied in clinical settings to promote mental health of young people with psychopathological conditions such as anxiety and depressive disorders (Cotton et al., 2014; Malboeuf-Hurtubise et al., 2017).

Several systematic reviews have demonstrated some evidence that mindfulness-based interventions including MBSR can reduce psychological symptoms, including depressive symptoms among adolescents (Kallapiran et al., 2015; Zoogman et al., 2015; Felver et al., 2016). Despite the promising results yielded by these studies, varied types of mindfulness practices (e.g., MBSR, MBCT, ACT), different outcomes (e.g., depression, anxiety, emotional problems), different study designs [e.g., non-randomized controlled trials (RCTs) and RCTs] were blended by previous reviews, which masked the evidence of the specific treatment effect of MBSR for depressive symptoms among young people. Because of its wide use among young people in recent years, it is necessary to examine the effect of MBSR on depression in this population. Therefore, we intended to explore the effect of MBSR on depression among adolescents and young adults by conducting a systematic review and meta-analysis of relevant RCTs.

MATERIALS AND METHODS

This study was conducted in accordance with the PRISMA guidelines, which provides detailed guidance for the preferred reporting style of systematic reviews and meta-analyses (Moher et al., 2009).

Inclusion Criteria

Studies were included in the systematic review according to the following eligibility criteria.

Type of Studies

Randomized controlled trial design was a key eligibility criterion to screen studies examining MBSR interventions for depression among adolescents and young adults. In this systematic review, we included studies written in English and Chinese language.

Type of Participants

The systematic review included studies with adolescents and young adults aged 12 to 25 years old. Participants who were clinically diagnosed as depressed using any diagnostic criterion, such as ICD-10 (Office of the Secretary, Health and Human Services [HHS], 2009) or DSM-5 (American Psychiatric Association, 2013) diagnostic criterion or who scored above a cutoff score on a depression rating scale (e.g., Center for Epidemiologic Studies Depression Scale ≥ 16) were eligible for inclusion. Due to the potentially small number of trials available in this field, we also included studies that used nonclinical samples (i.e., youth with depressive symptoms not reaching the level of clinical diagnosis) to detect the efficacy of MBSR in reducing depressive symptoms.

Type of Interventions

Experimental groups involved MBSR or adapted MBSR programs conducted according to the manual by Kabat-Zinn (1990). Control groups featured no treatment (e.g., no treatment in a control group or waitlist control group), treatment as usual (TAU; e.g., standard medical treatment or other standard practices), or active control condition with any nontherapeutic activities (e.g., health education or relaxing activities).

Outcome Measures

Change in depressive symptoms was the primary outcome, as measured using depression rating scales, such as the Hamilton Rating Scale for Depression (Hamilton, 1960), the Center for Epidemiologic Studies Depression Scale (McDowell and Newell, 1996), the Beck Depression Inventory-II (Beck et al., 1996), the Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983), the Depression Anxiety Stress Scales (Lovibond and Lovibond, 1995), and the Symptom Checklist-90 (Derogatis et al., 1973).

Search Methods

Electronic databases including PubMed, PsycINFO (Ovid), CINAHL, Web of Science, Embase, ProQuest, Cochrane Library, China National Knowledge Infrastructure, and Wangfang Data were searched to identify studies from the first available year to April 2018. We used following search terms: (“mindfulness-based stress reduction” OR MBSR) AND depress* AND (adolescen* OR youth OR student OR “young people” OR “young adult”). In addition, reference lists of selected articles and related reviews were hand searched.

Data Collection and Analysis

Selection of Studies

Identified records were exported into Endnote X6 to remove duplicates and screen titles and abstracts (Thomson Reuters, 2011). After removing duplicates, two independent reviewers

conducted title and abstract screening of the remaining records. Then the two reviewers independently screened full-text articles that passed the title and abstract screening. Finally, studies meeting the inclusion criteria were included for the systematic review and meta-analysis.

Data Extraction

A data extraction sheet was developed based on the data collection form for intervention reviews recommended by Cochrane’s guidelines for systematic reviews (Higgins and Green, 2008). The data extraction sheet includes study characteristics (e.g., study source, study design, sample inclusion and exclusion criteria, sample characteristics, intervention component, duration and frequency, setting and interventionist, control condition, outcome measures, and follow-up timing) and effect size data (e.g., sample size, posttest and follow-up means, standard deviations, or standard errors for the means). Data were extracted by two reviewers independently. If the two reviewers disagreed, a third reviewer was consulted to achieve consensus.

Assessment of Risk of Bias

Included studies were assessed for risk of bias using the Cochrane Collaboration’s risk of bias tool as described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins and Green, 2008). This assessment was performed independently by two reviewers. In the event of disagreements regarding the assessment of studies, a third reviewer was consulted. The risk of bias assessment covered the following items: allocation concealment, random sequence generation, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, and reporting bias. Each item was rated as high, low, or unclear, with an explanation. The results of the meta-analysis were interpreted with consideration of the risk of bias of the studies. We used Review Manager 5.3 (Cochrane Collaboration, 2014) to assess the risk of bias in included studies and present the results graphically.

Data Synthesis

Because of the variation in study characteristics (e.g., participant characteristics, geographical region), we assumed that the true effect size may vary from study to study. Thus, posttest effects were synthesized based on random-effects modeling (Borenstein et al., 2010). We used Comprehensive Meta-Analysis software version 2.0 to synthesize the effect size of continuous data using Hedges’ g with 95% confidence intervals (CIs) and to generate the forest plot (Borenstein et al., 2005). Hedges’ g provides unbiased estimates through small sample size correction (Hedges and Olkin, 1985). I^2 and T^2 statistics were used to examine overall heterogeneity between studies. I^2 indicates the proportion of the variation in observed effects that is due to the variation in true effects (Higgins et al., 2003). For standardized mean differences, the prediction intervals (i.e., an approximate 95% range of underlying effects) can be obtained by creating an interval from two times T below and above the random-effects pooled estimate (Higgins and Green, 2008). Potential sources of heterogeneity were explored using sensitivity analyses and meta-regression.

Meta-Regression

Meta-regression was performed to explore whether the treatment effect of MBSR varied based on the following: (a) control condition (e.g., no treatment or TAU versus active control), (b) participant age group (i.e., adolescent versus young adult), (c) baseline depression diagnosis (i.e., participants with a formal depression diagnosis at baseline versus participants with depressive symptoms only), and (d) duration of the treatment (i.e., less than 8 weeks versus 8 weeks or more). Robust variance estimation in meta-regression was used to synthesize the follow-up treatment effect size and to conduct moderator analysis in Stata (StataCorp, 2015). Several studies had multiple follow-ups, and thus these data were not statistically independent from one another. Robust variance estimate allows for the inclusion of dependent effect size estimates (Hedges et al., 2010; Tanner-Smith and Tipton, 2014). *Post hoc* power analysis was conducted for meta-analysis of average effect size and meta-regression to determine if nonsignificant results were due to low statistical power (Hedges and Pigott, 2001, 2004). We decided that a moderate effect size of 0.30 was important to detect, and that effect sizes less than 0.30 were too small to matter.

Assessment of Publication Bias

A funnel plot was used to explore the presence of publication bias. We included a formal test of funnel plot asymmetry as outlined by Egger et al. (1997) to examine the association between the overall estimated posttest intervention effect and the standard error of the intervention effect. The funnel plot trim-and-fill method described by Duval and Tweedie (2000) was used to adjust for possible bias in the overall effect size by accounting for effect sizes from the estimated number of missing studies.

RESULTS

Description of Studies

Results of the Search

The search process is summarized in **Figure 1** using a PRISMA flow diagram (Moher et al., 2009). Review Manager 5.3 (Cochrane Collaboration, 2014) was used to produce the figure.

Included Studies

Study origins and year of publication

The characteristics of the 18 included studies examining MBSR for prevention and intervention of depression in young people are summarized in **Table 1**. These studies were conducted in five countries: United States ($n = 12$; Shapiro et al., 1998; Jimenez, 2008; Biegel et al., 2009; Hindman, 2013; Sibinga et al., 2013, 2016; McIndoo, 2015; Bluth et al., 2016; Dvořáková et al., 2017; Freedenberg et al., 2017; Hazlett-Stevens and Oren, 2017; Shomaker et al., 2017), Korea ($n = 2$; Kang et al., 2009; Song and Lindquist, 2015), United Kingdom ($n = 1$; Raes et al., 2014), Australia ($n = 1$; Johnson et al., 2016), Thailand ($n = 1$; Aeamla-Or, 2015), and China ($n = 1$; Huang et al., 2015). The 18 studies were published between 1998 and 2017. Fourteen studies were published journal articles (Shapiro et al., 1998; Biegel et al., 2009; Kang et al., 2009; Sibinga et al., 2013, 2016; Raes et al., 2014;

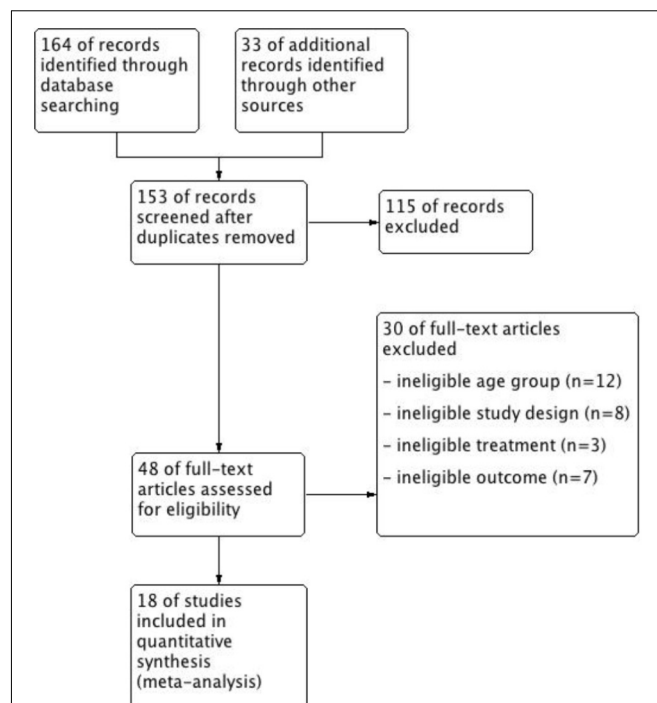


FIGURE 1 | Search flow: Trials identified and search process.

Huang et al., 2015; Song and Lindquist, 2015; Bluth et al., 2016; Johnson et al., 2016; Dvořáková et al., 2017; Freedenberg et al., 2017; Hazlett-Stevens and Oren, 2017; Shomaker et al., 2017) and four studies were dissertations (Jimenez, 2008; Hindman, 2013; Aeamla-Or, 2015; McIndoo, 2015).

Intervention and control conditions

Eight of the included studies adopted a standard 8-week MBSR program (Shapiro et al., 1998; Biegel et al., 2009; Kang et al., 2009; Raes et al., 2014; Aeamla-Or, 2015; Huang et al., 2015; Song and Lindquist, 2015; Johnson et al., 2016). Two studies adapted the program to a 12-week plan (Sibinga et al., 2013, 2016). One study adapted the program to an 11-week plan (Bluth et al., 2016) and one adapted the program to a 10-week plan (Hazlett-Stevens and Oren, 2017). Four studies used a 6-week MBSR program (Hindman, 2013; Dvořáková et al., 2017; Freedenberg et al., 2017; Shomaker et al., 2017) and two studies featured an MBSR program with 4 weeks (Jimenez, 2008; McIndoo, 2015). All 18 studies examined immediate effects at the end of intervention. Seven studies examined follow-up effect (i.e., 8, 12, 16, and 24 weeks) (Jimenez, 2008; Biegel et al., 2009; Raes et al., 2014; Aeamla-Or, 2015; McIndoo, 2015; Johnson et al., 2016; Shomaker et al., 2017).

Two studies compared MBSR plus TAU (i.e., standard medicine treatment and psychological therapy) with a TAU control group (Biegel et al., 2009; Huang et al., 2015). Six studies compared MBSR with active control conditions (Jimenez, 2008; Sibinga et al., 2013, 2016; Bluth et al., 2016; Freedenberg et al., 2017; Shomaker et al., 2017). Ten studies compared MBSR with

TABLE 1 | Characteristics of included studies.

Author, year (country)	Participants	Experimental Group			Control Group			Follow-Up Time	Outcome Measure
		<i>n</i>	Age, <i>M</i> (<i>SD</i>), or Range	Intervention	<i>n</i>	Age, <i>M</i> (<i>SD</i>), or Range	Intervention		
Aeamla-Or (2015; Thailand)	Nursing students	63	19.27 (0.79)	MBSR (8 weeks)	64	19.08 (0.93)	None	16 and 32 weeks	CES-D
Biegel et al. (2009; United States)	Adolescent psychiatric outpatients	50	15.7 (1.13)	MBSR (8 weeks)	52	15.0 (1.19)	TAU	12 weeks	SCL-90
Bluth et al. (2016; United States)	Ethnically diverse at-risk adolescents	14	16.8 (1.3)	Learning to BREATHE (11 weeks)	13	17.2 (1.1)	Substance abuse class	None	SMFQ
Dvořáková et al. (2017; United States)	First-year college students	55	18.2 (0.4)	Learning to BREATHE (6 weeks)	54	18.2 (0.4)	None	None	PHQ
Freedenberg et al. (2017; United States)	Adolescents with cardiac diagnoses	30	15.1 (1.8)	MBSR (6 weeks)	22	14.5 (1.6)	Live video conference	None	HADS
Hazlett-Stevens and Oren (2017; United States)	Undergraduate and graduate students	47	22.1 (4.7)	MBSR (10 weeks)	45	22.1 (4.7)	None	None	DASS-21
Hindman (2013; United States)	Undergraduate and graduate students	13	20.92 (n/a)	MBSR (6 weeks)	10	23.80 (n/a)	None	None	DASS-21
Huang et al. (2015; China)	Adolescent inpatients	60	13–18	MBSR (8 weeks)	60	13–18	TAU	None	HAMD
Johnson et al. (2016; Australia)	Young adolescents	165	13.63 (0.43)	Modified MBSR (8 weeks)	128	13.63 (0.43)	None	12 weeks	DASS-21
Jimenez (2008; United States)	University students	61	19.81 (n/a)	MBSR (4 weeks)	59	19.81 (n/a)	Relaxing training	12 and 24 weeks	CES-D
Kang et al. (2009; Korea)	Nursing students	21	22.69 (1.49)	MBSR (8 weeks)	20	22.25 (0.86)	None	None	BDI
McIndoo (2015; United States)	Depressed college students	20	19.3 (1.9)	MBSR(4 weeks)	14	19.0 (1.5)	None	4 weeks	BDI-II & HRSD
Raes et al. (2014; United Kingdom)	Secondary school students	201	15.4 (1.2) ^a	Modified MBSR (8 weeks)	207	15.4 (1.2)	None	24 weeks	DASS-21
Shapiro et al. (1998; United States)	Premedical students and first- and second-year medical students	37	n/a ^b	MBSR (8 weeks)	39	n/a	None	None	SCL-90
Shomaker et al. (2017; United States)	Adolescent girls	17	15.01 (1.68)	Learning to breathe (6 weeks)	16	14.97 (1.75)	Cognitive behavioral program	24 weeks	CES-D
Sibinga et al. (2013; United States)	Middle school students	22	12.5 (n/a)	MBSR (12 weeks)	19	12.5 (n/a)	Health education	None	SCL-90
Sibinga et al. (2016; United States)	Primary and middle school students	159	12.0 (n/a)	MBSR (12 weeks)	141	12.0 (n/a)	Health education	None	CDI-S
Song and Lindquist (2015; Korea)	Nursing students	21	19.6 (1.7)	MBSR (8 weeks)	23	19.5 (2.0)	None	None	DASS-21

^aMean age for whole group of participants without differentiating between experimental and control groups.

^bParticipants composed of premedical students and first- and second-year medical students.

BDI-II, Beck Depression Inventory; CDI-S, Children's Depression Inventory-Short Form; CES-D, Center for Epidemiologic Studies Depression Scale; DASS-21, Depression Anxiety Stress Scales-21; HADS, Hospital Anxiety and Depression Scale; HAMD, Hamilton Depression Rating Scale; HRSD, Hamilton Rating Scale for Depression; PHQ, Primary Health Questionnaire; SCL-90, Symptom Checklist 90 (Revised); SMFQ, Short Mood and Feelings Questionnaire.

no treatment (Shapiro et al., 1998; Kang et al., 2009; Hindman, 2013; Raes et al., 2014; Aeamla-Or, 2015; Song and Lindquist, 2015; Johnson et al., 2016; Dvořáková et al., 2017; Hazlett-Stevens and Oren, 2017).

Participant characteristics

Sample sizes of the included studies ranged from 23 to 408, with a total of 2,042 participants. Of these participants, the mean age was 17.2 (*SD* = 3.3). Three studies involved diagnoses of depression

(Biegel et al., 2009; Huang et al., 2015; McIndoo, 2015). The remaining studies were conducted with youth displaying varying extents of depressive symptoms (Shapiro et al., 1998; Jimenez, 2008; Kang et al., 2009; Hindman, 2013; Sibinga et al., 2013, 2016; Raes et al., 2014; Aeamla-Or, 2015; Song and Lindquist, 2015; Bluth et al., 2016; Johnson et al., 2016; Dvořáková et al., 2017; Freedenberg et al., 2017; Hazlett-Stevens and Oren, 2017).

Risk of Bias in Included Studies

Sixty percent of the included studies had low risk of bias in sequence generation, and 28% of included studies had low risk of bias in allocation concealment. Randomization methods of the remaining studies were unclear, because they did not mention random sequence generation in their studies and did not explain how they allocated participants. Thirty-three percent of the included studies mentioned using blinded personnel or outcome assessors. Blinding methods for participants were not feasible, and it also turns out that all the included studies did not achieve this form of blinding. Of the included studies, 78% had low attrition bias because they had low dropout rate or mentioned using intention-to-treat analysis. No reporting bias was detected in included studies. A risk of bias summary is presented in **Figure 2**.

Effects of Interventions

Posttest effect size for these 18 studies comparing MBSR to controls (e.g., TAU, no intervention, and active control conditions) are shown in **Figure 3**. The combined posttest effect size was $g = -0.45$ (95% CI = $-0.63, -0.27$), indicating that MBSR had moderate effects in reducing depressive symptoms. The overall I^2 indicated that 69% of the variability across studies was due to heterogeneity rather than chance. The T of 0.30 is the standard deviation of underlying effects across studies. The prediction interval is within -1.05 to 0.15 , which suggests a large amount of inconsistency among effect sizes.

The combined follow-up effect size using robust variance estimation with 10 effect sizes from seven studies was $g = -0.24$ (95% CI = $-0.54, 0.06$), which indicates no statistically difference between the MBSR group and the control group in follow-up tests. The power to detect a population effect of 0.30 was 0.70. As such, the nonsignificant result must be interpreted in the context of the low statistical power.

Meta-Regression Analyses

Meta-regression results are presented in **Table 2**. We found that the average treatment effect was moderated by control condition ($\beta = 0.37$, SE = 0.18, $p < 0.10$), indicating that effects were larger for MBSR groups compared to no treatment or TAU conditions relative to active control groups. The average treatment effect size was also moderated by treatment duration, especially during the follow-up period ($\beta = -0.41$, SE = 0.15, $p < 0.10$). The effect size in studies among individuals diagnosed with clinical depression at baseline was larger than participants with various depressive symptoms only ($\beta = -0.36$, SE = 0.37, ns), but it did not reach a statistically significant level due to low statistical power. The statistically nonsignificant effects of moderators do not provide strong evidence of the absence of moderator effects, and results

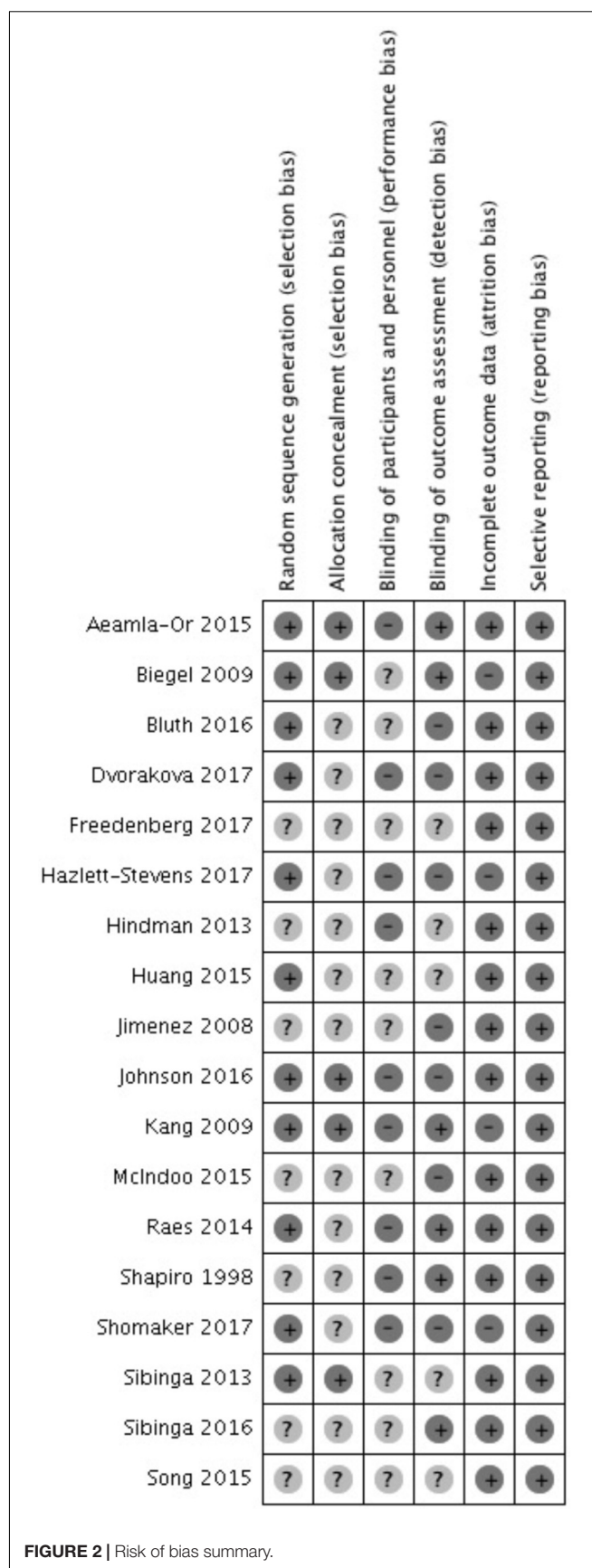


FIGURE 2 | Risk of bias summary.

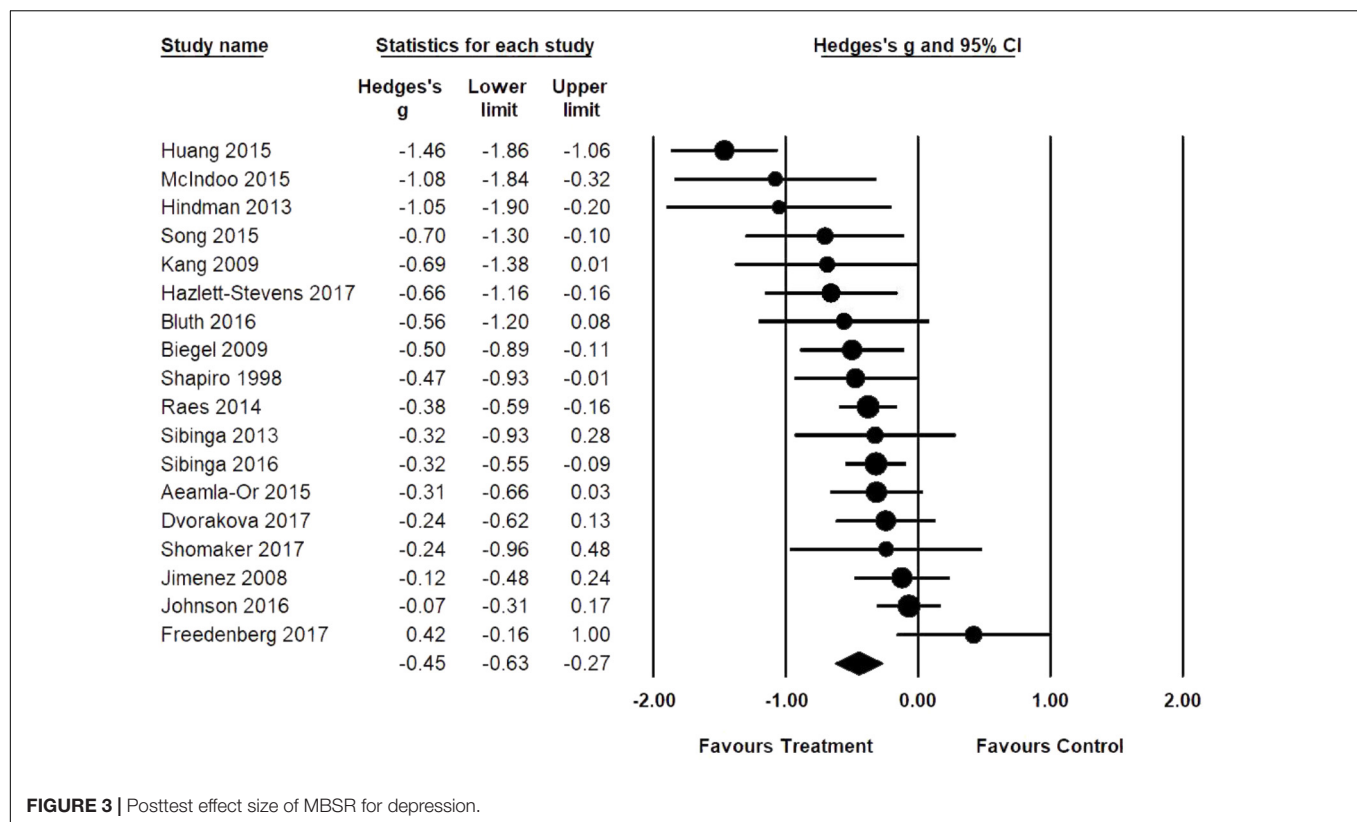


FIGURE 3 | Posttest effect size of MBSR for depression.

TABLE 2 | Results of meta-regression.

	k1	k2	Coefficient	SE
Baseline depression	29	18	-0.355	0.366
Age group ^a	29	18	-0.033	0.185
Control condition ^b	29	18	0.374*	0.184
Treatment duration ^c (all)	29	18	-0.350*	0.183
Treatment duration ^c (post-test effect sizes)	19	18	-0.236	0.211
Treatment duration ^c (follow-up effect sizes)	10	7	-0.407*	0.151

k1 = number of effect sizes, k2 = number of studies.

^aReference group was age <18.

^bReference group was no treatment or treatment as usual.

^cReference group is treatment less than 8 weeks.

* $p < 0.10$.

should be interpreted in the context of the low statistical power. We did not find a moderating effect of participants' age group ($\beta = -0.03$, $SE = 0.19$, ns). Although the moderator analysis by age was also underpowered, the difference was trivial in magnitude.

Sensitivity Analyses

Sensitivity analyses were conducted by excluding studies that may have had large effects on meta-analysis results (i.e., either being an outlier or having high or unclear risk of bias in multiple domains). After excluded seven studies that have high or unclear risk of bias in four out of the six domains, the combined Hedges' g for the remaining 11 studies was -0.46 (95% CI = -0.72 , -0.20)

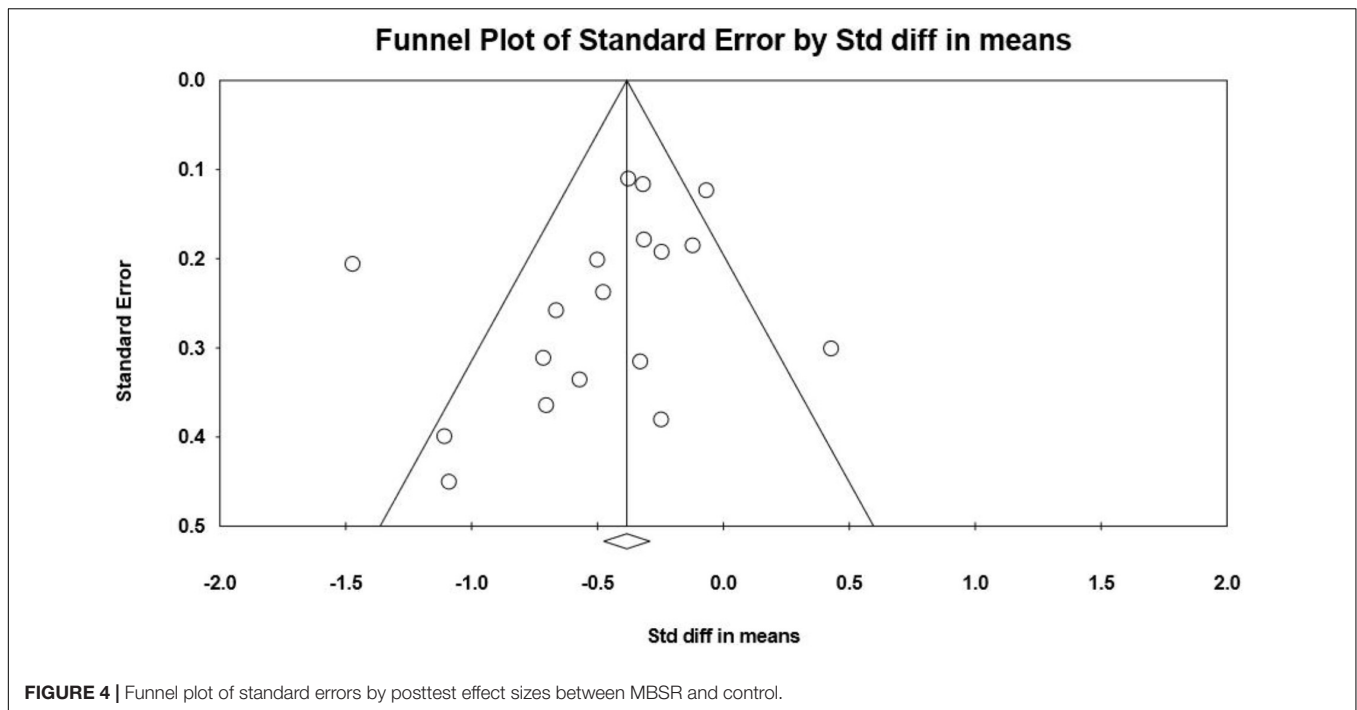
for posttest. Follow-up Hedges' g for the remaining four studies was -0.25 (95% CI = -0.75 , 0.25). Both results were comparable with the original analyses. After excluded one more study with the extreme value, the combined Hedges' g for the remaining 10 studies was -0.31 (95% CI = -0.46 , -0.17 , -0.14) for posttest and unchanged for follow-up.

Assessment of Publication Bias

Figure 4 shows a funnel plot of posttest effect sizes in relation to the standard errors of the effect sizes. Eggers regression test showed no evidence of asymmetry in the funnel plot (intercept = -1.43 ; $SE = 1.02$; CI = -3.58 , 0.73), and the trim-and-fill method indicated that no missing studies were needed to make the plot symmetric. However, due to the small number of included studies and the complicated nature of publication bias, we cannot conclude that our findings are robust against publication bias based on the funnel plot and the trim-and-fill method.

DISCUSSION

Eighteen RCTs involving 2,042 adolescents and young adults were assessed to examine the effect of MBSR on depressive symptoms. This review found a moderate posttest effect of MBSR in reducing depressive symptoms among adolescents and young adults when compared to control groups. This finding was generally consistent with previous reviews that found MBSR is moderately efficacious in treating mood disorders, including



depression among children and adolescents in clinical and nonclinical settings (Zenner et al., 2014; Kallapiran et al., 2015). The current review did not find a significant follow-up effect of MBSR in comparison to control groups. Follow-up effect was also not synthesized in previous reviews. Due to a small number of included studies with follow-up tests and a lack of statistical power, we cannot draw a conclusion regarding the sustaining effect of MBSR in alleviating depressive symptoms for this population. Future clinical trials are encouraged to include multiple follow-up tests to examine the long-term effects of MBSR on youth depression.

Regarding meta-regression analyses, we found MBSR compared to no treatment or TAU may have greater effect sizes than compared to active control condition. This can be explained by the nature of the active control design, which helps to control alternative explanations for the possible effects of the intervention (e.g., attention from study staff, therapeutic environment, and social support; Kinser and Robins, 2013).

Meta-regression analyses also found that MBSR was efficacious for both clinical and nonclinical groups, which is consistent with prior systematic reviews that mindfulness-based interventions were efficacious in reducing depressive symptoms based on different samples of children and youth (Burke, 2010; Virgili, 2015; Zoogman et al., 2015). Previous review also found that MBSR was commonly used in nonclinical populations (Kallapiran et al., 2015). Although MBSR was originally developed in a clinical setting for patients (Kabat-Zinn, 1990), it is applicable to generally healthy individuals to reduce depressive symptoms and promote emotional well-being. Nevertheless, we found the overall effect size was larger among individuals with a depression diagnosis

relative to the nonclinical group, which might be partially due to the low base rates of depression for the nonclinical group and floor effects (i.e., the relatively low baseline level of depression in the nonclinical group, leaving less opportunity for changes in depression scores). Findings were consistent with a recent study showing that the effect size of mindfulness interventions in clinical samples was larger than in nonclinical samples (Zoogman et al., 2015). Again, this finding should be interpreted with caution given the small number of studies included and the observational nature of moderator analysis.

In addition, the study found the longer the intervention duration, the larger the effect of MBSR on depressive symptoms, especially during the follow-up period. The finding was consistent with a previous meta-regression examining the effects of mindfulness-based therapies on a variety of psychological problems based on 182 studies, which found significant moderating effect of treatment duration ($\beta = 0.01$, $SE = 0.00$, $p < 0.05$; Khoury et al., 2013). However, the moderating effect of treatment duration on efficacy of MBSR in the literature is inconclusive. For example, Carmody et al. (2009) did not find a significant correlation between class contact hours and the mean effect size of MBSR interventions. The current review was the first to test the moderating effect of treatment duration on MBSR efficacy among young people. It is possible that young people may need more time to understand the meaning of MBSR and form practice habits in their daily life compared to adults. Especially over the long term, young people may lose interest in mindfulness practice and be less likely to persist if they did not get a solid practice foundation during the treatment period. Hence, it is understandable that MBSR training of 8 weeks or longer may have a greater

influence on young people's depressive symptoms during the follow-up period.

The present review had several limitations. First, our search only included published journal articles and dissertations in English and Chinese. Future research should include gray literature and research in other languages if possible. Second, relatively few RCTs on this topic were available and included in the current review, thus limiting the value of meta-regression. Due to the small number of studies with follow-up assessments, we were unable to draw a conclusion about the sustaining effect of MBSR for depressive symptoms among adolescents and young adults. We were also unable to perform a more sophisticated publication bias assessment. Third, many included studies have unclear risk of bias in allocation concealment and blinding. This is not uncommon for trials testing the efficacy for psychotherapies (Shean, 2014). To balance the potential risk of bias and the precision of the meta-analysis, we conducted sensitivity analysis by excluding studies with high or unclear risk of bias in multiple domains. The results of the meta-analysis should be interpreted cautiously considering the potential risk of bias. More rigorous RCTs with follow-up data (including short- and long-term) are needed to examine the effect of MBSR in treating depression among adolescents and young adults.

This study has potential implications for intervention. The moderate effect size of MBSR suggests that it is a promising approach in terms of reducing depressive symptoms and can be widely applied to treat depression or depressive symptoms among young people with various levels of depression severity, from expressing depressive symptoms to having a clinical diagnosis of depression. Given an increasing interest in positive education, MBSR that targets positive mental health could be incorporated into school-based educational programs to promote students' emotional well-being. The study also found longer treatment duration (e.g., 8 weeks or more) is associated with larger follow-up effect size. This may suggest

that the use of full-length MBSR may be necessary for adolescents and young adults to result in a larger sustaining effect.

AUTHOR CONTRIBUTIONS

XC, PZ, TL, AB, and IC contributed to problem formulation and study design. XC, AB, and TL conducted literature review, literature search and screening, data extraction, and data analysis. XC and AB interpreted the data and drafted the manuscript. XC, TL, AB, and IC critically revised the manuscript.

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Character Strengths, Strengths Use, Future Self-Continuity and Subjective Well-Being Among Chinese University Students

Yonghong Zhang* and Mengyan Chen

School of Culture and Social Development Studies, Southwest University, Chongqing, China

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Samuel Mun-yin Ho,
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Hong Kong

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Jesús Nicasio García Sánchez,
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Yang-Hsueh Chen,
National Chengchi University, Taiwan

*Correspondence:

Yonghong Zhang
zhzh@swu.edu.cn

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The study was designed to explore the relationships among character strengths, strengths use, future self-continuity and subjective well-being. A total of 225 undergraduates completed paper-and-pencil questionnaires assessing character strengths, strengths use, future self-continuity, and subjective well-being. Results suggested several character strengths were correlated with subjective well-being and the strongest correlations were found for hope, curiosity, zest, perseverance and love. All character strengths were significantly correlated with strengths use. Strengths use and future self-continuity were robustly correlated with subjective well-being. The mediation analysis showed that strengths use mediates the relationship between character strengths and subjective well-being, and specifically, the indirect effects of strengths use varies from different character strengths. The moderated mediator suggested that future self-continuity moderated the mediation of strengths use because future self-continuity moderates the effect of strengths use on subjective well-being. Furthermore, the indirect effect of strengths use was stronger with high level of future self-continuity than those with low level of future self-continuity. The present findings make a contribution to understand the underlying mechanisms involving in character strengths are associated with higher level of well-being. Additionally, the findings expand knowledge about future self-continuity and its relation to strengths use and subjective well-being among undergraduates, having significant implications in the educational context.

Keywords: character strengths, strengths use, future self-continuity, subjective well-being, positive education

INTRODUCTION

Over the last decade, worldwide there is a growing interest in positive psychology and its emerging applied field of positive education from the youngest years through to university students. Given the shockingly high prevalence of psychological disorder or depression among adolescents and young adults, psychologists, educators or policy makers became aware that, apart from equipping students with knowledge and skills for accomplishment, success, literacy and discipline, education should also teach students well-being by adopting findings of positive psychology (Seligman et al., 2009). In other words, the end-goal of schooling is to help students not only function well but also feel good. One central concern of positive psychology is character strengths. According to Peterson and Seligman (2004), character strengths can be recognized as an entire cluster of positive

traits vital for the good life, manifesting through a range of thoughts, feelings and behaviors. Moreover, these strengths are morally valued and universal, while there are individual differences that exist in degrees and vary across the lifespan (Park and Peterson, 2006a). In order to approach the multidimensionality of character strengths and assess these strengths as individual differences, based on the existing scientific literature, philosophical tradition and historical surveys, Peterson and Seligman (2004) introduced the classification of Virtue in action (VIA) which identifies 6 core virtues and the 24 character strengths. Also, Peterson and Seligman suggested that there are several criteria for the inclusion of character strengths in the classification, and one of these criteria is to contribute to the fulfilling life and happiness (Park et al., 2004).

A large body of literature has developed showing that possessing character strengths are correlated with various indicators of subjective well-being (SWB) (Park et al., 2004; Park and Peterson, 2006b; Shimai et al., 2006; Gillham et al., 2011; Shoshani and Slone, 2013; Weber et al., 2013; Martínez-Martí and Ruch, 2014). In a preliminary survey of the relationship between character strengths and SWB, participants were asked to complete the VIS Inventory of strengths (VIA-IS) and Satisfaction with Life scale (SWLS), and the results showed that the five strengths, namely, hope, zest, gratitude, love and curiosity, had the strongest correlations with life satisfaction, and modesty, creativity, judgment, appreciation of beauty, love of learning were the least correlated with life satisfaction, and also provided the empirical evidence that “the higher a given strength, the more life satisfaction” (Park et al., 2004). Of note, the finding that hope, zest, gratitude, love and curiosity are the best predictors of life satisfaction has been replicated in most of the subsequent research across different cultures (Shimai et al., 2006; Peterson et al., 2007; Brdar and Kashdan, 2010; Ruch et al., 2010, 2014; Zhou and Liu, 2011; Buschor et al., 2013). Such findings have demonstrated the convergence and similarity in terms of the relationship between character strengths and satisfaction of life to a large extent.

Literature also illustrated positive associations between character strengths and positive affect (PA) (Van Eeden et al., 2008; Littman-Ovadia and Lavy, 2012; Shoshani and Slone, 2013; Weber et al., 2013; Martínez-Martí and Ruch, 2014). Martínez-Martí and Ruch (2014) found that the strengths of hope, zest, humor, gratitude and love yielded the highest correlation with PA, whereas the lowest correlations were modesty, religiousness, appreciation of beauty and excellence, prudence, and open-minded. Also, Littman-Ovadia and Lavy (2012) suggested that hope, curiosity, zest, love of learning, and perspective were the five strengths most strongly and positively related to PA, whereas modesty, forgiveness, and spirituality were the ones correlated lowest (non-significant, *all*). In relation to negative affect, Martínez-Martí and Ruch (2014) suggested that hope, humor, zest, honesty and open-mindedness were the ones with mostly highest negatively correlations, whereas appreciation of beauty and prudence were the ones with the lowest negative correlations. Littman-Ovadia and Lavy (2012) demonstrated that hope, curiosity, zest, love, and self-regulation were the ones with mostly highest negatively correlations, whereas excellence,

modesty, creativity, bravery and prudence were the ones with the lowest negative correlations.

In addition, there were other existing studies investigating the relationship between character strengths and other indicators of subject well-being (e.g., happiness, job satisfaction, and quality of life) and other domains of well-being such as psychological well-being (PWB; Park and Peterson, 2006b; Buschor et al., 2013; Hausler et al., 2017; Park and Lee, 2017). In particular, Hausler et al. (2017) examined the different relations between individual character strengths and two types of well-being, namely, SWB and PWB, and found that the strengths of hope, zest, gratitude, curiosity and love (*called* “the happiness strengths”) were related mostly to PWB and SWB and the 24 character strengths in general showed the stronger correlations with PWB than SWB. Accordingly, it can be concluded that the possession of character strengths can be significantly and robustly associated with positive functioning. However, there is a question occurring, that is, how these strengths operate to promote positive functioning and well-being?

According to Seligman and Csikszentmihalyi (2000), exerting and habituating one's character strengths allows people to experience a sense of fulfillment and results in a satisfying life. Similarly, Peterson and Seligman (2004) suggested character strengths use is related to a feeling of self with vigor and authenticity, and leads to positive functioning and well-being (Proctor et al., 2011a). That is, when a person uses his strengths, he feels as if he has more energy, being more vigorous and alive, and feels as if he can reveal his true self, more authentic and engaging, resulting in positive functioning and performance (Linley, 2008; Dubreuil et al., 2014). Cross-sectional and longitudinal literature has demonstrated the positive link between strengths use and well-being (Linley et al., 2010; Proctor et al., 2011a; Wood et al., 2011; Harzer and Ruch, 2013; Botha and Mostert, 2014; Douglass and Duffy, 2015; Huber et al., 2017; Littman-Ovadia et al., 2017). In a longitudinal study, for example, strengths use was found to be significantly and positively associated with self-esteem, vitality, PA, and predicted increased well-being over time (Wood et al., 2011). Another study with undergraduate students also suggested that strengths use and satisfaction with life yielded a significant and positive relation (Douglass and Duffy, 2015). Moreover, in the work setting, researchers examined the associations among three types of strengths use and work outcomes. Results showed that signature-strengths use, happiness-strengths use, and lowest-strengths use had beneficial effects on different aspects of work-related outcomes. That is, using signature strengths (SS) was mostly correlated to behavioral aspects of functioning [e.g., performance, organizational citizen behavior (OCB), counterproductive work behavior (CWB)] at work; using happiness strengths was mostly correlated to emotional-psychological aspects including job satisfaction and work engagement and work meaningfulness; and using lowest strengths held unique contribution to OCB, and although using different kinds of would be beneficial, happiness-strengths use can be particularly beneficial for most people (Littman-Ovadia et al., 2017).

Moreover, many intervention studies also suggested that using one's character strengths has consistently and positively

correlated with various domains of well-being (Seligman et al., 2005; Mitchell et al., 2009; Sin and Lyubomirsky, 2009; Quinlan et al., 2012; Bolier et al., 2013; Proyer et al., 2015; Harzer and Ruch, 2016; Meyers and van Woerkom, 2017). For example, in the first strength-based intervention study, participants were asked to use one of their top five strengths in a new way each day over 1 week, and the obtained results showed that participants did experience significantly greater benefits in well-being over a period of 6 months (Seligman et al., 2005). This design “using the top 5 strengths” or “using SS” has also become the main strategy in the subsequent intervention research (Mitchell et al., 2009; Proctor et al., 2011b; Bridges et al., 2012; Mongrain and Anselmo-Matthews, 2012; Gander et al., 2013; Duan et al., 2014; Proyer et al., 2014). Of note, there also have a small number of interventions studies focusing on lesser strengths (LS) or weaknesses (Rust et al., 2009; Walker, 2013; Proyer et al., 2015). For instance, in the work of Proyer et al. (2015), 375 adults were randomly assigned to a LS intervention, a SS intervention, and a placebo control condition. The results showed that participants in both intervention conditions reported increases in happiness lasting 3 months and decreases in depressive symptoms in the short term and the intervention targeting the LS led to significant improvement in satisfaction with personal health and quality of living conditions in general.

Therefore, it may be concluded that the possession of strengths is a prerequisite of a fulfilling life and positive functioning; whereas the unblocked deployment is the direct way to achieve a good life. In fact, there is a clear difference between possessing strengths and using strengths. For instance, if a person was highly creative but never makes use of this strength, he is unlikely to get much benefit from this strength. In contrast, a person has high level of creativity and make the most of such a strength in different ways such as completing required tasks creatively in the workplace, he will get the most benefit such as experiencing a strong sense of accomplishment (Wood et al., 2011). Consistent with this argument, in a previous cross-sectional study, the authors found that although knowledge about people's strengths and strengths use were both highly correlated with indicators of well-being, they had distinctly predictive effects on well-being. Specifically, knowing one's strengths would not cause any significant increases in well-being, while using strengths promoted stronger vitality and well-being (Govindji and Linley, 2007).

Taken together, the positive link between the possession of character strengths and well-being may be built with making use of personal strengths. Indeed, for individuals when they authentically apply their strengths in a wide variety of daily situations, they can experience a sense of fulfillment and achievement, resulting in the achievement of happiness (Peterson and Seligman, 2004). However, to the best of knowledge, almost no research has directly examined the role of strengths use in relation between the possession of character strengths and well-being. Therefore, the leading purpose of the current research is to examine the mediating role of strengths use in the link between character strengths and SWB, and further investigate the indirect effect of every strength on SWB through the “bridge” of strengths use.

According to the temporal model of SWB proposed by Durayappah (2011), the definition of global SWB not only consider the immediate thoughts and states as well as the present self, but also concerns the past, future thoughts and states as well as past and present selves. As such, the temporal state is a fundamental component in the model of SWB because when people evaluate their global life satisfaction, they consider “not only current proceedings, but also the moments that have occurred, as well as those yet to be.” Although we live in the present, we often recall the past life stories and also anticipate the future events; such kinds of imagination, connecting the past, present and future selves into a continuous narrative, stems from the perceived personal “sameness” over time, a sense of connectedness and similarity to the temporal selves through time (James, 1985; Blouin-Hudon and Pychyl, 2016). The sense of self-continuity is vital throughout the life ranging from building up social networking to interpreting the surrounding world and to making emotional responses for that world as well as planning for the future (Sadeh and Karniol, 2012).

On the basis of motivated identity construction theory, the self-continuity perspective plays a key role in how people develop and maintain their senses of identities that strongly influence personal and societal functioning (Bird and Reese, 2008; Vignoles et al., 2011; Becker et al., 2017). According to Murillo (2012), every moral behavior might be based on a conception of the self over the course of time, which is compatible with the direction of self-realization, and the conceptualization of personal identity involving the continuity of the person over the course of time has close relationships with the general goal of life, namely, happiness. Similarly, Konut suggested that a feeling of personal continuity is related to greater creativity, vitality and self-esteem. Furthermore, prior psychologists suggested that the perception of the temporally extended self is a central part of self-knowledge (James, 1890/1981; Stern, 1985), which can be seen as an important predictor of global well-being and psychological health (Bénabou and Tirole, 2003; Kurtz, 2011; Ahadi et al., 2015). Empirical studies on self-continuity showed that individuals' feeling of connected and continuous self has robust impacts on a range of consequential outcome including time management, decision making, saving behavior, well-being and coping (Singer and Bluck, 2001; Ersner-Hersfield et al., 2009a, 2012; Sadeh and Karniol, 2012; Blouin-Hudon and Pychyl, 2015). For example, Chandler et al. (2003) demonstrated that a sense of personal continuity over time enables adolescents to show appropriate care and concern for themselves and promotes well-being in the long term.

In many discussions of self-continuity, the sense that the present self connects to the future, namely, future self-continuity is of considerable concern. According to Parfit (1971), if a person recognizes his future self as a stranger, he might have no more reasons to work on his resources for his future self than for this stranger; conversely, if he perceives the future self as similar to the present self, he is more likely to make prudent decision. On a more general level, individuals' feelings of connectedness to the future self affect one's attitude and behavior. For example, for people who have greater continuity with their future self, they are more willing to save for the future and place a high value on

future gains (Ersner-Hersfield et al., 2009a,b). Similarly, when the future self shares similarity to the present self with a vivid and realistic terms and in the positive affective state, people might be more likely to make sacrifices today that may benefit them at some point in the years to come (Ersner-Hersfield, 2011). Along with these findings, Adelman et al. (2017) suggested that future self-continuity also plays a signature role in the educational setting and has beneficial impacts on academic performance, by considering more possible and long-term consequences instead of merely focusing on the current and short-term consequences. Additionally, the perceptions of future self-continuity may have a positive correlation with positive affective states and specifically, people with high level of future self-continuity might feel pleasant when they imagine how the current behavior may cause positive future consequences, and in turn, those experiencing greater positive affection might be more willing to include the patterning of future self's goals (Blouin-Hudon and Pychyl, 2015).

Based on these considerations, we conclude that future self-continuity plays an important role in initiating one's rational behavior and is closely related to his or her affective states, and for those high in future self-continuity, they are more likely to exhibit the beneficial action (e.g., applying strengths in different ways) and draw attention on the positive long-term consequences of their beneficial action, and in turn experience the positive affective state. To the best of our knowledge, almost no prior studies have examined the role of future self-continuity in the relationships between strengths of character, strengths use and SWB. Thus, the second objective of the present study is to explore whether people with different levels of future self-continuity display different levels of strengths use and experience different levels of well-being from using their strengths, or alternatively, does the way in which strengths use mediates the association between strengths of character and SWB depend on one's different levels of future self-continuity?

THE PRESENT STUDY

The current study attempts to explore the relations among character strengths, strengths use, future self-continuity and SWB with a sample of Chinese undergraduate students. Specifically, this study has two objectives: (1) to examine the mediating role of strengths use in the relationship between the 24 character strengths and SWB and assess the indirect effect of each character strength on SWB through the "bridge" of strengths use; (2) to explore the moderating role of future self-continuity in the link of character strengths and SWB and the link of strengths use and SWB.

Participants

A sample of 238 undergraduate university students from Southwest University participated in this survey. Thirteen students were excluded from the analysis because of incomplete data. Among the remaining 225 students, 52 (23.1%) were males and 173 (76.9%) were females. The average age of students was 19.23 years ($SD = 0.816$; range from 17 to 22). The sample was comprised of freshmen (47%), sophomores (32.6%), juniors

(15.9%), and seniors (4.5%). With regard to students' hometown, 78 (34.8%) came from rural areas, 83 (37.1%) came from small towns, and 63 (28.1%) came from large and medium-sized cities. One participant did not provide information about his hometown.

Procedure

The present study received the Ethics approval from the school of Culture and Social Development in Southwest University of China. Our study also obtained the consent of the undergraduate students. Before the application of the questionnaires, participants were informed about the purposes of the present study. Alternative options were provided if participants did not wish to participate in the study. The study group also confirmed that all data would be kept confidential, only accessible to the study group and be only used for study purposes as well as there was no right or wrong answer. The data of the study were collected in the course of regular class hours.

Instruments

Character Strengths

The *Chinese virtues questionnaire (CVQ)*, which was developed by Duan et al. (2012, 2013), was used in the present study to measure the 24 character strengths. CVQ is a simplified Chinese self-report questionnaire that measures the 24 widely valued character strengths and 3 virtues (i.e., interpersonal, vitality and cautiousness) with 96 items. An example of items is "I see beauty that other people pass by without noticing" (beauty). The respondents were asked to rate the extent to which each item described them on a five-point Likert scale ranging from 1 (very much unlike me) to 5 (very much like me). The means scores of the 24 strengths were obtained by summing the corresponding items of per strengths and then dividing them by the numbers of item. A high score represents a high degree of the character strength within an individual. CVQ showed good psychometric characteristic and solid cultural foundations in the existing research. The internal coefficient alpha were 0.90 (the interpersonal subscale), 0.91 (the vitality subscale), 0.88 (the cautiousness subscale), as reported by Duan et al. (2013), and the test-retest reliability for three subscales over 10 weeks ranged from 0.70 to 0.76 and the convergent validity ranged from 0.27 to 0.52, and also this scale showed clear discriminant validity from related constructs such as hope and gratitude. In another study, the reliability for this total questionnaire was 0.945 and the test-retest reliability over 6 weeks for three scales ranged from 0.738 to 0.826 and convergent validity ranged from 0.379 to 0.587 (Zhang et al., 2014). In the present study, the internal consistency coefficient of the total questionnaire was 0.96.

Strength Use

The *Strength Use Scale (SUS)*, which was developed by Govindji and Linley (2007), was used to assess individual strength use with 14 items. An example of items is "I always play to my strengths." Participants were asked to each item on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The higher the mean score of the whole scale reflected the higher degree of strength use. In the original study, the coefficient

alpha of the SUS, as reported by Govindji and Linley (2007), was 0.95 and this construct has been demonstrated to associate significantly with other criterion measures including self-esteem, self-efficacy, and subjective vitality and with measures of related constructs including SWB, and PWB. Wood et al. (2011) suggested that this scale has good internal consistency ($\alpha_{(T1/T2/T3)} = 0.97/0.97/0.94$) and test–retest reliability ($r = 0.85$) as well as good criterion validity with well-being. In the present study, the internal consistency coefficient was 0.93.

Future Self-Continuity

The *Future Self-continuity scale*, which was developed by Ersner-Hershfield et al. (2009b), was used to assess similarity between current and future selves. This scale was based on the inclusion of the other in the self scale (Aron et al., 1992). As such, the index of future self-continuity is measured by 2 questions on a 7-point scale marked at each point by two circles that ranged from depicting no overlap to depicting almost complete overlap. The first question asks participants to select the circle pair that best described how similar they felt to a future self 10 years from now on the scale ranging from 1 (not similar at all) to 7 (completely similar). The higher scores reflected the more continuity with one's future self. The test–retest reliability over a period of 2 weeks, as reported by Ersner-Hershfield et al. (2009b), was high (0.79 for similarity and 0.80 for connectness) and the similarity rating on this scale was significantly correlated with other corresponding measures rating including match in adjective descriptions of present and future selves and valuation of future reward. Bartels and Urminsky (2011) suggested that the future self-continuity scale has clear discriminant validity from measures of related concepts such as uncertainty about the future and about one's future preferences and general perceived change in life circumstances.

Subjective Well-Being

The *Positive and Negative Affect schedule (PANAS)*, which was developed by Watson et al. (1988), was used to assess positive and negative affectivity. The scale is made up of two subscales each consisting of ten items: 10 positive affects (i.e., interested, excited, strong, enthusiastic . . .) and 10 negative affects (i.e., distressed, upset, guilty, scared . . .). Participants were asked to rate the extent to which they had felt each feeling during the past week on a five-point Likert scale ranging from 1 (very slightly or not at all to extremely) to 5 (extremely). In the original study, the coefficient alpha of the PA and NA scales were 0.86 and 0.87, and the test–retest reliabilities after 1 week interval were 0.79 for PA and 0.81 for NA, and convergent validity ranging from 0.89 to 0.95 (Watson et al., 1988). The reliabilities for this scale, as also reported by Crawford and Henry (2004), was 0.89 for PA and 0.85 for NA, and the CFA results clearly supported the construct validity of the PANAS scales. In the present study, the internal consistency coefficients were 0.83 for PA and 0.87 for NA.

Satisfaction With Life Scale (SWLS), which was developed by Diener et al. (1985), was used to measure global life satisfaction with 5 items. An example of items is “I am satisfied with my life.” Participants was asked to each item on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The

higher the total score of the whole scale reflected the higher level of global life satisfaction. In the original research, the coefficient alpha was 0.87 and the test–retest correlation coefficient over a period of 2 months was 0.82 (Diener et al., 1985). Shevlin et al. (1998) reported that the common metric standardized factor loadings ranged from 0.92 to 0.98, and the reliability for this scale was 0.921. In the present study, the internal consistency coefficient was 0.76.

Data Analysis

In order to explore the relationship among character strengths, strengths use, future self-continuity and SWB, we use SPSS 20.0 to conduct data analysis, which included four steps. As a first step, we computed descriptive statistics of 24 character strengths, and whether students' age and gender were correlated with any variables analyzed for the present study questions with Pearson correlation. Because we observed that some character strengths would be influenced by participants' gender, we decided to control for the effects of this demographic variables in the subsequent analyses. As a second step, we computed partial correlations between character strengths, strengths use, future self-continuity and SWB with gender as the control variable. As a third step, we tested whether strengths use mediated the relationship between the whole character strengths and SWB, and further examined the direct and indirect effects between 24 character strengths and SWB respectively with the help of an SPSS macro developed by Hayes (2013). As a final step, we explored the moderating role of future self-continuity in the link of character strengths and SWB and the link of strengths use and SWB, and further examined indirect effects of at different levels of the moderator.

RESULTS

Preliminary Analyses

The results of the preliminary analyses are shown in **Table 1**. Means of 24 character strengths range from 2.90 (regulation) to 3.91 (fairness). The top five strengths were fairness, love, authenticity, gratitude as well as leadership, and the last five strengths were zest, creativity, perspective, learning as well as regulation, which are comparable with earlier findings. In addition, there were no significant correlations with age. Furthermore, compared with boys, girls were more likely to report higher scores on teamwork, fairness, Love, and gratitude. Because some of variables analyzed for the present study questions would be influenced by participants' gender, we decided to control for the effects of this demographic variables in the subsequent analyses.

Correlations

Partial correlations among study variables are shown in **Table 2**. All character strengths were significantly correlated with strengths use with the top coefficients being found for social, perspective, zest, creativity and humor, and 22 of the 24 character strengths were significantly related to SWB with the top coefficients being found for hope, curiosity, zest, perseverance

TABLE 1 | Self-reported variables: means, standard deviations, and correlations with students' age and gender.

Variables	M	SD	Correlations with	
			Age	Gender
Self-reported CVQ				
Kindness	3.70	0.57	0.055	0.092
Teamwork	3.73	0.57	0.010	0.137*
Fairness	3.91	0.51	−0.010	0.132*
Love	3.90	0.62	0.027	0.249**
Authenticity	3.84	0.52	0.014	0.095
Leadership	3.78	0.56	0.027	0.042
Forgiveness	3.61	0.62	0.025	0.062
Gratitude	3.79	0.58	−0.037	0.241**
Humor	3.23	0.75	0.023	−0.067
Curiosity	3.20	0.63	0.059	0.060
Zest	3.19	0.65	0.101	0.042
Creativity	3.19	0.67	0.001	−0.073
Perspective	3.16	0.58	0.043	−0.064
Hope	3.40	0.64	−0.020	0.064
Social	3.27	0.61	0.030	−0.124
Beauty	3.52	0.67	−0.031	0.129
Bravery	3.33	0.61	0.042	−0.027
Belief	3.24	0.70	0.031	−0.018
Judgment	3.44	0.58	−0.043	−0.148*
Prudence	3.50	0.62	0.017	−0.066
Regulation	2.90	0.60	0.016	−0.103
Perseverance	3.37	0.59	0.023	−0.049
Learning	3.10	0.74	0.081	−0.020
Modesty	3.24	0.57	0.053	0.025
SU	4.24	0.91	0.020	0.125
FSC	4.14	1.45	0.013	−0.013
SWB	4.06	1.60	−0.061	0.075

N = 225. Age: 17–22 years. Gender: 1 = male, 2 = female. CVQ, Chinese virtues questionnaire; SU, Strengths use; FSC, Future self-continuity; SWB: Subjective well-being. **p* < 0.05, ***p* < 0.01 (Pearson correlation, two-tailed).

and love, which was in line with previous findings (Park et al., 2004; Wagner and Ruch, 2015; Hausler et al., 2017). Forgiveness was not significantly related to students' SWB, and prudence was negatively related to SWB. In addition, authenticity and perseverance were correlated with future self-continuity. Strengths use had no correlation with future self-continuity. Strengths use and future self-continuity were found to be correlated with SWB significantly. The significant correlations were exclusively positive.

Mediation

We conducted a mediation analysis based on 5000 bootstrapped sample using bias corrected and accelerated 95% confidence intervals (CIs). Before the analysis, we z-transformed all the variables to ensure that variable effect sizes would be compared. As **Table 3** shown, character strengths had a significant, direct path to strengths use ($\beta = 0.07$, $SE = 0.01$, $p < 0.01$) in the mediator variable model. Next, when strengths use was included into the dependent variable model, the direct effect of

TABLE 2 | Partial correlations between 24 character strengths and strengths use, future self-continuity and subjective well-being.

Variables	SU	FSC	SWB
Kindness	0.346**	0.060	0.247**
Teamwork	0.385**	0.131	0.270**
Fairness	0.363**	0.050	0.185**
Love	0.356**	0.083	0.321**
Authenticity	0.434**	0.156*	0.209**
Leadership	0.471**	0.040	0.175**
Forgiveness	0.201**	0.082	0.089
Gratitude	0.316**	0.037	0.151*
Humor	0.503**	−0.023	0.244**
Curiosity	0.489**	0.012	0.392**
Zest	0.544**	0.044	0.385**
Creativity	0.528**	−0.078	0.258**
Perspective	0.568**	0.056	0.189**
Hope	0.406**	0.026	0.466**
Social	0.577**	−0.043	0.286**
Beauty	0.434**	0.046	0.184**
Bravery	0.441**	−0.005	0.167*
Belief	0.340**	0.090	0.234**
Judgment	0.466**	0.024	0.146*
Prudence	0.179**	0.112	−0.010
Regulation	0.247**	0.091	0.208**
Perseverance	0.417**	0.145*	0.344**
Learning	0.325**	0.065	0.240**
Modesty	0.243**	0.158*	0.201**
SU	1.00	0.08	0.49**
FSC	0.08	1.00	0.30**
SWB	0.49**	0.30**	1.00

N = 225. Correlations are controlled for influences of students' gender. SU, Strengths use; FSC, Future self-continuity; SWB, Subjective well-being. **p* < 0.05, ***p* < 0.01.

TABLE 3 | Result of the mediation analysis of strengths use between the whole character strengths and subjective well-being.

Predictor	B	SE	t	p
Mediator variable model				
CCS	0.07	0.01	12.4677	0.0000
Dependent variable model				
CCS	0.02	0.01	1.15	0.2511
CM	0.73	0.13	5.46	0.0000

CCS, character strengths; CM, strengths use.

character strengths on SWB was not significant ($SE = 0.0136$, 95% CI: {−0.0112, 0.0425}), and indirect effect was significant ($SE = 0.0103$, 95% CI: {0.0297, 0.0706}). Thus, strengths use mediates the relation between character strengths and SWB.

In addition, we examined the direct and indirect effects between 24 character strengths factors and SWB respectively. As **Table 4** shown, for most of the 24 character strengths (except forgiveness, judgment and prudence), the total effects were significant and positive, and hope was the strongest predictor of SWB with the regression weight 1.14**.

TABLE 4 | Results of mediation analyses for character strengths as predictors of subjective well-being with strengths use.

	Total effect			Direct effect	Mediation by strengths use	Total R ²
	a	b	c	c'	indirect effect a × b	
Kindness	0.56**	0.79**	0.62**	0.18	0.44**	0.23**
Teamwork	0.61**	0.78**	0.70**	0.23	0.48**	0.23**
Fairness	0.65**	0.84**	0.49*	−0.06	0.55**	0.23**
Love	0.55**	0.74**	0.78**	0.38*	0.40**	0.24**
Authenticity	0.75**	0.84**	0.59**	−0.04	0.63**	0.23**
Leadership	0.77**	0.90**	0.46*	−0.22	0.69**	0.23**
Forgiveness	0.31**	0.84**	0.18	−0.08	0.26**	0.22**
Gratitude	0.53**	0.85**	0.38*	−0.06	0.44**	0.23**
Humor	0.59**	0.84**	0.48**	−0.02	0.49**	0.23**
Curiosity	0.70**	0.66**	0.98**	0.51**	0.46**	0.26**
Zest	0.75**	0.66**	0.96**	0.47**	0.49**	0.25**
Creativity	0.67**	0.86**	0.50**	−0.09	0.58**	0.23**
Perspective	0.87**	0.95**	0.49**	−0.34	0.83**	0.24**
Hope	0.58**	0.61**	1.14**	0.78**	0.36**	0.31**
Social	0.83**	0.84**	0.67**	−0.03	0.70**	0.23**
Beauty	0.60**	0.85**	0.45**	−0.05	0.51**	0.23**
Bravery	0.65**	0.88**	0.41*	−0.17	0.58**	0.23**
Belief	0.44**	0.79**	0.50**	0.15	0.35**	0.23**
Judgment	0.67**	0.91**	0.32	−0.29	0.61**	0.24**
Prudence	0.25*	0.86**	−0.05	−0.26	0.21*	0.24**
Regulation	0.35**	0.79**	0.52**	0.24	0.28**	0.23**
Perseverance	0.63**	0.72**	0.88**	0.42*	0.45**	0.25**
Learning	0.38**	0.78**	0.52**	0.23	0.29**	0.24**
Modesty	0.39**	0.80**	0.52**	0.21	0.31**	0.23**

N = 225. *a* – Direct effect of IV (character strengths) on the mediator (strengths use); *b* – Direct effect of the mediator (strengths use) on DV (subjective well-being); *c* – Total effect of IV (character strengths) on DV (subjective well-being); *c'* – Direct effect of IV (character strengths) on DV (subjective well-being); *a* × *b* – Indirect effect of IV (character strengths) on DV (subjective well-being) through the mediator (strengths use). *z* = 5000 bootstrap resamples. **p* < 0.05, ***p* < 0.01.

For all of the 24 character strengths factors, there were significant indirect effects (*a* × *b*), which means that the relationships between the 24 character strengths and SWB were mediated by strengths use. For love, curiosity, zest, hope and perseverance, there were not only a significant indirect but also a significant direct effect. Similarly, hope also had the highest direct effect on SWB with the regression weight 0.78**. For the remaining character strengths, there were only a significant indirect effect and no significant direct effect, which means that the relationships between these character strengths factors and SWB were mediated by strengths use.

The Moderated, Mediating Analysis

In order to assess the moderating role of future self-continuity in the link between character strengths and strengths use and the link between strengths use and SWB, we used the PROCESS macro written by Hayes (2013) to conduct moderated mediation analyses. This macro allowed us to get the estimates of the model and the conditional indirect effect and hypothesis tests conditioned on the moderators being set to the sample mean and ±1 SD and also can produce the conditional indirect effect at the different value of the moderator for which the effect is just statistically significant (at $\alpha = 0.05$) using the J-N

technique. Similarly, we *z*-transformed all the variables in order to compare effect sizes and reduce multicollinearity before this analysis.

As shown in Table 5, future self-continuity yielded no significant effects on strengths use and there was no significant interaction between character strengths on the whole and future self-continuity in the mediator variable model; whereas future self-continuity had the significant effect on SWB and the statistically significant interaction between strengths use and future self-continuity in the dependent variable model for SWB suggests that the indirect effect of character strengths on SWB through strengths use is moderated by future self-continuity. The positive sign of the interaction indicated that the indirect effect is large for students with higher level of future self-continuity. With the significant interaction, it allowed us to probe the indirect effect at different levels of the moderator. The default output displays the conditional indirect effect at three values of the moderator variable (the mean and ± 1 SD from the mean). As Table 6 shown, three conditional indirect effects of future self-continuity were positive and significant. Specifically, when the value of the moderator was at one SD below the mean, the mean and above the mean, the indirect effect were significantly different from 0 at $\alpha = 0.05$, yielded 95% BCa CIs of {0.0137, 0.0590},

TABLE 5 | Results of moderated mediation analyses for future self-continuity moderating strengths use's mediation of character strengths and subjective well-being.

Predictor	B	SE	t	p
Mediator variable model				
CCS	0.064	0.005	12.4677	0.0000
CW	0.004	0.033	0.1213	0.9035
CCS × CW	−0.005	0.003	−1.6633	0.0977
Dependent variable model				
CCS	0.013	0.013	1.038	0.3006
CM	0.758	0.128	5.919	0.0000
CW	0.285	0.062	4.587	0.0000
CM × CW	0.165	0.063	2.615	0.0095

CCS, Character Strengths; CM, Strengths use; CW, Future Self-continuity.

TABLE 6 | Results of conditional indirect effects of future self-continuity.

FSC score	Conditional effects at future self-continuity + 1 SD			
	$a_1(b_1 + b_3W)$	SE	(Boot) LLCI	(Boot) ULCI
−1.00	0.0337	0.0115	0.0137	0.0590
0	0.0493	0.0097	0.0322	0.0709
+1.00	0.0648	0.0119	0.0438	0.0911

The conditional indirect effect is computed $a_1(b_1 + b_3W)$ where a_1 is the path from character strengths to strengths use, b_1 is the path from strengths use to subjective well-being, b_3 is the path from the interaction of strengths use and future self-continuity to subjective well-being, and W is future self-continuity.

{0.0322, 0.0709} and {0.00438, 0.0911}, respectively. In addition, the mediating effect of strengths use in the Moderated Mediation Model was also found to be significant (95% CI: {0.0019, 0.0193} with 5,000 resamples).

Overall, future self-continuity moderates the link between strength use and SWB, and this link was significant in three conditional indirect effects of future self-continuity (see Figure 1).

GENERAL DISCUSSION

This current research had two objectives: (1) to examine the mediating role of strengths use in the relationship between the 24 character strengths and SWB, and assess the indirect effects of each character strength on SWB through strengths use; (2) to explore the moderating role of future self-continuity in the link of character strengths and SWB and the link of strengths use and SWB. Additionally, the common-endorsement of character strengths and the associations between the 24 character strengths and SWB in the sample of Chinese undergraduate students were also investigated.

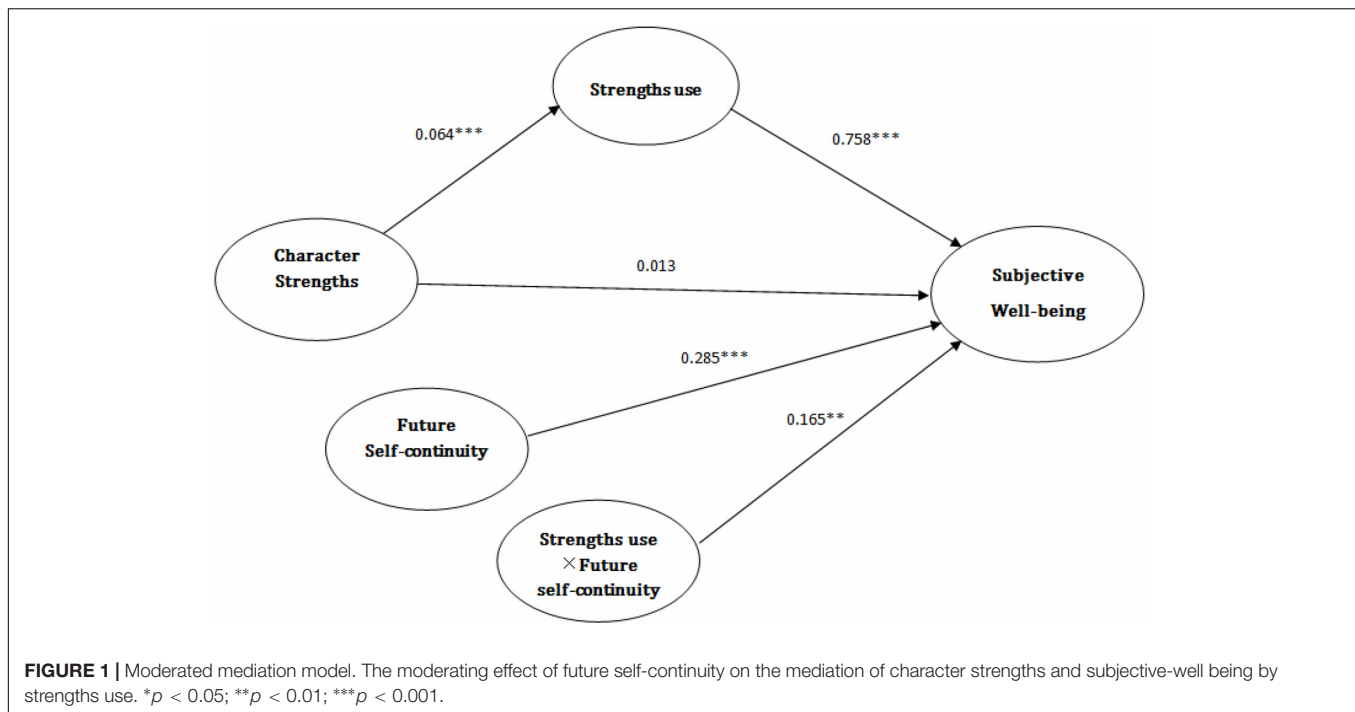
Firstly, four of the top five “SS” in the present sample were: fairness, love, authenticity, gratitude, and the least strengths included creativity, perspective, learning and regulation. This result was largely consistent with several studies conducted with samples of Chinese college students (Zhang, 2009; Li, 2015). For example, Zhang (2009) suggested that, for undergraduate

students, authenticity, kindness, love and fairness were the most common character strengths whilst creativity, perspective, bravery, social and modest were the least ones. Moreover, Li (2015) found that the top 5 “SS” were: love, fairness, gratitude, teamwork and integrity whilst the bottom 5 were self-regulation, love of learning, perspective, creativity and social intelligence. Of these studies, it could be concluded that love, fairness, gratitude are relatively common SS while the strengths of creativity, perspective, love of learning and self-regulation ranked at relatively low positions among Chinese university students.

Furthermore, when compared to research conducted in other nations, results suggested there is a certain degree of similarity and consistency in terms of the most commonly endorsed and least character strengths. For instance, Park et al. (2006) found that the most commonly endorsed strengths from country to country included fairness and gratitude and the least strengths included self-regulation, and also the rank ordering of strengths across different nations showed certain degrees of similarity. To the extent, these analyses reveal that there is something similar in the endorsement of strengths across different nations and cultures, which could be seen as indicators about universal human nature. As Bok (1995) suggested, the universal values pervasively across nations and societies include reciprocity and positive obligations to care mutually and negative injunctions against cheat and betrayal as well as consistent standards of even-handedness and procedural justice in conflicting situations concerning positive obligations and/or negative injunctions. In the present study, the mostly common strengths of love and gratitude precisely reflect positive obligations, and the strength of authenticity embodies negative injunctions and the strength of fairness represents standards of fairness and procedural justice.

Nevertheless, that the most commonly endorsed strengths from nation to nation are universal does not indicate that people from different contexts have totally similar endorsements of strengths. As Shimai et al. (2006) suggested Americans were more likely to rank highly humor, perspective and integrity while Japanese ranked these strengths at relatively bottom position. These inconsistent results indicated that although there is something universal about the endorsement of personal strengths, the profile of character strengths certainly differs from culture to culture and from country to country. For example, the strength of bravery, in the western cultural system underlies “speaking up for what is right even if there is opposition,” and among the VIA, one of the items assessing this strength is “when I hear people say something mean, I make a protest.” That is, if people exhibit such behavior, then they may be seen as a person with the strength of bravery. However, it ought to be noted such behavior may not be appropriate in the Chinese context as Chinese people emphasize more importance of harmony, “mianzi” (namely, face) and tend to express their thoughts and emotions in a reserved way.

Additionally, analyses showed gender differences in the distribution of character strengths, that is, females were more likely to endorse higher scores on teamwork, fairness, Love and gratitude than males, whereas males were more likely to



endorse higher scores on judgment. These differences were in line with the previous studies (Shimai et al., 2006; Linley et al., 2007; Brdar et al., 2011; Li, 2015). As Brdar et al. (2011) suggested, gender difference in character strengths may be explained from three different perspectives: (a) evolutionary perspective, that is, females are more likely to endorse strengths such as kindness and love possibly because such strengths are related to their natural, evolutionary roles as chief caregivers, while males are more likely to endorse strengths such as bravery possibly because of their natural, evolutionary role in hunting and looking for food to survive; (b) social construction perspective, that is, as males and females have distinct social roles, they develop different characteristics and traits. Specifically, males tend to develop characteristics such as self-reliance and invulnerability and to be tough and strong as they are more likely to be the backbone in the family, whereas females are more likely to be sympathetic and careful and sensitive that makes them greatly recognize others' needs and response to others' emotional expression; (c) biosocial perspective, that is, biosocial interactions including the evolutionary sex roles and developed social roles and some certain settings in society cause gender difference in terms of character and traits. To the extent, findings of the present study support the proposed arguments though we didn't provide such evidence that males are more likely to endorse bravery (valor) and persistence (industriousness and perseverance). Nevertheless, it should be noted that apart from these strengths scored significantly different between males and females such as kindness, love, gratitude, there were more similarities of the endorsement of character strengths between genders. Therefore, gender difference in character strengths ought not to be exaggerated (Linley et al., 2007).

Secondly, the correlation analyses showed that the strengths of hope, curiosity, zest, perseverance and love were closely related to SWB after controlling for influences of students' gender. This finding was largely consistent with prior studies (Park et al., 2004; Shimai et al., 2006; Brdar and Kashdan, 2010; Littman-Ovadia and Lavy, 2012; Proyer et al., 2014; Hausler et al., 2017). As Park et al. (2004) suggested, though on the whole having character strengths belonging to the classification of VIA are generally associated with psychological and subjective fulfilling, some strengths appear to be more important than others. In their survey, among the 24 character strengths the most robust associations with life satisfaction were love, zest, hope, and gratitude. Unsurprisingly, these positive strengths are indeed grounded in human nature, and contribute genuinely to "the good life" for individual.

According to Peterson and Seligman (2004), the strength of love, emphasizing good interpersonal relationship and mutual care and reciprocity, is the brilliant one that enables humans to achieve fulfillment and happiness; the strength of zest, manifesting strong vitality and enthusiasm for life, endows people with energy and excitement to approach colorful life; the strength of hope, a belief that a good future can be brought about, connects one to the future in a happy way; and lastly the strength of gratitude, being grateful to good things happening and expressing thanks, connects one to the past in a happy way. As well, Park and Peterson (2006a) also suggested that strengths of the heart such as gratitude, hope, love and zest were more related to well-being than are strengths of the head such as creativity and judgment. Furthermore, in the longitude study, Gillham et al. (2011) demonstrated the roles of transcendence strengths including hope, zest, love, gratitude (as well as meaning) in

general happiness, life satisfaction and future well-being. Taken together, empirical research has supplied sufficient evidence for the unique and ubiquity benefits of these four distinct strengths and, arguably certain character strengths tend to be more important than others. These findings provide basic knowledge for developing intervention strategies aiming to improve individual well-being and happiness more efficiently and effectively.

Thirdly, the mediation analyses suggested that strengths use wholly mediates the relationship between character strengths on the whole and SWB. That means, the possession of strengths, as an essential condition, enables individual to display strengths-related behavior, and in turn, makes ones experience satisfaction and joy. In other words strengths use played a “bridge” between the possession of character strengths and SWB. Perhaps this finding would be seen as a psychological tautology as we think that we may have been developing the pattern that naturally endows us with ability to apply our own strengths that we possess, and experience satisfaction. However, such a process or pattern may not be so spontaneous and simple as the above mentioned. In many cases, people fail to achieve the active and comprehensive good life what they ought to not because they do not possess the strengths to a certain extent that can be greatly beneficial to achieve happiness but they do not show strength-related behavior. Similarly, James (1907) suggested that people the world over have amounts of resource, but most individuals make use of only a small part in the whole lifetime, while only a small group push to their extreme of use and thus exceptional. Therefore, a possible explanation of this present finding may be that possessing the more of the strengths (e.g., creativity) is a prerequisite of a fulfilling life, but the unblocked deployment of such strengths is a more direct predictor of achieving optimal functioning.

Consistent with this explanation, Murillo (2012) concludes that possessing good character and exercising relevant behavior in the right way are two essential conditions for the good life but ultimately happiness is the end to which our actions are directed. Empirical literature has also supported the important role of applying personal strengths (Botha and Mostert, 2014; Dubreuil et al., 2014; Littman-Ovadia et al., 2017), and the direct effect of strengths use on well-being (Govindji and Linley, 2007; Wood et al., 2011; Douglass and Duffy, 2015; Huber et al., 2017). Consistent with our finding, in the work of Govindji and Linley (2007), they also suggested that although strengths knowledge and strengths use were both highly correlated with indicators of well-being but the former would not cause any significant increases in well-being, whereas using strengths promoted greater well-being. Overall, our finding answered the proposed question “how strengths of character operate to well-being,” and uncovered the underlying process from character strengths to well-being. Indeed, it was through strengths use.

More particularly, the mediation analyses further examined the indirect effect of the 24 character strength on SWB through the “bridge” of strengths use. Results showed that strength use mediates the relationships between every strength and SWB and the indirect effects of strengths use varied from different

strengths. Among these strengths, perspective and social yielded the highest indirect effects. Regarding this finding, possible reasons were that possessing more perspective helps people form a broader perspective and in turn, enables them to tackle their problems appropriately and also provide sensible advices for others, which may be beneficial to develop good interpersonal relationships, and in turn lead to greater PA and well-being; and possessing social intelligence enables them to understand the social world more easily and adapt to others’ feelings and expectations, which helps them behave and speak in right ways, and foster positive relationship with others, and thus, they are happier (Park et al., 2004). Thus, it could be inferred that developing and using strengths that relate to the good interpersonal relationship would be a pretty effective strategy to improve individual well-being and satisfaction. To some extent, this explanation is also consistent with the finding of the longest study on happiness conducted by the Harvard Study of Adult Development that good relationship is the secret of the good life.

Finally, regarding the second objective exploring the moderating role of future self-continuity in the link of character strengths and SWB and the link of strengths use and SWB, analyses demonstrated that future self-continuity moderates the relationship between strengths use and SWB, and this relationship was significant in all three conditional indirect effects of the moderator. Indeed, this is an original finding of such a role of future self-continuity in the link between strengths use and SWB, but previous literature demonstrated the perception of self-continuity as an important predictor of psychological adjustment (i.e., SWB) and equanimity (Landau et al., 2008; Sani et al., 2008; Timothy et al., 2011).

Further, in the discussion of self-continuity already research suggested that, with regard to the perceived connectedness and persistence from past to present, when individuals recall positive events such as making the right choice, engaging in effective behavior and perceive these event in accordance with their self-concept, positive emotional responses would be provoked, and the stronger the self-concept, the greater intensity of positive affection provoked. From this perspective, people may have certain emotional responses when anticipating their future selves (like recalling of their personal past) (Ritchie et al., 2016). One might feel ambitious when anticipating great success they may achieve; one might feel pleased when thinking about the benefits they will get; and one might be satisfied when considering good consequences in the near or relatively distant future caused by their current behavior. Thus, a possible explanation of the present finding is that using their strengths as engaging behavior makes people feel as if he can reveal his true self, being more authentic and vigorous and in turns resulting in optimal functioning, and for those endorsing a sense of continuity and connectedness with a future self, they are more likely to experience joy through anticipating beneficial outcomes of their present action. Nevertheless, it is also possible that the links of these variables on well-being are influenced by some other underlying processes such as goals pursuit and mental imagery and that the moderating effect of future self-continuity is a mere epiphenomenon.

Therefore, it is necessary for future studies to investigate more underlying mechanisms of these associations by considering other variables related to future self-continuity and well-being.

Limitations and Future Directions

The present research has several limitations. First, this was a cross-sectional study, and thus the obtained results could not demonstrate casual relationships among these variables involved. Moreover, research on mediation analyses showed that complete mediation effects examined by cross-sectional data might be non-significant in a longitudinal study (Maxwell and Cole, 2007). That means the mediating effect of strengths use demonstrated in the present study might be biased. However, according to the longitudinal research conducted by Wood et al. (2011), strengths use indeed predicted the improvement in well-being and optimal functioning over time, and the positive relation between character strengths and well-being has been well-established by existing longitudinal studies (Shoshani and Slone, 2013; Duan and Ho, 2017). While these studies have provided empirical evidence for the model the present study constructed, future research is needed to further examine the mediation effect with longitudinal data. Furthermore, the present study adopted participants' composite scores of strengths use, instead of allowing them to identify their each strength and then asked about the deployment of specific strength. It is possible that the latter measurement approach is a more effective way to find stronger relations between character strengths, strengths use and well-being outcomes.

Second, the small sample size raised questions about how representative participants are of others engaged in similar educational context. Future research is needed to investigate the relations between character strengths, strengths use, future self-continuity and SWB to the wider population, and to establish the ubiquity of the present findings. Third, the present study adopted self-reported instruments to measure all variables involved, and thus the common method variance (CMV) would be a considerable concern. Although we have used the pre-control method including adopting the same instructions informing participants that there was no right or wrong answer and ensuring the anonymity of participants, which may reduce CMV to the extent, we still encourage future studies to adopt more appropriate designs and multiple approaches to reduce such bias such as changing scales types and arranging items in varying order (Zeng et al., 2016).

Fourth, the present study considered SWB as the outcome variable, and adopted Diener's (1984) model of SWB containing positive affect, negative affect, and life satisfaction to measure SWB because of its wide acceptance and well-established generalizability. However, it is suggested that for better understanding of multi-facet constructs of well-being and its relations to character strengths and strengths use as well as future self-continuity, future research should adopt some other models of well-being such as Ryff's (1989) model of PWB and Seligman's (2011) PERMA of well-being. Finally, given that this was the

original study to present the moderating role of future self-continuity, future research should further investigate whether there are more underlying mechanisms (or other psychological or behavior variables such as goals pursuit and mental imagery) in such relations, which would provide more specific evidence to elucidate the role of future self-continuity in relation to strengths use and well-being.

Implication

The findings of the current research have several practical implications. Firstly, the obtained results demonstrated strengths use plays a bridge between possessing strengths and SWB. To the extent, that means, possessing the more of the strengths is a prerequisite of a fulfilling life, and the unblocked deployment of such strengths is the direct predictor of achieving optimal functioning. Therefore, educators, teachers and school coaches should encourage students not only to identify their strengths but also apply their strengths. Also, the schooling should present more opportunities for youth to display strength-related behavior. It would be beneficial for students to engage these effective behaviors, resulting in optimal functioning and experiencing great happiness. Secondly, considering the role of future self-continuity, existing literature, coupled with the current research, suggested that a feeling of connectedness to the future self could be vital for people in various domains of life such as time management, decision making, academic performance, coping and well-being. More importantly, in the education context, it is necessary for students to be endowed with a strong sense of future self-continuity that allows them to realize the continuing nature of self and makes them show more appropriate and sensible behavior and prepare them to anticipate the positive consequences of such action in the long term and in turn feel engaged and energized. Overall, these findings demonstrate sights for the current and future educational programs, considering strengths use and future self-continuity promising factors of personal and positive functioning and further suggest recommendations for well-being interventions in the educational setting.

CONCLUSION

The present study extended the existing knowledge of the relation between character strengths and SWB by adding to strength use as a mediator. Findings suggested that strengths use plays a bridge between character strengths and SWB, and the indirect effect mediated by strengths use varied from different character strengths. Moreover, the study also examined the moderating effect of future self-continuity in the relation of character strengths, strengths use and SWB, and results showed that future self-continuity moderated the link of strengths use and SWB. This finding implied that the strategy of focusing on the future self may play a key role in educational context. That is, the continuous perspective of the present -to-future selves may enable students to think more about positive consequences of their current actions such as devoting more effort to their studying in the long

term and in turn experience greater joy. This would not only cause positive consequences of “traditional skills” but also lead to “happiness,” in accordance with the core of positive education.

ETHICS STATEMENT

The study was carried out in accordance with the recommendations of ‘the University of Southwest’s Human Research Ethics Committee’ with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the ‘the University of Southwest’s Human Research Ethics Committee.’

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YZ and MC designed the experiments, carried out the experiments, and wrote the manuscript. MC analyzed the experimental results.

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Examining the Structure of Negative Affect Regulation and Its Association With Hedonic and Psychological Wellbeing

Alicia Puente-Martínez¹, Darío Páez¹, Silvia Ubillos-Landa^{2*} and Silvia Da Costa-Dutra¹

¹ Department of Social Psychology and Methodology of Behavioural Sciences, University of Basque Country, Gipuzkoa, Spain, ² Department of Social Psychology, Faculty of Health Sciences, University of Burgos, Burgos, Spain

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*Correspondence:

Silvia Ubillos-Landa
subillos@ubu.es

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The present study examines the structure of negative affect regulation strategies by confirmatory factor analysis. A total of 264 students ($n = 187$ women, 65 men) ($M = 24$ years; $SD = 9.32$) took part in this study. Results show a good fit indices for a three facets model: (1) modification of situation (problem-directed action, seeking emotional and instrumental social support, psychological abandonment and social isolation); (2) attentional deployment and cognitive change (distraction, acceptance, gratitude, rumination, reappraisal, spirituality, and social comparison); and (3) response modification (suppression, active and passive physiological, humor and warmth, venting, confrontation, and regulated emotional expression). The scale validity is confirmed through correlations between the expanded of Mood Affect Regulation Scale dimensions including dimensions of dispositional reappraisal and suppression, and hedonic and psychological well-being. Participants report an adaptive profile with high psychological well-being, even if they report low positive affect, suggesting a greater relevance of eudaimonic than hedonic well-being for affect regulation.

Keywords: measure of affect regulation, hedonic and psychological well-being, coping, anger, sadness

INTRODUCTION

The way positive and negative emotions are regulated can have a crucial impact on our well-being (Bryant and Veroff, 2007; Gross, 2015). There are various theories on self-regulation; however, there is consensus that it includes skills or conducts such as planning; cognitive, and meta-cognitive aspects such as self-tracking and motivational aspects such as setting goals. Nevertheless, there are few attempts to contrast the whole structure of a large repertoire of forms of self-regulation to the management of negative affect (Augustine and Hemenover, 2008; Webb et al., 2012; Peña-Sarrionandia et al., 2015; Naragon-Gainey et al., 2017).

Gross et al. (2006) only examined reappraisal and suppression of emotions through the Emotional Regulation Questionnaire (ERQ) scale. Prizmic and Larsen (2012) described around 20 coping and affect regulation strategies with the 32 item Mood Affect Regulation Scale (MARS) (Barber et al., 2010). However, the psychometric characteristics of the MARS questionnaire have not yet been studied. In the Spanish adaptation, a similar number of coping and affect regulation forms have been applied using an expanded 56 item version of the MARS scale, indicating that

a nucleus of regulation was associated with the attainment of adaptive goals (Páez et al., 2012, 2013; Naragon-Gainey et al., 2017). In fact, different studies have shown a relationship between hedonic and eudaimonic well-being and affect regulation (Gross, 2015). For instance, “flourishing people” reporting simultaneous high hedonic and eudaimonic well-being, use less suppression as a form of emotional regulation (Barber et al., 2010).

Hedonic well-being is typically referred to as being composed of two different elements, emotional well-being (positive/negative affect) and cognitive well-being or life satisfaction (De Leersnyder et al., 2013). Regulation of affect is related to hedonic goals like increasing positive emotions and decreasing negative ones (Larsen and Prizmic, 2008). Functional strategies should be related to more positive rather than negative emotions (Fredrickson, 2009). Psychological or eudaimonic well-being concerns human potential and a satisfactory global mental health, including purpose in life, autonomy, personal growth, self-esteem or acceptance, mastery and positive relations with others (Keyes et al., 2002). Also, psychological well-being is related to emotional and affect regulation (Korpela et al., 2018) because this process implies goals such as increasing self-esteem and showing a positive self-image, situation facing and control increase, and social integration or relatedness (Koole, 2009). That is to say, affect strategies should be related to psychological well-being, through dimensions associated with previous goals, like self-acceptance, mastery or control, and positive relations with others (Ryff, 1989).

Following the taxonomy of regulation proposed by Gross and John (2003), strategies of affect regulation have been divided into (1) modification of situation, (2) attentional deployment and cognitive change, and (3) emotional response modulation.

Modification of situation is a psychological process similar to a functional problem-focused coping strategy and improves negative affect (Skinner et al., 2003). It was found that problem-directed action and planning how to avoid problems is associated with low negative and high positive affect (Larsen and Prizmic, 2008). An integration of five meta-analyses (Penley et al., 2002; Campos M. et al., 2004; Augustine and Hemenover, 2008; Aldao et al., 2010; Webb et al., 2012) about coping, affect regulation and emotional wellbeing estimated the association between affect regulation strategies and emotional balance, and they showed a correlation between direct coping and high wellbeing and positive affectivity, $r = 0.23$ (Páez and Da Costa, 2014). Modification of situation is also associated with emotional intelligence (EI) ($r = 0.42$) (Peña-Sarrionandia et al., 2015). Seeking social support is adaptive for negative affect, particularly when coupled with instrumental responses (Skinner et al., 2003). Finally, helping others and altruistic or pro-social behaviors are a form of functional regulation for negative affect (Skinner et al., 2003). Withdrawing from the situation, or psychological abandonment, is usually related to dysfunctional outcomes. Previous meta-analyses found negative associations between psychological abandonment and affect balance, $r = -0.28$ (Páez and Da Costa, 2014) and with EI, $r = -0.24$ (Peña-Sarrionandia et al., 2015). Individuals with a flourishing state of well-being use fewer avoidance strategies as a form of emotional regulation (Barber et al., 2010). Social isolation is another

avoidant dysfunctional form of emotional regulation (Larsen and Prizmic, 2008). Furthermore, there is a negative association between social isolation and affect balance, $r = -0.31$ (Páez and Da Costa, 2014).

Affect regulation could seek to change how a person perceives an emotional situation (Gross, 2015). Distraction or removing oneself cognitively and behaviorally from the negative emotional episode is a functional attentional strategy (Augustine and Hemenover, 2008). Distraction activities that are rewarding and that involve some degree of activity produce positive emotions (Larsen and Prizmic, 2008). Thus, Páez and Da Costa (2014) find a positive association between distraction and positive affect ($r = 0.17$) and Peña-Sarrionandia et al. (2015) between distraction and IE ($r = 0.17$). Strategies such as acceptance or accepting the reality of the event are also adaptive (Aldao et al., 2010; Naragon-Gainey et al., 2017). Also, focusing attention on positive aspects of life and feeling gratitude and self-reward for them is associated with well-being (Larsen and Prizmic, 2008). An integration of meta-analysis found a positive association between acceptance and affect balance, $r = 0.30$ (Páez and Da Costa, 2014), and also with EI, $r = 0.30$ (Peña-Sarrionandia et al., 2015). In contrast, rumination, or repetitive thinking on the causes and consequences of emotions, intensifies emotion in general and is linked to negative affect (Aldao et al., 2010), affect balance, $r = -0.30$ (Páez and Da Costa, 2014) and IE, $r = -0.17$ (Peña-Sarrionandia et al., 2015). However, one meta-analysis found a positive effect of rumination on wellbeing (Augustine and Hemenover, 2008), probably because it was connected to emotional processing, and trying to understand and analyze feelings. Individuals may regulate emotions and affect also by cognitive change. A form of functional cognitive change is a positive reappraisal or perceiving the positive aspects of events and behaviors or distancing from the situation (Larsen and Prizmic, 2008; Jamieson et al., 2013). Research has confirmed that reappraisal is associated with low negative affect and also with positive affect (Nezlek and Kuppens, 2008), with high psychological wellbeing (Barber et al., 2010), with a positive affect balance, $r = 0.17$ (da Costa et al., 2014) and with EI, $r = 0.18$ (Peña-Sarrionandia et al., 2015). Seeking meaning through religion is also an instance of positive reappraisal, related to low negative affect and also to positive affect (Skinner et al., 2003). Social comparison is another cognitive process associated with emotion regulation (Rimé, 2009). Downward social comparison is assumed to have a positive affective influence in the case of negative-affect loaded episodes, and upward social comparison is expected to have a motivational positive effect. Nevertheless, people who often compare themselves with others are less happy (Fujita, 2008), and high hedonic and psychological well-being is negatively associated with social comparison (Barber et al., 2010).

Response modulation includes modification of physiological, subjective and expressive reactions (Páez et al., 2012). Active physiological regulation by exercise or relaxation decreases negative affect, as well as it improves wellbeing, while passive physiological regulation of emotions by eating, drinking, or sleeping is an avoidant dysfunctional response (Biddle and Ekkekakis, 2006). Activation of positive emotions such as affection and humor are also functional forms of regulation used

to control especially negative feelings like anger (Kennedy-Moore and Watson, 1999). Humor, involving laughing at one's own mistakes or faults and those of others but without scorn, seeking merely to lighten the mood, is associated with psychological wellbeing (Martin, 2007; Koval et al., 2014) and is associated with IE, $r = 0.34$ (Peña-Sarrionandia et al., 2015). Furthermore, the ability to regulate the emotional expressive behavior is associated with greater well-being possibly because it helps people adapt flexibly to situational demands (communicate attitudes, goals, and intentions in an adaptive way) (Côté et al., 2010). Venting or the strong non-verbal and behavioral expression of emotions (Augustine and Hemenover, 2008) is a form of regulation that enhances negative affect (Larsen and Prizmic, 2008) and correlates negatively with EI, $r = -0.13$ (Peña-Sarrionandia et al., 2015). However, Páez and Da Costa (2014) found a non-significant association between venting and affect balance, $r = 0.04$. Confrontation or the expression of emotion to those responsible for the negative emotions, with the aim of changing what happened, is usually dysfunctional or neutral in the case of negative affect (Penley et al., 2002). Also, inhibition of feelings and suppression of expressions are dysfunctional forms of emotional regulation for negative affect (Gross, 2005, 2015; Hu et al., 2014), and are negatively associated with well-being (Gross and John, 2003). Both are related to affect balance, $r = -0.16$ and $r = -0.18$ (Páez and Da Costa, 2014) and suppression is associated with EI, $r = -0.21$ (Peña-Sarrionandia et al., 2015).

Based on the above, the research question of this study is to examine (1) whether emotional regulation strategies are structured in the phases of regulation proposed by Gross (2015), and (2) how they are associated with hedonic and psychological well-being.

Objectives of the Study

The aim of the present research is to examine (a) the psychometric properties and the structure of regulation of negative affect in the different facets of Gross' model (2015) and (b) the association with hedonic and eudemonic well-being. While previous literature has usually analyzed dispositional regulation strategies (Barber et al., 2010) applied to abstract negative events, we will explore how individuals apply the same strategies to negative emotional episodes of sadness and anger.

We also expect to find a congruent relationship between the use of functional and dysfunctional strategies in episodes of anger and sadness with dispositional indicators of emotional regulation and hedonic and psychological well-being.

MATERIALS AND METHODS

Participants

The total sample is composed by 264 students ($n = 187$ women and 65 men, and $n = 12$ was missing data) who took part in this study. The students were from three different Spanish universities, and were consulted during different practice sessions (in the 3rd year and in the adult university cases). The mean age was 24 years ($SD = 9.32$, range 18–71 years) where only 10.6% were working and 72.7% studying too.

Instruments

The instruments applied include an affective regulation scale (MARS), a dispositional regulation criterion variable (ERQ) and two indicators of wellbeing, one related to hedonic (PANAS) and another psychological (PWB) wellbeing. Two simple questions were also included to measure the intensity of negative events (sadness and anger) (1: low intensity and 10: high intensity) and how (un)pleasant emotional experiences were (1: unpleasant- 8: pleasant).

Measure of Affect Regulation Styles, MARS (Larsen and Prizmic, 2004; Páez et al., 2012)

The MARS scale is originally made up of 32 items, to which a further 24 items version was added, generated on the basis of the previous emotional regulation scales (Nezlek and Kuppens, 2008; Quoidbach et al., 2010), so as to adequately represent different forms of emotional regulation (see Table 1). It refers to the events of the last 12 months with a Likert-type response scale, ranged from 0 (never) to 6 (nearly always). Higher scores indicate greater use of these forms of coping and emotional regulation in negative emotional episodes. The internal consistency for the extended version of the MARS scale was good, with α between 0.61 and 0.91 (Páez et al., 2012) and between 0.52 and 0.92 (Páez et al., 2013). Table 1 presents the dimensions, the items and the descriptive statistics for each item. The g factor exhibited a ω_h coefficient of 0.88 the modification of situation dimension (total variance: 0.62, common variance: 0.62); 0.76 cognitive and attentional change (total variance: 0.29, common variance: 0.36), and 0.75 (total variance: 0.29, common variance: 0.35) for the response modulation subscale.

The Emotion Regulation Questionnaire, ERQ (Gross and John, 2003; Páez et al., 2012)

The ERQ is a self-report questionnaire that measures dispositional emotional regulation, which consists of two scales corresponding to two different emotion regulation strategies: reappraisal (e.g., 'When I want to feel more positive emotion I change what I'm thinking about') and expressive suppression (e.g., 'I keep my emotions to myself'). It has 10 items which are answered using a 7 point scale, from 1 (strongly disagree) to 7 (strongly agree). In this study alpha coefficients were 0.69 and 0.57, respectively. High scores indicated greater dispositional emotional regulation.

Positive and Negative Affect Scale, PANAS (Watson et al., 1988)

This scale contains 20 mood descriptors (e.g., active, excited, hostile, etc.) which are relatively pure markers of either high negative affect (NA) or high positive affect (PA). In the Spanish version Cronbach alpha for NA was 0.80 and 0.68 for PA (Velasco and Páez, 1996). The reliability in the present sample of the positive mood was 0.85, and for negative mood 0.89. Items are answered using a 5-point scale, from 1 (never), to 5 (always). High scores indicated greater presence of negative or positive affect.

TABLE 1 | Descriptive statistics for each item.

Item	Anger and sadness		
	α	<i>M</i>	<i>DT</i>
Modification of situation- split-half reliability- $\alpha_1 = 0.91$, $\alpha_2 = 0.70$, $r = 0.58$ Problem-directed action (F)	0.89		
04. I made a plan or resolution to change this situation		5.63	3.18
05. I took action to solve the problem causing my mood		6.01	3.16
06. I made a plan or resolution to avoid such problems in the future or to maintain a positive situation		6.17	3.11
<i>Social support emotional (F)</i>	0.92		
52. I talked to someone about my feelings		6.06	3.43
53. I spoke in order to get understanding and support		5.62	3.41
<i>Instrumental and informative social support (F)</i>	0.93		
54. I talked to someone in order to resolve or improve the situation that triggered my mood		4.64	3.46
55. I talked to an advisor or counselor		5.41	3.50
56. I asked someone who had faced a similar problem or situation what they did		4.16	3.38
<i>Withdrawal (D)</i>	0.66		
07. I withdrew from or avoided the situation		2.88	2.42
08. I carried on as if nothing had happened		2.65	2.66
09. I gave up, did nothing; I did not attempt to control the situation		2.17	2.26
35. I tried to accept it as my fate: what will be, will be		4.81	3.24
<i>Social isolation (D)</i>	0.52		
13. I withdrew from or avoided the persons related to the situation		3.52	2.70
14. I kept myself to myself, I wanted to be alone		3.61	2.94
<i>Altruism (F)</i>			
41. I went out of my way to help someone		3.20	2.86
Attentional deployment and cognitive change- split-half reliability- $\alpha_1 = 0.92$, $\alpha_2 = 0.70$, $r = 0.93$			
<i>Rumination (D)</i>	0.84		
01. I thought about how I could have done things differently		5.29	3
02. I tried to understand my feelings by thinking about and analyzing them		6.49	3.08
03. I thought quickly about what had happened, about the emotional effects of the situation		6.49	2.83
<i>Distraction (F)</i>	0.89		
21. I did something fun, something I really enjoy		5.63	2.98
22. I watched TV, read a book, etc., for distraction		5.70	2.85
23. I worked on something or stayed busy to forget my mood		5.43	2.92
24. I thought about something to distract myself from my feelings		5.33	2.72
25. I socialized to forget my mood		5.93	2.84
<i>Wishful thinking (D)</i>			
29. I daydreamed about the time when I will feel better than today		4.91	3.08
<i>Acceptance and self-control (F)</i>	0.69		
32. I counted to 10 before answering, in an effort to avoid overflowing emotionally, to control my reaction		4.14	3.41
33. I wrote about what had happened to me, about the feelings it triggered in me, in an effort to avoid overflowing emotionally, to control my reaction		2.68	3.24
34. I accepted and endured the situation, trying to get on with normal life		6.54	2.97
<i>Gratitude and self-reward (F)</i>	0.87		
28. I treated myself to something special		4.23	2.95
30. I tried to think about those things that are going well for me		5.47	3.05
31. I tried to be grateful for the things in my life that are going well		6.16	3.41
<i>Spiritual activities (F)</i>	0.89		
36. I tried to cope spiritually, put my faith in God, or did something religious		2.23	3.20
40. I read or did something religious, of a spiritual nature.		1.73	2.78
<i>Reappraisal (F)</i>	0.91		
37. I tried to reinterpret the situation, to find a different meaning		5.02	3.09
38. I tried to put things in perspective		5.69	3.08
39. I tried to find something good in the situation.		4.95	3.35

(Continued)

TABLE 1 | Continued

Item	Anger and sadness		
	α	<i>M</i>	<i>DT</i>
<i>Social comparison</i> (D)	0.69		
42. I compared myself to people who are worse off		3	2.78
43. I compared myself to people who have more resources, personal resources, and done better than me, to improve the situation.		2.39	2.58
Response modulation- split-half reliability- $\alpha_1 = 81$, $\alpha_2 = 0.81$, $r = 0.69$			
<i>Inhibition/suppression</i> (D)	0.80		
10. I tried not to think about what had happened, to ignore the emotions I was feeling		2.95	2.34
11. I tried to not let my feelings show, to suppress any expression		3.58	2.83
12. I faked, or expressed emotions opposite to those I was feeling		2.75	2.69
<i>Active physiological regulation</i> (F)	0.78		
15. I played sports, exercised		3.02	3.04
16. I practiced relaxation, meditation		2.61	3.05
<i>Passive physiological regulation</i> (D)	0.79		
17. I slept or took a nap		3.35	3.15
18. I ate something to get over my bad mood		3.24	3.19
19. I drank coffee or caffeinated beverages		2.36	3.08
20. I used alcohol to get out of a bad mood		1.56	2.39
<i>Humor, warmth</i> (F)	0.61		
26. I laughed, joked around, tried to make myself or others laugh		5.03	3.07
27. I expressed myself or behaved more affectionately, sought erotic enjoyment.		2.92	2.62
<i>Venting</i>	0.87		
44. I let my feelings out by venting or expressing them		4.89	3.16
45. I made my emotion clear, verbalizing it and expressing it as strongly as I could with my face, my gestures and my way of behaving		4.16	3.01
<i>Confrontation</i> (D)	0.75		
46. I expressed my feelings to the person(s) responsible for the situation or tried to get them to change their minds or to improve the situation		4.42	3.17
47. I spoke sarcastically or ironically to/about the person(s) responsible for the situation		2.91	2.61
48. I showed my emotions to the person(s) responsible for the situation, behaving differently toward them		3.17	2.84
<i>Regulated expression</i> (F)	0.64		
49. I kept my feelings under control while it was convenient, and later, when they would not make matters worse, I expressed them		4.46	3.06
50. I wrote about my feelings in a diary, letter, or e-mail		2.52	3.32
51. I calmly apologized for what was done and said		3.32	2.94

Bold items represent original version mood affect regulation- Larsen and Prizmic (2004). F, functional strategies; D, dysfunctional strategies defined by Aldao and Nolen-Hoeksema (2012), Aldao (2013).

Psychological Well-Being Scale, PWB (Ryff, 1989; Adapted and Validated by Díaz et al., 2006)

Ryff (1989) developed a theoretically based self-report inventory designed to measure six dimensions of psychological well-being. The six dimensions are self-acceptance, environmental mastery, purpose in life, positive relations with others, personal growth, and autonomy. Responses were recorded on a 5-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). The reliability in the present sample of the composite PWB score was high ($\alpha = 0.90$). High scores indicated greater psychological well-being.

Procedure

The study used a descriptive, correlational, and cross-sectional design. Participants were recruited from local universities, where research assistants administered the questionnaire during lectures. We included adults (≥ 18 years of age) without

diagnosed personality or anxiety disorders. Instruments were administered with pencil and paper, in groups and under the supervision of research assistants. The data were collected at two moments. Participants used a code to identify themselves at both moments. First, participants were asked to select and describe an event that had caused them anger, and another sadness, choosing from a list of 12 life changing episodes. With regard to that event, they were to provide information on the type of event, its intensity, pleasant or unpleasant emotions, and the date on which it occurred. The list included negative events like problems with personal relationships, studies or work, diseases and deaths, which could be related either to anger or sadness. All participants responded with regard to each of the two emotional episodes on the same day. With regard to each of the emotional events, students were instructed to provide information on the type of event and to inform when the event had occurred. Then, they responded to MARS in relation to each specific emotional event. The data from the well-being and dispositional

emotional regulation scales were collected in the class sessions 2 weeks prior to the participants completing the MARS scale. Participants (adults and students) took an average of 30 min for each practice session to complete the questionnaire. The students and adults completed the questionnaires following the same procedure. Filling in the questionnaire was volunteer. This study was carried out in accordance with the recommendations of university's bioethical committee with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Research Ethics Committee of Basque Country University.

RESULTS

Descriptive Analyses

As anger evoking episodes, participants mainly selected problems related to personal relationships as triggers (66.7%). Regarding to sadness episodes, participants mainly selected experiences associated with deaths (38.6%) and personal relationships (40.5%). Both episodes had occurred over the previous 6 months. Paired *T*-tests also found no differences between sadness (intensity: $M = 8.62$, $DT = 1.87$; unpleasant/pleasant: $M = 1.99$, $DT = 1.66$) and anger (intensity: $M = 8.45$, $DT = 7.98$; unpleasant/pleasant: $M = 2.84$, $DT = 8.26$) in emotional experiences (intensity: $t = 0.260$, $p = 0.795$; unpleasant/pleasant: $t = -1.22$, $p = 0.224$). As we did not find differential impact with the aforementioned variables, we collapsed anger and sadness. Both are expressions of negative emotional experiences. We did not differentiate between them further within the analyses. Correlations between the strategies used in the two episodes are significant (ranging from 0.32 to 0.80, with mean r equal to 0.51). Also, there are satisfactory global reliabilities of each item across the episodes (alphas between 0.52 and 0.93) (see **Table 1**).

Construct or Structural Validity

Two different theoretical models are examined by a confirmatory factor analysis (CFA) with Maximum Likelihood estimation using the Mplus 7.11 software package (Muthén and Muthén, 1998–2012), for each of the sub-scales: (a) modification of the situation, (b) attention and cognitive change and (c) modulation of emotional response. Model 1, proposed by Larsen and Prizmic (2004), describes multiple forms of coping strategies regarding to the emotional process: modification of situation, attentional and cognitive change, and modulation of emotional response (Brown, 1998). Model 2 with changes on the structure of Model 1 (Páez et al., 2012), confirms and achieves a significant improvement in each of the three theoretical dimensions described by Brown (1998) and Gross (2015) (see **Figures 1–3**). The scaled chi-squared test is applied with the Satorra–Bentler adjustment (χ^2 -SB, Satorra and Bentler, 1994), based on the robust standard estimator. A good model fit is indicated by a Comparative Fit Index (CFI) higher than 0.90 and a Root Mean Square Error of Approximation (RMSEA) lower than 0.08 (Hu and Bentler, 1999; Kline, 2010). Finally, omega hierarchical (ω_h) estimates the reliability of each factor with variance from the

general factor removed. There are no absolute standards for evaluating the magnitude of ω or ω_h , but it has been tentatively suggested that values near 0.75 might be preferred, and values greater than 0.50 might be a minimum (Reise et al., 2013) (see instruments).

Modification of Situation

The original one-factor structure composed by eight items finds to be a poor fit (Model 1) (Larsen and Prizmic, 2004): $\chi^2(20, N = 264) = 260$, $p < 0.0001$; CFI = 0.68; TLI = 0.56; RMSEA = 0.21 (95% CI [0.19, 0.23]), ACI = 10226.005 (see **Table 1**).

The model 2 (see **Figure 1**) proposes by Páez et al. (2012), includes 14 items and 4 first-order factors (problem-directed action, emotional social support, instrumental and informative social support, and psychological abandonment and social isolation) and one second-order factor (social support). The results suggest some modifications to the theoretical model (Model 1). First, altruism (item 41) was included in the social support dimensions, a form of reciprocal social support, but did not show a satisfactory correlation (increasing the error variance) and was excluded. Second, psychological abandonment and social isolation correlate strongly [$r_{(252)} = 0.98$, $p = 0.0001$] as well as instrumental/informative and emotional social support [$r_{(252)} = 0.89$, $p = 0.0001$]. The correlations indicate that psychological abandonment and social isolation may be measuring the same construct and thus, are not different dimensions. In addition, modification indices include item 54 ('I talked to someone in order to resolve the situation or to improve the situation that triggered my mood') as a form of informational social support. Finally, the fit indices are better if social support is considered as a second order factor describing the emotional, informative social and instrumental support, rather than being treated as a single factor. The data confirm that all these dimensions represent the latent factor of modification of situation: $\chi^2(72, N = 264) = 183$, $p < 0.0001$; CFI = 0.95; TLI = 0.94; RMSEA = 0.07 (95% CI [0.06, 0.09]), ACI = 16419.55. Model modification indices shows that none of the items should be included in a different factor with respect to conceptual dimensions. The indices of fit are acceptable and the change in the chi-squared value is significant in comparison with model 1 [$\Delta\chi^2_{(27)} = 65.16$, $p < 0.001$] (Hu and Bentler, 1999) (**Figure 1**).

Attentional Deployment and Cognitive Change

Firstly, the 1-factor, 15-item model 1 shows that, the goodness of fit indices are not adequate: $\chi^2(119, N = 264) = 694.791$, $p < 0.0001$; CFI = 0.81; TLI = 0.78; RMSEA = 0.14 (95% CI [0.13, 0.15]), ACI = 20218.193 (see **Table 1**).

The second model analyses a structure with 7 dimensions and 21 items (Páez et al., 2012). The CFA shows that the model fit improves with the exclusion of the wishful thinking item (29. 'I daydreamed about the time when I will feel better than today'): $\chi^2(182, N = 264) = 458.64$, $p < 0.001$; CFI = 0.93; TLI = 0.92; RMSEA = 0.07 (90% CI [0.07, 0.08]), ACI = 24423.50 (see **Figure 2**). The change in chi-squared between models 1 and 2 is significant and improves the model's fit indicators [$\Delta\chi^2_{(119)} = 207.99$, $p < 0.001$] (**Figure 2**).

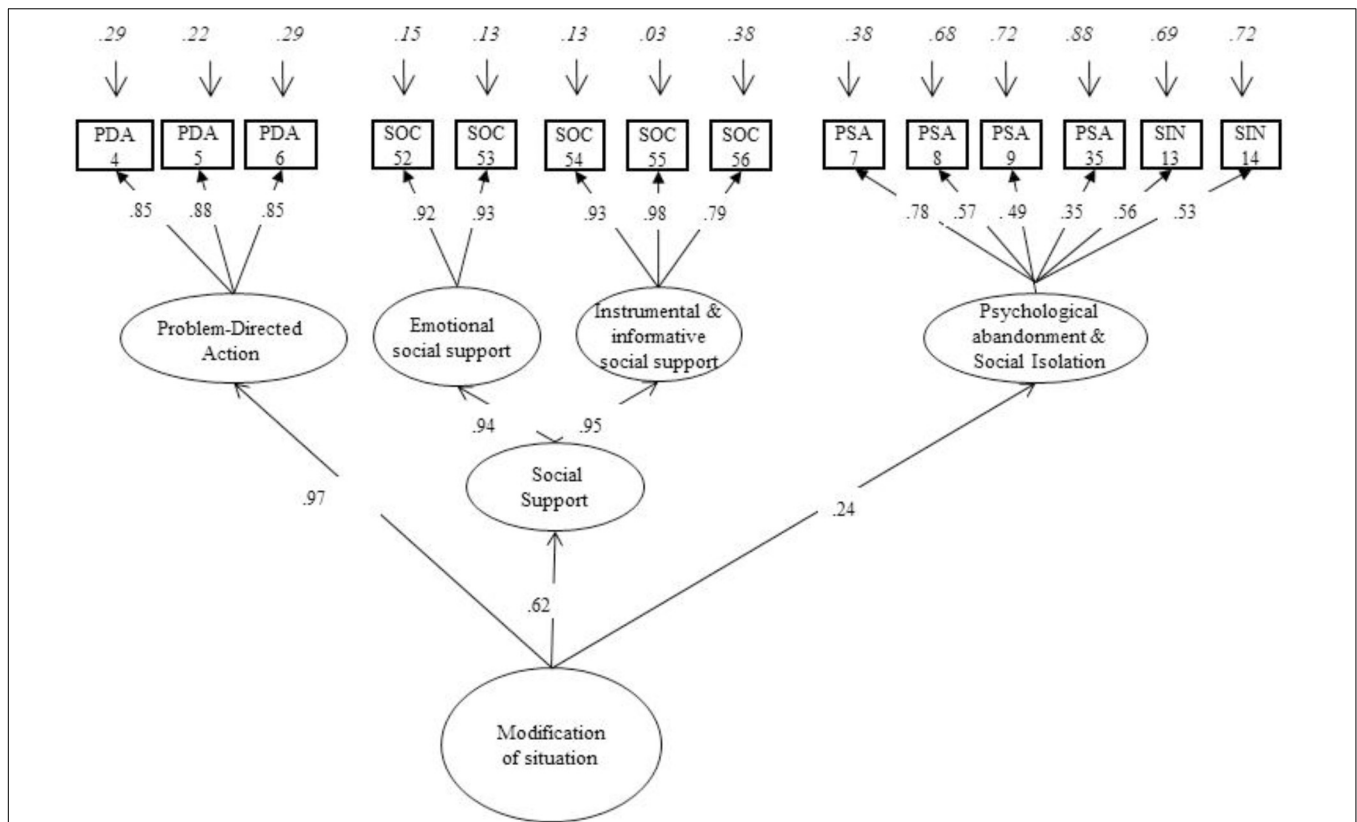


FIGURE 1 | Confirmatory factor analysis (CFA). Affect regulation strategies: direct and indirect modification of situation.

Emotional Response Modulation

The original one-dimensional structure (Model 1) includes nine items. The Model 1 fit indices are acceptable: $\chi^2(27, N = 264) = 81.689, p < 0.0001$; CFI = 0.91; TLI = 0.87; RMSEA = 0.08 (95% CI [0.06, 0.11]) (see **Table 1**).

In addition, MARS model 2 includes 18 items and seven dimensions in the emotional response modulation facet. Item 46 is eliminated due to it increases the error variance (RMSA = 0.09) and decreases the model fit (CFI = 0.87, TLI = 0.84). The final CFA shows a good fit with the data: $\chi^2(127, N = 264) = 285.80, p < 0.0001$; CFI = 0.91; TLI = 0.90; RMSEA = 0.07 (95% CI [0.06, 0.08]). Model modification indices show that none of the items should be included in a different dimension with respect to the conceptual factor (see **Figure 3**). Furthermore, the change in the chi-squared value is significant in comparison with model 1 [$\Delta\chi^2_{(188)} = 400.26, p < 0.001$] (**Figure 3**).

Convergent Validity

To obtain evidence of the convergent validity of the instrument, Pearson correlations were calculated between the scores of MARS dimensions and ERQ (reappraisal and suppression) as dispositional indices of affect regulation (see **Table 2**). The bivariate analyses confirm that reappraisal was associated positively with all forms of adaptive regulation, but also with rumination and passive physiological regulation.

Suppression was associated with psychological abandonment and social isolation, suppression, low social support and venting.

In order to contrast the association between coping and affect regulation strategies with hedonic adaptive goals, factor scores are correlated with PANAS positive and negative affect scores (see **Table 2**). Maladaptive forms of regulation like withdrawal and social isolation, and suppression are associated with higher negative affect. Problem-directed action, distraction, acceptance, rumination, active physiological regulation and use of humor are positively and significantly related to both, positive and negative affect. Social support, gratitude and self-reward, reappraisal as well as venting and regulated expression are significantly associated with positive affect and not significantly with negative effect.

With the goal of examining the association between previously described forms of regulation and instrumental and social-adaptive goal factors, scores were correlated with Ryff's PWB scores (see **Table 2**). As expected, problem-directed action and planning, seeking social support, attentional deployment through distraction, acceptance and gratitude/self-reward, cognitive change by reappraisal, response modulation by active physiological regulation, venting and regulated expression correlate positively with psychological well-being. Withdrawal, social isolation and suppression were associated with low psychological well-being.

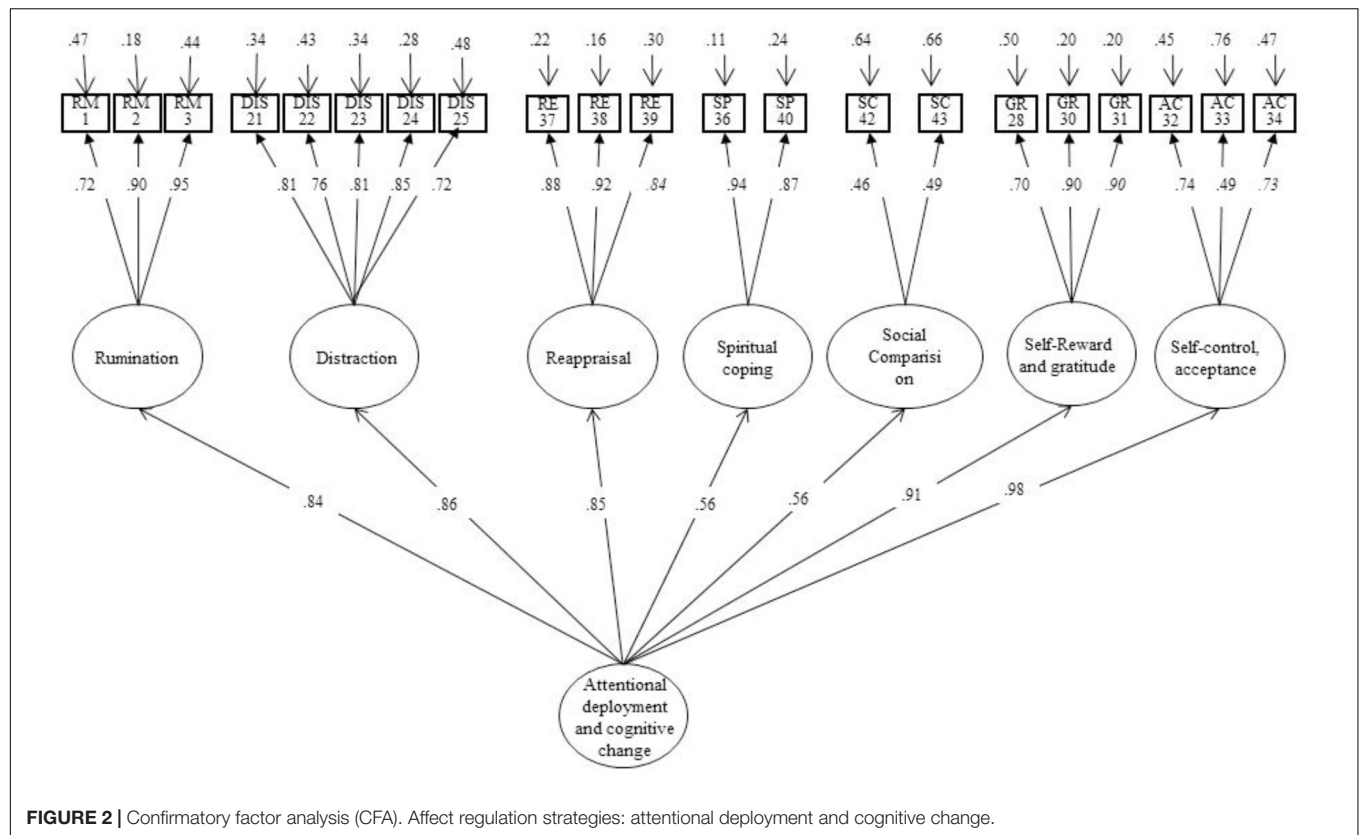


FIGURE 2 | Confirmatory factor analysis (CFA). Affect regulation strategies: attentional deployment and cognitive change.

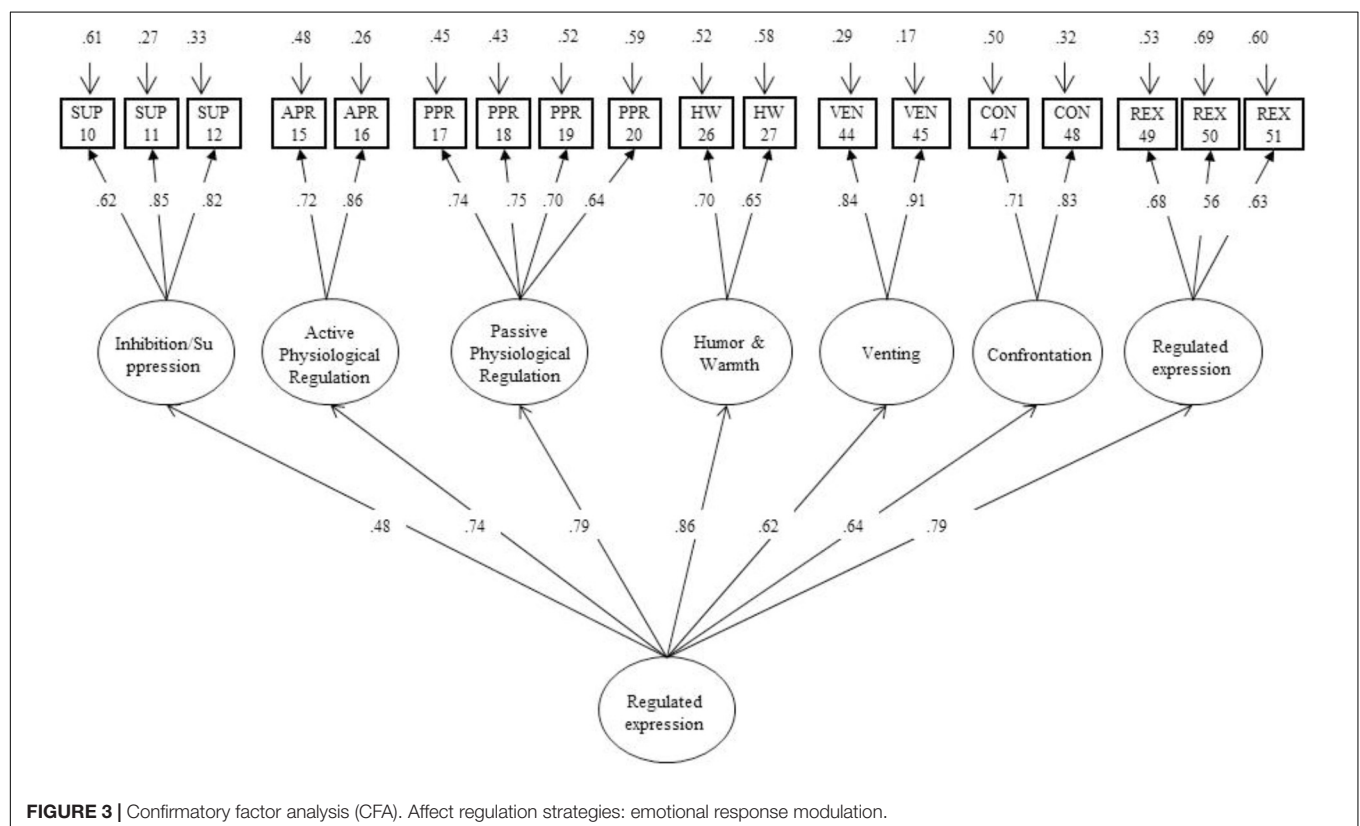


FIGURE 3 | Confirmatory factor analysis (CFA). Affect regulation strategies: emotional response modulation.

TABLE 2 | Correlations between MARS and ERQ, PANAS and PWB Ryff scales.

	ERQ		PANAS		PWB Ryff
	Reappraisal	Suppression	Positive	Negative	
Problem-directed action	0.24***	−0.09	0.22***	0.18**	0.21***
Withdrawal and social isolation	0.03	0.26***	0.02	0.33***	−0.17***
Social support	0.26***	−0.33***	0.27***	0.11	0.26***
Distraction	0.31***	−0.03	0.17**	0.24***	0.14*
Acceptance and self-control	0.32***	−0.02	0.26***	0.15*	0.25***
Gratitude and self-reward	0.36***	−0.01	0.22***	0.11	0.19***
Spiritual activities	0.20***	0.03	0.02	0.10	0.12
Rumination	0.22***	−0.02	0.19**	0.28***	0.13
Reappraisal	0.36***	−0.07	0.20***	0.06	0.25***
Social comparison	0.11	−0.05	−0.044	0.01	−0.05
Inhibition and suppression	0.05	0.43***	−0.64	0.33***	−0.18**
Active physiological regulation	0.25***	0.06	0.16*	0.16*	0.18***
Passive physiological regulation	0.17***	−0.02	0.01	0.01	0.03
Humor, Warm	0.25***	0.01	0.17**	0.16*	0.13
Venting	0.10	−0.36***	0.26***	0.05	0.28***
Confrontation	0.11	0.06	0.06	0.08	0.07
Regulated expression	0.29***	0.1	0.19***	0.09	0.20***

*** $p < 0.001$, ** $p < 0.01$, and * $p < 0.05$.

Discriminant Validity Between Groups of High and Low Hedonic and Psychological Well-Being

Discriminant function analysis (DFA) and analysis of variance (ANOVA) are used to examine the differences in affect regulation between groups. Hence, the overall analyses sought to answer the questions of how each strategy: (a) contributes to predicting group assignment and (b) represents significant mean differences among groups.

To explore a combination of well-being, we create four groups based on the median of PWB and PANAS (high PWB and PANAS; high PWB and low PANAS; low PWB and high PANAS, and low PWB and PANAS). Discriminant analysis between these groups found one statistically significant canonical discriminant function (see **Table 3**) which explains 68.2% of the variance in the use of affect regulation strategies differentiating between groups [Wilks' $\lambda = 0.61$, $\chi^2_{(51)} = 104.65$, $p = 0.0001$].

Specific items comprising Function 1 can be found in **Table 3** along with one-way ANOVAs, significant *post hoc* differences, group mean, and standard deviations. Eta square effect size shows that type of wellbeing explains between 1.9 and 4% of variance. Significant group differences are found between the high PWB-low PANAS and low PWB- low PANAS' group in problem-directed action, social support, acceptance and self-control, gratitude, spiritual activities, rumination, reappraisal and regulated expression. Besides, languishing individuals report using more inhibition and suppression strategies than the individuals with high PWB and low PANAS. In terms of the *post hoc* analyses, participants with high PWB and PANAS report higher gratitude and lower withdrawal and social isolation than the languishing group. Also, participants with high PWB and PANAS report lower rumination than the high PWB-low

PANAS. Furthermore, high PWB-low PANAS present higher scores than low PWB-high PANAS in problem-directed action, acceptance, spiritual activities, rumination, reappraisal and regulated expression.

DISCUSSION AND CONCLUSION

This paper empirically evaluates Gross's Process Model of Emotion Regulation and validates an expanded version of the MARS in negative emotional episodes. Globally, our results confirm the structural validity of dimensions of regulations and types of strategies. One of the most important findings of this study is that various forms of affect regulation show a reliable structure in different aspects or phases of affect regulation. Also, it provides an instrument that enables reliable diagnoses of functional self-regulation. Confirmatory factor analyses support the structure of expanded MARS (Páez et al., 2012). Consistent with previous research, the results of these analyses show a satisfactory fit with the three affect regulation systems: direct and indirect modification of situation through asking for social support, deployment of attention and cognitive change, and emotional response modulation. Furthermore, the expanded version of the scale implies an improvement regarding the original structure proposed by Larsen and Prizmic (2004) (Model 1).

First, the data show that both emotional and cognitive instrumental social support load together in the second factor, differentiating between instrumental/informative and emotional social support. Unfortunately, and at odds with the conception that receiving and giving social support are integrated in a common process, coping by helping others or altruism did not fit adequately. Only one item was used which did not allow testing

TABLE 3 | Items discriminating between Flourishing group, low PANAS and high PWB, high PANAS and low PWB, and languishing group.

Item	PWB Ryff *PNAS										Function Loading	η^2
	High PWB*PANAS (n = 70)			High PWB*low PANAS (n = 74)			Low PWB* high PANAS (n = 50)			Wilks' λ		
	M	DT	M	DT	M	DT	M	DT				
Modification of situation												
Problem-directed action	3.72	1.43	4.18 ^a	1.18	3.47 ^b	1.25	3.68 ^b	1.37	0.95	3.36**	0.07	2.35
Social support	3.52	1.70	3.90 ^a	1.59	3.28	1.70	3.34 ^b	1.55	0.96	2.98*	-0.36	2.06
Withdrawal and social isolation	1.72 ^a	0.96	1.93	0.99	2.30	0.86	2.74 ^b	1.15	0.93	4.23**	-1.02	2.97
Attentional deployment and cognitive change												
Distraction	3.58	1.25	3.77	0.94	3.70	0.92	3.67	1.14	0.97	2.41	-0.11	-
Acceptance and self-control	2.86	1.08	3.29 ^a	1.34	2.50 ^b	1.01	2.53 ^b	1.04	0.91	6.52***	1.03	4.05
Gratitude and self-reward	3.45 ^a	1.30	3.55 ^b	1.19	3.28	1.29	2.99 ^b	1.36	0.95	3.53*	0.38	2.41
Spiritual activities	1.04	1.58	1.55 ^a	1.91	0.69 ^b	1.04	0.85 ^b	1.38	0.95	3.67*	0.51	2.42
Rumination	3.60 ^b	1.21	4.29 ^a	0.91	3.76 ^b	0.93	3.99 ^b	1.08	0.95	4.23**	0.09	2.97
Reappraisal	3.39	1.52	3.73 ^a	1.51	3.20 ^b	1.11	2.94 ^b	1.42	0.93	5.88**	-0.11	4.03
Social comparison	1.62	1.37	1.64	1.50	1.88	1.54	1.95	1.46	0.99	0.21	-0.05	-
Response modulation												
Inhibition and suppression	1.59	1.28	1.77 ^a	1.11	2.02	1.29	2.50 ^b	1.51	0.96	2.78*	-0.14	1.91
Active physiological regulation	1.82	1.43	1.92	1.80	1.69	1.40	1.46	1.46	0.97	1.72	0.22	-
Passive physiological regulation	1.51	1.27	1.78	1.58	1.55	1.33	1.93	1.16	0.98	1.01	-0.33	1.91
Humor, warmth	2.49	1.31	2.65	1.26	2.73	1.25	2.46	1.42	0.96	2.78*	-0.06	-
Venting	3.21	1.63	3.15	1.51	2.74	1.58	2.89	1.51	0.97	2.15	0.11	-
Confrontation	1.96	1.75	1.87	1.14	2.19	1.64	2.39	1.88	0.99	0.02	0.21	-
Regulated expression	2.2	1.43	2.44 ^a	1.32	1.87 ^b	1.09	2.11 ^b	1.26	0.96	2.69*	-0.12	1.90

17 total affect regulation strategies; Likert-type response scale ranged from 0 (never) to 6 (nearly always). Different sub-indices indicate significant differences between groups (Bonferroni correction). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

the existence of a separate dimension. Asking for social support during distress does not necessarily imply a similar orientation toward giving social support – the latter is probably associated with high self-efficacy and prosocial values. Furthermore, CFA also suggests that withdrawal and social isolation should be considered together, forming an avoidance dimension strategy that is clearly dysfunctional. Both of them refer to taking actions that directly alter a situation in order to change its emotional impact, and although these situation-modifying behaviors lead to short-term relief, they prevent full exposure to the feared situations, preventing longer term benefits of exposure (Gross, 2015). Second, the strategies of attention deployment and cognitive change show a good fit with the data. The second family includes 21 items and 7 dimensions referring to distraction, acceptance and self-control, gratitude and self-reward, spiritual activities, rumination, reappraisal and social comparison. In fact, these strategies suppose a positive reevaluation of behaviors or negative emotional situations (Larsen and Prizmic, 2008). A previous research has also found that distraction and reappraisal are strongly related in affect regulation. Even if items try to represent mainly attentional effort versus cognitive processing, in other CFAs attentional items load in reappraisal and vice versa (da Costa et al., 2014), probably because attention and thinking are intrinsically connected processes.

Finally, the items related to dimensions of emotional response modulation show good fit with the data. The final model includes 18 items and 7 dimensions; suppression, active and passive psychological regulation, humor and warm, venting, confrontation and regulated expression. All of these coping strategies involve attempts to directly influence emotional response system (Koval et al., 2014). In sum, expanded MARS (Páez et al., 2012) could be considered relatively satisfactory due to none of the items in each dimension are included in different family according to the conceptually postulated models.

Convergent validity of the scales is also confirmed. Results suggest that there is a congruent relationship between dispositional indicators of emotional regulation and using functional and dysfunctional strategies in episodes of anger and sadness. Reappraisal is associated with high use of problem-directed action and social support, and attentional deployment and cognitive change strategies (except social comparison); moreover, it is associated with high active and passive psychological regulation, humor, warmth and regulated expression. Suppression is associated not only with withdrawal, social isolation and inhibition, but also with low social support and venting (Naragon-Gainey et al., 2017; Schäfer et al., 2017).

Results support a congruent relationship between the use of functional and dysfunctional strategies in episodes of anger and sadness and indicators of hedonic and psychological well-being (Seligowski et al., 2015). Forms of affect regulation were also related to well-being (Koval et al., 2014; Visted et al., 2018). Results confirm that withdrawal and social isolation, and suppression are associated with negative high self-reported affect over the past month, and to low psychological well-being. These forms of regulation are detrimental for hedonic, instrumental and social goals (English et al., 2017).

Problem-directed action, distraction, acceptance and self-control, rumination, active physiological regulation, use of

humor and affection were related to positive and negative affect. Most of these forms are a response to emotional stress and are associated with negative affect as a coping response. Social support, gratitude and self-reward, reappraisal, and regulated expression are only associated with positive affect and not to negative affect (Brockman et al., 2017). This means that these forms could be conceived as being based on dispositional positive affect or as improving positive affect when coping with negative events. However, venting and rumination could be understood as fueled by negative affect (Aldao et al., 2010; Renna et al., 2018).

As expected, psychological well-being was associated with modifying the situation through problem-directed action and seeking social support. PWB was also associated with attentional deployment through distraction, acceptance/self-control and gratitude/self-reward and to cognitive change by reappraisal (English et al., 2017). Finally, PWB correlates with response modulation by active physiological regulation, and regulated expression. In other words, results also confirm that these forms of regulation were associated with perceived control of the situation, high self-esteem and positive relationships with others as measured by Ryff's PWB scale. Because all of them are also related to positive affect, these forms appear to be connected with improved hedonic, instrumental and social-adaptive goals.

Venting, thought as to be a negative form of regulation, was associated with psychological well-being, positive affect and low suppression. Results suggest that intense emotional expression is not necessarily dysfunctional. This is congruent with a non-significant positive association between venting and affect balance (Páez and Da Costa, 2014). Recent studies conclude that venting and confrontation could be adaptive if they are associated with regulated expression, probably because both are related to assertiveness and to elicit and receive social support (Campos J.J. et al., 2004; da Costa et al., 2014). Rumination has an ambivalent profile. It was associated with positive affect and high reappraisal, suggesting that is linked with positive forms of emotional processing. However, it is at the same time related to negative PANAS, confirming the association between repetitive thinking and anxiety (Aldao et al., 2010; Jamieson et al., 2013).

Discriminant analysis shows an interesting result. The forms of affect regulation that most significantly characterize languishing participants with low PWB and hedonic well-being were high psychological abandonment, social isolation, low social support and high inhibition/suppression. This is an important finding, because it reaffirms the central role of social relations and low helplessness for well-being. Furthermore, this group usually used gratitude and self-reward less than other groups (except low PWB, high PANAS). Flourishing subjects (high PWB and PANAS) report highest gratitude and low social isolation and psychological abandonment. Attentional deployment positively oriented and absence of social and behavioral avoidance, appeared as the mark of subjects with the most positive well-being profile when regulating negative events. The most adaptive profile was reported by participants with high PWB and low positive affect, which reported highest modification of situation (problem-directed action and social support), acceptance and self-control, gratitude and self-reward, spiritual activities, rumination, reappraisal and regulated expression, and lower inhibition. The fact that an adaptive profile was showed by

participants with high psychological well-being (Korpela et al., 2018), even if they reported low positive and high negative affect, suggests the relevance of eudaimonic over hedonic well-being. Results can be interpreted also in the sense that participants with high psychological well-being but with an affect balance below the median cope with this unpleasant hedonic state by deploying strong affect regulation. However, because of the correlational character of this study it is difficult to clarify whether these associations show a form of coping with negative affect or if they are elicited by high negative affect. In addition, PANAS was answered with regard to the previous months and globally negative episodes were lived 6 months prior the test whereas stress episodes influence the last 3–6 months (Schimmack, 2008; Gross, 2015). It is possible that these people had salient coping efforts in the aftermath of recent negative events.

In conclusion, the results show a significant, medium-low correlation between forms of regulation with hedonic and psychological well-being. At the same time, the study replicates the association of adaptive regulation with well-being, and supports the structural validity of the MARS scale, as well as convergent validity with ERQ's suppression and reappraisal. There is an association between dysfunctional emotional regulation (high coping by withdrawal and social isolation and suppression) and low hedonic and psychological well-being. In addition, the measure was found to be reliable and valid, with the construct validity supported by associations with conceptually relevant constructs accessed via self-report measures. Information regarding the specific difficulties that participants experience in response to particular types of cues or stressors could also be used to enhance the targeted and tailored nature of interventions in other contexts (i.e., clinical). The results of this study are useful for promoting emotional capacities for coping more effectively with negative situations in educational contexts. These results provide guidance on how to implement intervention programs, aimed at enhancing well-being and reducing psychosocial maladjustment in negative situations. Adaptive strategies are forms of regulation that should be reinforced as ways to improve affective well-being. To help people overcome a state of low emotional and psychological well-being, it is essential to reduce their tendencies toward psychological abandonment, social isolation, low social support and high inhibition/suppression. This means that increasing successful social integration and self-efficacy

is essential for well-being. In this line of reasoning, teaching students to use positive reappraisal and acceptance can foster healthy skills to help them face adverse circumstances in the future.

In contrast, this study has clear limitations: the conclusions are based on the correlational analysis of self-reports. The sample size may have been too small, and further larger studies are required to confirm these results. More research is needed to fully understand the complex relationships among these constructs. The cross-sectional design of the study limits any conclusion about causality and direction of relationships. Measuring affect regulation with retrospective self-reports is another limitation because self-reported emotion regulation is not the same as actual measurement of affect regulation on-line. On-line experimental studies, as well as observational longitudinal studies, are needed to expand our understanding of affect regulation. Nevertheless, our results are globally congruent with the findings of both experimental (Augustine and Hemenover, 2008) and longitudinal studies (Nezlek and Kuppens, 2008), as well as with previous meta-analyses (Aldao et al., 2010; Webb et al., 2012). As such, future research examining the factor structure and psychometric properties of the MARS in response to a variety of naturalistic and/or laboratory-based stressors is needed. Also, the examination of the psychometric properties of the MARS in relevant populations that are characterized by higher levels of emotion dysregulation would be a useful direction for future research.

AUTHOR CONTRIBUTIONS

AP-M data analysis and wrote the paper. DP and SU-L wrote the paper. SDC-D collected the data.

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A Multidimensional PERMA-H Positive Education Model, General Satisfaction of School Life, and Character Strengths Use in Hong Kong Senior Primary School Students: Confirmatory Factor Analysis and Path Analysis Using the APASO-II

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Wenjie Duan,
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Reviewed by:

Nelson Silva Filho,
Universidade Estadual Paulista Júlio
de Mesquita Filho (UNESP), Brazil
Pin-Ju Chen,
St. Mary's Junior College of Medicine,
Nursing and Management, Taiwan

*Correspondence:

Man K. Lai
ssmklai@polyu.edu.hk

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Man K. Lai^{1*}, Cynthia Leung¹, Sylvia Y. C. Kwok², Anna N. N. Hui², Herman H. M. Lo¹,
Janet T. Y. Leung¹ and Cherry H. L. Tam²

¹ Applied Social Sciences, Hong Kong Polytechnic University, Kowloon, Hong Kong, ² Department of Applied Social Sciences, City University of Hong Kong, Kowloon, Hong Kong

The multidimensional PERMA-H positive education model provided evaluation and education framework for the theoretical and practice development of positive psychology in schools. Character strengths use mediates the association of strength knowledge and well-being. Using the Assessment Program for Affective and Social Outcomes (2nd Version) (APASO-II), the Subjective Happiness Scale, and the Physical Health Subscale of the PERMA-profiler, a multidimensional measure of PERMA-H was validated using confirmatory factor analysis in the context of a positive education program evaluation in senior primary school students. The association of PERMA-H measurements with school well-being as measured by general satisfaction of school life, and levels of depression and anxiety, and the mediation mechanism of character strengths use in such association were studied using path analysis. A cross-sectional sample of 726 senior primary school students (i.e., grade 4–6) aged 8–13 from the two primary schools completed a baseline evaluation questionnaire of a positive education program. Satisfactory internal reliability of the scales was obtained with Cronbach's alpha coefficients <0.70 . The scales were generally positively and moderately inter-correlated, except for level of anxiety and depression symptoms which was negative. Good psychometric properties of APASO-II were evidenced from the factor structure of sub-scale scores conforming to six factors of the PERMA-H model by confirmatory factor analysis. Path analyses showed that the APASO-II factors together with measures of subject happiness and positive health as the multidimensional PERMA-H model of positive education differentially predicted general satisfaction of school life, level of anxiety and depression, and character strengths use. Character strengths use mediated the relationship of Positive Engagement with general satisfaction of school life. Positive education utilizes knowledge and research findings

from positive psychology in schools to produce intended positive outcomes like enhanced well-being and reduced level of depression in students. This study provided a solid foundation for related scientific research and the understanding of the multidimensional framework of positive psychology concepts. Systematic promotion and longitudinal evaluation of positive education at the institutional level in Hong Kong can be achieved with the use of APASO-II and the positive education scales of subjective happiness and physical health.

Keywords: APASO-II, Hong Kong, affective and social outcomes, character strengths, confirmatory factor analysis, path analysis, PERMA-H, positive education

INTRODUCTION

Positive psychology is the “scientific study of optimal human functioning” (Linley et al., 2006, p. 8) and as a discipline, positive psychology studied positive emotion (i.e., happiness, joy, hedonia, subjective wellbeing/SWB, life with good things), engagement (i.e., flow, vitality, eudaimonia, psychological wellbeing/PWB, life with autonomy and actualization), and meaning (i.e., transcendence, purpose, life with connections) (Ryan and Deci, 2001; Seligman et al., 2009). This three components of Authentic Happiness theory was further developed into the five elements PERMA model (Seligman, 2011). Apart from the Positive Emotion (P), Engagement (E), and Meaning and Purpose (M), the two additional elements Relationships (R) and Achievement (A) covers wellbeing cultivate through human interactions and mastery goal pursuit (Norris et al., 2013). These five unique elements of wellbeing are measurable, and wellbeing can be assessed under an integrative framework with a multidimensional understanding as proclaimed by the model. Wellbeing attained by optimal functioning is both holistic and multidimensional (Norris et al., 2013). Individuals have the potentials to attain and experience wellbeing through various pathways and this connotes the multidimensional nature of wellbeing. The state of wellbeing experienced by oneself however would be a complete whole from all its related elements.

A multidimensional understanding of wellbeing provides theoretical and practical insights in the application of positive psychology at the different level of human organizations (Huppert and So, 2013; Kern et al., 2015). Although common core elements of wellbeing were evidenced across theories, countries and cultures, and individuals (Ryan and Deci, 2001; Peterson and Seligman, 2004; Park et al., 2006; Dodge et al., 2012; OECD, 2013), there are also variations in focus, levels, and pattern of relationships among elements of wellbeing (Ryff and Keyes, 1995) in which a profiler approach to assessed wellbeing and its application on the policies and programs (Huppert and So, 2013), interventions and trainings, and school individual students (Dodge et al., 2012; Kern et al., 2015; Butler and Kern, 2016) could be benefit.

Character strengths as vehicles to wellbeing are unique positive traits exist in every individuals which reflect in their thoughts, feelings, and behaviors to meet the challenges in the life and produce positive experiences (Peterson and Seligman,

2004). Derived from past cultural materials and recent literatures in wellbeing and happiness, twenty-four character strengths were identified and the Value in Action Inventory of Strengths (VIA-IS) was developed to measure these strengths. Good psychometric properties in large adult samples across countries (Park et al., 2006) and in different youth samples with the youth version Values in Action Inventory of Strengths for Youth (VIA-Youth) were found (Park and Peterson, 2006). The twenty-four character strengths are suggested to fall under six universal virtue categories, namely wisdom and knowledge, courage, humanity, justice, temperance, and transcendence (Peterson and Seligman, 2004). However, empirical studies did not consistently recover these six virtues (Peterson and Seligman, 2004; Shryack et al., 2010; Toner et al., 2012; Duan et al., 2013) and character strength measurements can be further developed and adapted into alternative measurement, such as the Chinese Virtues Questionnaire (CVQ) to reflect the other identified virtue structure and cultural emphases (Duan et al., 2013; Ho et al., 2014).

The investigation of universal virtues would be an important theoretical research question whereas the identification of a fix set of virtues might post challenges about individual potentials in producing positive experiences and acceptance in different groups of individuals. Apart from the approach of identifying latent virtues from manifested character strengths (Kristjánsson, 2012), another approach is to develop positive measurements from the PERMA model, as Butler and Kern's PERMA-Profiler (Butler and Kern, 2016) and Kern and colleagues' EPOCH Measure of Adolescent Well-Being (Kern et al., 2016). Pools of items were formed using items of scales used in wellbeing related literature and items of some character strengths subscales in the VIA-IS. The items were studied with calibration and validation subsets formed in the samples. Standard procedures in item selection, factor analyses of items to identify good performing items to the PERMA model structure, and development of good psychometric properties were performed in these PERMA-model-based positive measurements. This latter approach in developing positive measures for the study of wellbeing and evaluation of positive education programs has the advantage of a clear relationship between measurements and the elements of wellbeing, which can be complementary to the use of the twenty-four character strengths without a clear structure under the PERMA model (Oxford, 2016).

Apart from equipping strength knowledge, uses of character strengths also contribute to wellbeing and this is particularly important for positive psychology intervention to teach strengths use and evaluation studies to include this indicator in the understanding of the association between character strengths and wellbeing (Govinji and Linley, 2007; Quinlan et al., 2012), though character strengths predicted higher levels of wellbeing as indicated by vitality, positive affect, and perceived stress (Wood et al., 2011). Strengths use, like functioning, has a mediating nature in the process of strengths possessed to wellbeing outcomes (Weber et al., 2016). Evaluating its role through mediational analysis can provide information to the conceptual understanding of wellbeing development as well as education and evaluation practices in positive education.

The building of positive qualities in people and their lives apart from resolving negative issues in bio-psycho-social domains was herald among psychologists in the dawn of a new millennium (Seligman and Csikszentmihalyi, 2000). The absence of physical and mental illness is not sufficient for producing wellbeing, and assuming living can be without any negative emotions and experiences would be a fantasy. Signature character strengths in individuals can be identified, developed, and deployed (Seligman et al., 2009). Skills grounded in positive psychology theories and empirical findings can also be taught and developed to build individuals' positive qualities. This important breakthrough in the realization of implementing positive education in the schools, apart from what parents want and what schools teach, is a timely response to the general phenomenon of a high level of prosperity in the society but also a high prevalence of psychological issues, especially among the student population, in recent years (Seligman et al., 2009). In Hong Kong, the number of suicide cases in primary and secondary school doubled from around 10 cases each school year in 2013/14 and 2014/15, to around 20 cases each school year in 2015/16 and 2016/17 (Yip, 2016). A trend of increasing behavioral and emotional problems in students would catch the government's attention in trying to reduce such problems through positive education programs and a thorough rethinking of the educational goals and curriculum (Wu and Mok, 2017).

Positive Psychology Curriculum and Positive Psychology Intervention programs have been scientifically studied and implemented in a variety of school contexts, including the Penn Resiliency Program (PRP), Strath Haven Positive Psychology Curriculum (Seligman et al., 2009), Geelong Grammar School Applied Framework for Positive Education (Norrish, 2015a,b), and the St. Peter's College Positive Institution (White et al., 2015). Under the support of a local private foundation, a primary school in Hong Kong has launched a whole-school positive education program in 2016 utilizing the Model of Positive Education, which is based on Seligman's PERMA model plus a sixth element, the Positive Health, which embraces a holistic view of physical and psychological health through "practicing sustainable habits for optimal physical and psychological health" (Norrish et al., 2013, p. 155). Positive psychology does not only work at the student level, but also involving school administrators, teachers, and parents so that the school aim to become a positive education institution and community. Under the Model

of Positive Education, positive education is learned through training to people in the ecology of students (Learn), taught as a curriculum (Teach), tied-in different school subjects, activities, and interactions (Embed), and applied in personal and work life (Live) so that students can acquire and master the way to flourish (Seligman et al., 2009; Norrish et al., 2013; Norrish, 2015a).

A program evaluation component was included in the program and positive measurements were used together with the government endorsed Assessment Program for Affective and Social Outcomes (APASO-II). The second version of the Assessment Program for Affective and Social Outcomes (APASO-II) was revised and launched in 2010/11 school year, for schools to examine their students' social and affective development and needs, and conduct self-evaluation on related program implemented in schools (Education Bureau HKSAR, 2016b). A wide range of items on numerous affective and social outcomes are selected to meet the aims and latest development of education in Hong Kong. Positive education has been receiving attention in the past few years and applications of positive psychology in kindergarten, primary and secondary schools, and also undergraduate teacher training have been reported in newspapers in recent years. The validated and developed APASO-II would be an invaluable tool in the development of positive education in Hong Kong.

The purpose of this study was to identify and confirm the appropriate use of Hong Kong government endorsed APASO-II as a positive psychology measurement under Seligman's PERMA (Seligman, 2011) and Norrish's PERMA-H models (Norrish et al., 2013; Norrish, 2015a) in a primary school implementing a whole-school positive education program. In parallel, the multidimensional PERMA-H positive education model was validated by a confirmatory factor analysis (CFA) with the identified APASO-II measurements, the Subjective Happiness Scale (SHS) for positive emotions (Lyubomirsky and Lepper, 1999), and Physical Health Subscale (PHS) of the PERMA-profiler for positive health (Butler and Kern, 2016) as the latter two dimensions were not captured by APASO-II subscales. Psychometric information of APASO-II subscales, SHS, PHS, and the Strength Use Questionnaire (Govinji and Linley, 2007; Wood et al., 2011), together with a measure on levels of anxiety and depression in students were presented. The PERMA-H dimensions would predict scores on general satisfaction of school life, levels of anxiety and depression, and strength use. Furthermore, it was hypothesized that strength use will have a mediating role in the association of positive measures with general satisfaction of school life and the mediation would be evaluated by path analysis in this study.

MATERIALS AND METHODS

The main aim of the present study was to evaluate the association of selected APASO-II subscales guided by the PERMA model and Strengths Use Scale as having and using positive strengths with the General Satisfaction of school life subscale from APASO-II as an outcome in positive psychology among senior primary school students in a whole-school positive education program. The

association with levels of anxiety and depression was also studied. Cross-sectional baseline survey data were collected with the scale items from the Chinese version of the scales or translated items with back-translated method. The dimensionality and internal consistency of these scales, and their correlations with anxiety and depression symptoms measured by the Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983; Leung et al., 1993), subjective happiness, and physical health were also presented as supporting evidence of the adequacy of using these scales for evaluation of positive education program.

APASO-II measurements for primary schools assess outcomes at four levels according to the bioecological model (Bronfenbrenner, 1995), namely self (as self-concept), self-others (as interpersonal relationships), self-school (as attitudes to school, motivation, causal attribution, learning competency, and independent learning capacity), and self-society (as values). The measurements are validated scales selected from the literature or developed by the government to represent various affective and social outcomes (Education Bureau HKSAR and The Hong Kong Institute of Education, 2010). For the evaluation research of an application of positive education in a local primary school, relevant subscales in the APASO-II were chosen by university professors with professional training in educational psychology and social work under the applied model for positive education (Norrish et al., 2013) developed from the multidimensional PERMA framework (Seligman, 2011; Kern et al., 2015) with an additional domain of Positive Health (Butler and Kern, 2016). Subscales in APASO-II representing character strengths of Positive Engagement include Perseverance, Success Effort Attribution, Effort Motivation, and Task Motivation; representing Positive Relationships include Parent Relationships, Peer Relationship, and Teacher-Student Relationship; representing Positive Purpose include Experience, Value of School Work, and Education Aims; representing Positive Accomplishment include Achievement and Academic Self Concept. Since no subscale of APASO-II indicates character strengths of Positive Emotions and Positive Health, the Subjective Happiness Scale (Lyubomirsky and Lepper, 1999) and the Physical Health Subscale of the PERMA-profiler (Butler and Kern, 2016) were adopted and an evaluation framework under the positive education model was formed to evaluate a Hong Kong whole-school positive education program.

Apart from the PERMA measurements adapted from the APASO-II, use of character strengths understood as another precursor of psychological well-being in primary school students was assessed by the Strengths Use Scale (Wood et al., 2011). Both having and using positive personal strengths lead to psychological well-being and the subscale General Satisfaction of School Life in APASO-II was the outcome measure of the positive education program.

Sample

The studied sample in this study consists 726 primary 4 to 6 students with 436 (60.06%) students from the program school and 290 (39.94%) students from the comparison school. There were 232 (31.96%), 243 (33.47%), and 251 (34.57%) primary 4, 5, and 6 students, respectively. The percentages of boy and

girl in the sample were 54.55% (396 students) and 45.45% (330 students). Students aged between 8 and 13 years old, with a mean and standard deviation of 9.93 and 0.91.

Procedure

In the academic year of 2016/2017, a longitudinal three-year whole school positive education program has been implemented following the positive education model by Norrish (2015a). Positive education curriculums were developed by program personnel from the university and primary school according to the six pillars of character strengths through the four implementation levels of Learn It, Live It, Teach It, and Embed It. To study the effectiveness of the program, evaluation survey using positive psychology scales and APASO-II are administered in September of a year and June of the next year to capture any changes in the measurements. Another primary school of similar background to the program school but do not implement positive education program has formed the comparison group.

Students of the program school and comparison school were invited with parent and student consents obtained. The surveys are self-administered in classes without the presence of teachers but a research assistant to answer questions and assist students with problems in completing the survey. Students are instructed that participation is voluntary without any consequences and their identities are collected for matching the data at different timepoints. All information will be kept strictly confidential to the research personnel and only summary statistics will be used in reports and sharing of research findings.

Different versions of survey instruments are used for junior and senior primary school students, mainly due to their different literacy levels and age requirements of the scales. In the present study, we used only data from the senior primary school students of the program and comparison schools as the information collected from the survey were more comprehensive. A total of 791 questionnaires were distributed to the Primary 4 to 6 students of the two schools (486 and 305 from the program and comparison schools) and 788 questionnaires were collected. There were 570 students (72.34%) providing full information on the 115 items of the 17 studied measurements, age, and gender whereas the others were mostly missing only one item (115 students) from all measurements, or one item each in two to four measurements (36 students). In the calculation of scale scores, adopting a calculation allowing missing in less than 20% of the items (i.e., missing at most one item for every five items in a scale), the rate of completion would increase from 72.34% (570 students) to 92.13% (726 students). Analyses will be performed on responses of the 726 students providing information with less than 20% item missing in any single studied scale.

Measures

Assessment Programme for Affective and Social Outcomes (2nd Version) (APASO-II)

Developed in 2001 and revised in 2010, the Hong Kong government has adopted APASO as additional school quality assurance indicators on social and affective outcomes in students (Moore et al., 2006; Wu and Mok, 2017). Good validity and

reliability evidences were established for APASO-II with a sample of 80,000 primary and 130,000 secondary students of 352 primary and secondary schools in Hong Kong, representing 36 and 29% of all primary and secondary school students (Education Bureau HKSAR, 2016a; Wu and Mok, 2017). Local norms were developed for schools to make reference in their self-evaluation and strategic planning. The APASO-II for primary schools consists eight scales which further separated into 53 subscales, and they are organized at four levels: self, self-others, self-school, and self-society (Education Bureau HKSAR and The Hong Kong Institute of Education, 2010).

For the present study in measuring strengths possessed by students, 12 subscales with 78 items were selected based on the four domains of Positive Engagement, Positive Relationships, Positive Purpose, and Positive Accomplishment in the positive education model. A thirteenth subscale, General Satisfaction under Quality of School Life was used as indicator for psychological well-being at school. Internal consistency coefficients (Cronbach's α s) of all the subscales were above 0.80 (Table 1). All items are rated on a Likert-type scale ranging from 1 (Not agree at all) to 4 (Extremely agree).

Subjective Happiness Scale (SHS) and Physical Health Subscale (PHS)

Apart from the APASO-II subscales, Positive Emotions and Positive Health of positive education model were assessed by the Subjective Happiness Scale (Lyubomirsky and Lepper, 1999) and the Physical Health Subscale of the PERMA-profiler (Butler and Kern, 2016). The Subjective Happiness Scale consists 4 items and are rated on a 7-point Likert-type scale. An item about "not very happy" was not used in this study as it is not about positive emotion. Internal consistency coefficient (Cronbach's α) of the three items was 0.87 in the current sample. The Physical Health Subscale consists 3 items about self-rated health using an 11-point Likert-type scale. Good internal consistency was observed in the current sample (Cronbach's $\alpha = 0.92$).

Strengths Use Scale (SUS)

Use of strengths has been proposed as another important component in the study of positive psychology and well-being, and the Strengths Use Scale (Govinji and Linley, 2007; Wood et al., 2011) was validated and tested showing good reliability (Cronbach's $\alpha > 0.90$) and construct validity. This scale consists 14 items to be rated on a 7-point Likert-type scale ranging from 1 (Strongly disagree) to 7 (Strongly agree). In the studied sample, good internal consistency (Cronbach's $\alpha = 0.97$) was achieved.

Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety and Depression Scale was developed and used to assess states of anxiety and depression in medical settings (Zigmond and Snaith, 1983) and a Chinese version was developed showing good agreement with the original version as well as good psychometric properties (Leung et al., 1993). In this study, HADS would indicate ill-being and an expected negative correlation with other positive measures would provide discriminative validity evidence for the positive measures (Kern et al., 2015). Good internal reliability (Cronbach's $\alpha = 0.81$) and concurrent validity with suicidal thought intensity in a large Hong Kong adolescent sample was reported (Chan et al., 2010). A Cronbach's α of 0.80 was found in the studied sample.

Data Analysis

Good psychometric properties of APASO-II were evaluated by internal consistency of subscales and the structure of domains under positive education model which was evaluated by confirmatory factor analysis (CFA). Cronbach's α value larger than 0.70 indicates good reliability of items of a measurement (Nunnally, 1978) and all subscales achieved 0.80 or above in Cronbach's α . Usefulness of APASO-II in positive education programs was evaluated by correlation analysis of positive education domain scores as mean scores of positive education domains with mean scores of SUS, HADS, and the General Satisfaction subscale of APASO-II. Positive moderate correlations between domains of positive education model,

TABLE 1 | Cronbach's α s of APASO-II subscales.

Positive education domains	APASO-II subscales (please see Education Bureau HKSAR and The Hong Kong Institute of Education (2010) for simple descriptions of the subscales)	No. of items	α s
Psychological well-being at school	General Satisfaction	6	0.94
Positive Engagement	Perseverance	10	0.91
	Success Effort Attribution	4	0.90
	Effort Motivation	7	0.92
	Task Motivation	4	0.87
Positive Relationships	Parent Relationships	8	0.92
	Peer Relationship	6	0.92
	Teacher-Student Relationship	7	0.95
Positive Purpose	Experience	5	0.83
	Value of School Work	5	0.90
	Education Aims	5	0.87
Positive Accomplishment	Achievement	6	0.93
	Academic Self Concept	5	0.88

strengths use, and general satisfaction of school life, but negative correlations with symptoms and severity of anxiety and depression were expected. The factor structure of the PERMA-H positive education model was assessed by CFA under Structural Equation Modeling (SEM). Individual item scores of SHS and PHS for Positive Emotions (P) and Positive Health (H), and mean APASO-II sub-domain scores for Positive Engagement (E), Positive Relationships (R), Positive Purpose (M), and Positive Accomplishment (A) were loaded on their respective latent factors with factor variance fixed at 1, hence factor loadings could be freely estimated. Due to the nonnormality of manifested variables in the CFA model, robust Maximum-Likelihood estimation were performed using the asymptotic covariance matrix in LISREL (Jöreskog and Sörbom, 2001) and the Satorra-Bentler scaled χ^2 would be calculated (Satorra and Bentler, 1994; Jöreskog and Sörbom, 2001).

A path model was hypothesized to describe the association between the six positive education domains with strengths use, general satisfaction, and anxiety and depression intensity. The multidimensional understanding of well-being as measured by general satisfaction of school life could be studied from the specific associations with the different positive education domains. Scores of Positive Emotions and Positive Health were represented by mean scores of SHS and PHS. Scores of the other four domains of positive education model, namely Positive Engagement, Positive Relationships, Positive Purpose, and Positive Accomplishment were calculated by the mean scores of the APASO-II subscales under the respective domains. The role of strengths use proposed by Wood et al. (2011) was tested as a mediator in the association of positive education strengths and school well-being in the path model as well.

The CFA of APASO-II subscales, SHS, and PHS under PERMA-H domains of positive education, and the path model of positive education mechanism were performed using LISREL (Jöreskog and Sörbom, 2001), whereas the other analyses were performed using SPSS 22.0 (IBM Corp, 2013). The χ^2 test in Structural Equation Modeling is sensitive to sample size and is not appropriate as an absolute standard for evaluating models with large sample size (Bentler and Bonett, 1980). Models with 400 or more cases would almost always obtained a statistically significant χ^2 (Kenny, 2015). In this current CFA and path analysis in a sample of over 700 students, other fit information was suggested in the evaluation of model fits (Wheaton et al., 1977; Hu and Bentler, 1998; Schermelleh-Engel et al., 2003). Goodness-of-fit indices and criteria for good fit in models would be indicated by the χ^2/df (between 2 and 3), Comparative Fit Index (CFI close to or above 0.95), Tucker-Lewis coefficient (TLI close to or above 0.95), Standard Root Mean Square Residual (SRMR close to or below 0.08), and Root Mean Square Error of Approximation (RMSEA close to or below 0.06).

RESULTS

Among the thirteen APASO-II subscales, including the outcome subscale of General Satisfaction, SHS, PHS, HADS, and SUS,

significant higher mean scores in girls were found in General Satisfaction, Task Motivation, Peer Relationships, Teacher-student relationship, Experience, Values of School Work, and Education Aims, but a significant lower mean score in HADS. There was no significant correlation between age and the studied variables.

Correlation coefficients among the studied APASO-II subscales, SHS, PHS, and SUS were generally positive and with strength of association from moderate (minimum $r = 0.29$) to large ($r = 0.74$). The correlation coefficients of HADS with the studied APASO-II subscales, SHS, PHS, and SUS were all negative, ranged from -0.49 to -0.31 . This is consistent with the understanding that strength possessed and strengths use measurements under the positive education model are positively correlated whereas they are negatively correlated with states of anxiety and depression among the senior primary school students.

Apart from the good support of scale internal reliability (Cronbach's $\alpha s > 0.80$) for the studied variables, CFA was performed on the PERMA-H positive education model with twelve APASO-II subscales (excluding the outcome variable General Satisfaction), SHS, and PHS to confirm the structure of positive education model of these APASO-II subscales. The positive education domains of Positive Engagement, Positive Relationships, Positive Purpose, and Positive Accomplishment manifested by the twelve APASO-II subscales and schematized in **Table 1**, and the Positive Emotions and Positive Health measurement items produced adequate goodness-of-fit, although a significant χ^2 was found [Satorra-Bentler scaled $\chi^2_{(120)} = 306.50$, $p < 0.05$]. The positive education model of six positive education domains generated a χ^2/df of 2.55, CFI of 0.96, a TLI of 0.95, an SRMR of 0.04, and an RMSEA of 0.06. Factor loadings from APASO-II subscales to positive education domains were all positive and significant, ranging from 0.60 to 0.95 (**Figure 1**). The domains also correlated moderately to strongly among themselves (r s from 0.41 to 0.92).

Together with the Positive Emotions and Positive Health, the PERMA-H positive education model as strength possessed and the mediating role of strengths use in relationship with the outcome variable of General Satisfaction under Quality of School Life, and the direct association between PERMA-H domains with state of anxiety and depression were evaluated with path analysis. Firstly, outcomes of General Satisfaction and HADS, and the mediator strengths use were regressed on the six domains of the positive education model. This path model produced a good fit with the sample covariance matrix with a Satorra-Bentler scaled $\chi^2_{(3)} = 6.86$ ($p = 0.08$), a χ^2/df of 2.29, a CFI of 1.00, a TLI of 0.98, an SRMR of 0.01, and an RMSEA of 0.04. The positive education domains of Positive Emotions, Positive Engagement, and Positive Meaning significantly correlated with General Satisfaction. Positive Emotions, Positive Relationships, Positive Meaning, and Positive Achievement correlated negatively with HADS. Positive Emotions, Positive Engagement, Positive Achievement, and Positive Health correlated positively with strengths use. All positive education domains correlated positively among themselves (r s ranging from 0.37 to 0.72), supporting a

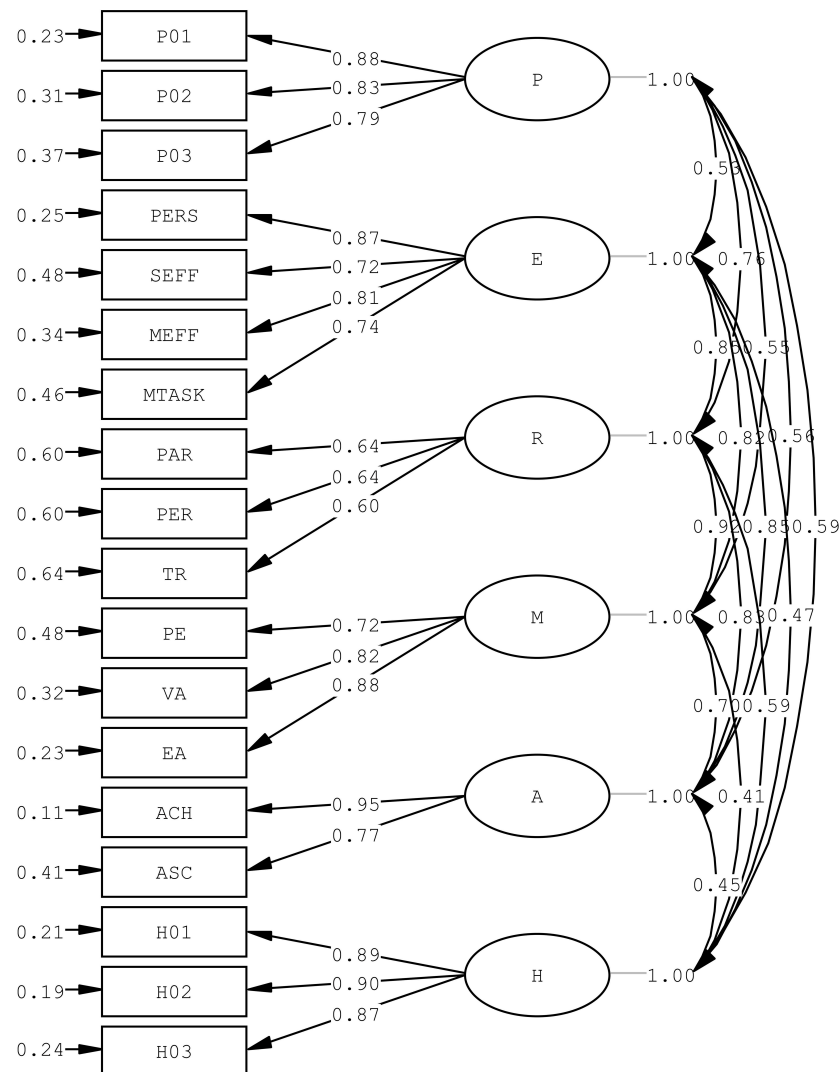
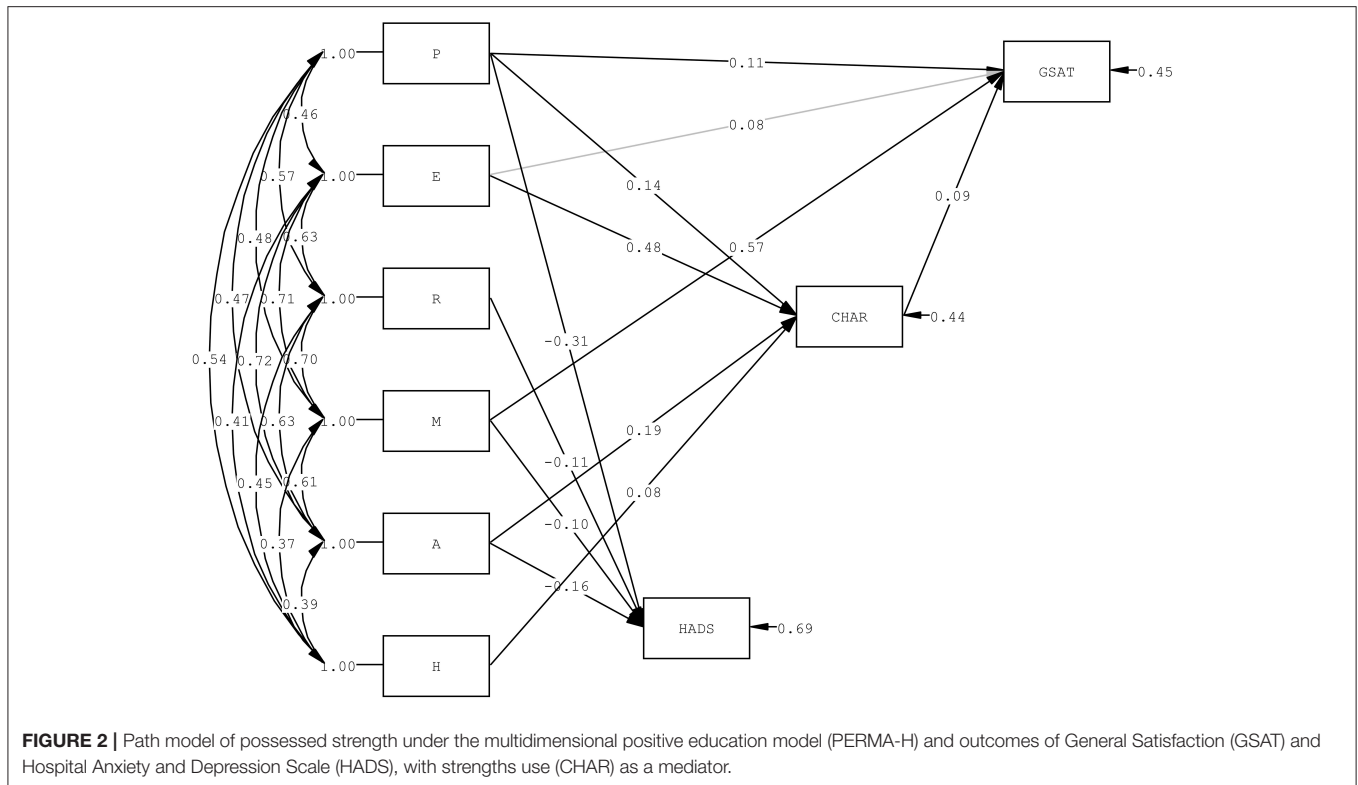


FIGURE 1 | Confirmatory factor analysis of PERMA-H Positive Education Model with Positive Education Domains: (i) Positive Emotions manifested by the three Subject Happiness Scale (SHS) items, (ii) Positive Engagement (E), Positive Relationships (R), Positive Meaning (M), and Positive Achievement (A) manifested by the twelve the Assessment Program for Affective and Social Outcomes (2nd Version) (APASO-II) subscales, namely Perseverance (PERS), Success Effort Attribution (SEFF), Effort Motivation (MEFF), Task Motivation (MTASK), Parent Relationships (PAR), Peer Relationship (PER), Teacher-Student Relationship (TR), Experience (PE), Value of School Work (VA), Education Aims (EA), Achievement (ACH), and Academic Self Concept (ASC), and (iii) Positive Health by the three Physical Health Subscale (PHS) items.

general flourishing concept described with the different positive strengths. Secondly, the path model was estimated with the non-significant paths from positive education domains to outcomes and strengths use removed, resulting in a good model fit of Satorra-Bentler scaled $\chi^2_{(10)} = 12.25$ ($p = 0.27$), $\chi^2/\text{df} = 1.23$, CFI = 1.00, TFI = 0.99, SRMR = 0.01, and RMSEA = 0.02. Lastly, the mediating role of strengths use in the association of positive education domains, namely Positive Emotions and Positive Engagement with General Satisfaction were evaluated by path analysis and a marginally significant change in χ^2 was found [Δ in Satorra-Bentler scaled $\chi^2_{(1)} = 3.84$, $p = 0.05$] when General Satisfaction was also regressed on strengths use (Figure 2). This mediation model produced a good fit

[$\chi^2_{(9)} = 9.15$ and $p = 0.42$, $\chi^2/\text{df} = 1.11$, CFI = 1.00, TFI = 1.00, SRMR = 0.01, and RMSEA = 0.005]. Strengths use fully mediated the relationship of Positive Engagement with General Satisfaction. The positive education model of PERMA-H manifested by APASO-II subscales and happiness and physical health scales appropriately represented flourishing in senior primary school students. This multidimensional understanding of well-being correlated significantly and positively with general satisfaction of school life and strengths use, and negatively with state of anxiety and depression. Furthermore, the mediating role of strengths use was identified by the path analyses in the relationship of Positive Engagement with general satisfaction of school life.



DISCUSSION

Assessment Programme for Affective and Social Outcomes (2nd version) (APASO-II), a Hong Kong government endorsed outcome measures in education, was found to be an appropriate positive education measurement. Subscales of APASO-II conforms to four elements of the PERMA-H model, which were Positive Purpose, and Positive Accomplishment, as evidenced by a good model fit in the confirmatory factor analysis. One of its subscale, General Satisfaction is also an appropriate positive measure for wellbeing. All the thirteen selected subscales of APASO-II and the Strengths Use Scale (SUS) showed satisfactory internal consistency reliability of over 0.80. These positive education measures, together with Subjective Happiness Scale (SHS) and Physical Health Subscale (PHS) also correlated positively moderately with each other, and negatively with levels of anxiety and depression measured by Hospital Anxiety and Depression Scale (HADS). The APASO-II subscales together with the SHS and PHS validated a complete multidimensional PERMA-H positive education model (Seligman et al., 2009; Norrish, 2015a) and formed a positive education measurement in a primary school implementing a whole-school positive education program. Positive measures can be reliably assessed in Hong Kong primary school students as small as Primary 4 of eight years old. The multidimensional understanding would allow students to utilize signature strengths and address the other strengths, improve and develop strengths through Positive Psychology Intervention activities at schools (Kern et al.,

2015). White et al. (2015) stated eight operational goals for an institution to turn into a positive institution and three of them are 1) a definition and measurement of wellbeing, 2) scientifically informed implementation of positive education program, and 3) evaluation of efficiency of the program. The PERMA-H model informed positive measures studied in this paper would help to prepare the positive education school to become a positive institution.

The mediation model of the relationships between positive measures informed by the PERMA-H model and wellbeing measures of general satisfaction of school life and levels of anxiety and depression mediated by strengths use was confirmed by the path analysis. Positive measures under the elements of Positive Emotion, Positive Engagement, Positive Achievement, and Positive Health predicted strengths use, whereas Positive Emotion, Positive Engagement, and Positive Purpose predicted general satisfaction of school life. Full mediation on the association between Positive Engagement and general satisfaction by strengths use was found. Except for Positive Relationships, the six dimensions of wellbeing measures directly or indirectly predicted general satisfaction of school life in the studied group of primary school students. Positive Relationships, together with Positive Emotion and Positive Achievement, showed negative associations with levels of anxiety and depression among the students. The dimension of relationship was emphasized in the Chinese culture (Ho et al., 2014) and cultural sensitive strength measures also identified this important dimensions (Duan et al., 2013). It would be interesting explore further if Positive Relationship would have a

differential association with wellbeing at different development stages (Martínez-Martí and Ruch, 2014).

After more than a decade development of positive psychology, advancements in the models and theories, measurements and intervention programs, and actual whole-school implementation have been accumulated. School implementation of positive education in Hong Kong has been also getting popular. The finding of APASO-II subscales conforming to a positive education model would create possibilities for all schools in Hong Kong to evaluate their school programs under a positive education model and a strength-based approach. Academic achievement together with positive education outcomes can be assessed regularly in the schools and longitudinal assessment of these outcomes in education can inform education policies, programs, and management as well as the activities, the curriculum, and teaching and learning (Gilman and Huebner, 2003). This potential however is still not optimally actualized as schools are free to decide how frequent, which subscales used, and the students in the APASO-II administration.

The positive education model extends the application of positive psychology from a thriving individual to a thriving school community (Seligman et al., 2009; Norrish et al., 2013; Norrish, 2015b; White et al., 2015; Butler and Kern, 2016; MacIntyre, 2016). The strengths language can be shared among stakeholders of the school community and there will be a connection between students and the school community. The purpose of flourishing and utilization of character strengths can meet the opportunities for practice positive knowledge and skills provided in the school community (Noble and McGrath, 2015). The wellbeing of students would be hinged on positive interaction with school stakeholders and the community they are growing up and learning. The school as a positive institution would be the most appropriate environment for acquiring positive knowledge and skills, and to practice and live with these positive characters. APASO-II is a valid and reliable positive education measure and can be used with scales on Positive Emotion and Positive Health to represent the positive education model. This multidimensional measure creates possibilities for the longitudinal assessment of wellbeing in students, evaluation of school programs, and informing school policies and the development of a positive school community. Through regular and complete collection of APASO-II information, institution level longitudinal positive education information can be accumulated for theoretical and

practical scientific research in positive education and positive psychology.

This study has several limitations. The psychometric properties and the mediation model were based on cross-sectional data with missing values, although the problem of missing values was circumvented by calculating mean scores with missing in less than 20% of the items in individual scales. The findings were also based on students studying senior primary school forms. APASO-II for secondary school is also available and the government encourages secondary schools to use it for the study of school performance. The multidimensional understanding of APASO-II subscales under the PERMA-H positive education model should be evaluated empirically. Validation study of APASO-II and other existing positive education and positive psychology measurements should be conducted to obtain a more comprehensive understanding of student wellbeing, character strengths and strengths use, the structure of virtue and PERMA-H domains, and the relationship among them. Existing Chinese version of such measures, specifically the Chinese Virtues Questionnaire (Duan et al., 2013) and the Flourishing Scale (Diener et al., 2010; Duan and Xie, 2016), can further anchor cultural specific domains from the core domains in wellbeing.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of guidelines of the Human Subjects Ethics Sub-committee (HSESC) with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Human Subjects Ethics Sub-committee (HSESC).

AUTHOR CONTRIBUTIONS

ML, CL, and SK contributed to the instrument selection and development, conceptualization, and drafting of the paper. ML contributed to the data analyses and interpretation of results. SK, CL, AH, HL, JL, and CT contribute to the conception and design of the study, acquisition of the data.

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*Correspondence:

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ssmklai@polyu.edu.hk

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Man K. Lai^{1*}, Cynthia Leung¹, Sylvia Y. C. Kwok², Anna N. N. Hui², Herman H. M. Lo¹,
Janet T. Y. Leung¹ and Cherry H. L. Tam²

¹ Applied Social Sciences, Hong Kong Polytechnic University, Kowloon, Hong Kong, ² Department of Applied Social
Sciences, City University of Hong Kong, Kowloon, Hong Kong

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From Growth Mindset to Grit in Chinese Schools: The Mediating Roles of Learning Motivations

Yukun Zhao^{1†}, Gengfeng Niu^{2†}, Hanchao Hou³, Guang Zeng¹, Liying Xu², Kaiping Peng¹ and Feng Yu^{2*}

¹ Department of Psychology, Tsinghua University, Beijing, China, ² Institute of Social Psychology, Xi'an Jiaotong University, Xi'an, China, ³ Centre for Positive Psychology, University of Melbourne, Parkville, VIC, Australia

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*Correspondence:

Feng Yu
yufengx@xjtu.edu.cn

[†]Co-first authors

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Growth mindset and grit have attracted much attention in educational research recently. Yet the underlying mechanisms that relate these variables to each other as well as to other variables remain largely unclear. This study investigates the relationships among growth mindset, learning motivations, and grit. We recruited a total of 1,842 students (884 males and 958 females) from third to ninth grade in a Chinese city. Results from the structural equation model analyzing the students' responses showed that learning motivations partially mediate the relationship between growth mindset and grit. Specifically, intrinsic motivation and identified regulation of extrinsic motivation are positively associated with growth mindset and grit, while external regulation of extrinsic motivation is negatively associated with them. Additionally, introjected regulation of extrinsic motivation is uncorrelated with these two variables. This study furthers the understanding of the underlying mechanisms through which growth mindset and grit positively impact education.

Keywords: growth mindset, learning motivations, grit, positive education, self-determination theory

INTRODUCTION

Positive education advocates for both the well-being and academic performance of students (Seligman et al., 2009). In practice, it fosters positive character traits and cognitions of students to help them achieve not only a higher level of well-being but also better academic performance (Park, 2004). Various positive education programs have been developed to foster these character strengths and cognitions (Waters, 2011; Norrish et al., 2013; Adler, 2016). There is empirical evidence that these programs improve students' academic performance (Seligman et al., 2009; Adler, 2016). In particular, research and intervention programs on growth mindset and grit are fast growing (Duckworth, 2016). Yet the mechanisms through which growth mindset and grit affect academic performance remain largely unclear. This study aims to fill in these gaps.

Growth Mindset

Growth mindset, a concept initially developed as a person's implicit theory of intelligence (Dweck and Leggett, 1988), develops from the belief that an individual's intelligence is largely malleable (Dweck, 2000). In contrast, fixed mindset is founded upon the theoretical assumption that an individual's intelligence is mostly immutable. In subsequent research, Dweck (2006) expanded this concept beyond intelligence to apply to personal qualities and abilities, including character

strengths and skills. Generally speaking, people who possess a growth mindset tend to see ability as something that can be incrementally developed over time while those who possess a fixed mindset tend to see ability as a fixed, unchangeable entity (Yeager and Dweck, 2012).

Zhang et al. (2017) reviewed the research on the role of students' mindsets in their academic performance. Most studies found that mindset plays a causal role in academic performance. For example, Mueller and Dweck (1998) found that praising fifth graders for intelligence, which was intended to instill the fixed mindset, performed worse than praising them for effort, which was intended to instill the growth mindset. Various intervention programs have been implemented to improve students' academic performance through fostering their growth mindset. Blackwell et al. (2007) found that teaching 7th graders about growth mindset can protect them from a further decline in their grades. In another study conducted by Aronson, Fried, and Good, African American college students who were encouraged to see intelligence as malleable rather than fixed achieved better grades than those in the control group (Aronson et al., 2002).

Learning Motivations

Learning motivations are "the motives...that regulate learners' study behavior" (Vansteenkiste et al., 2006, p. 19). Self-Determination Theory (SDT; Ryan and Deci, 2000b) differentiates types of learning motivations by the degree to which these motivations are autonomous or controlled. According to SDT, intrinsic motivation is a type of motivation high in autonomy in that people are engaged in an activity for the sake of the activity itself. For example, the fun of learning new things, the interest and curiosity to explore the unknown, and the optimal experience of flow in the activity (Csikszentmihalyi, 1997) are all examples of intrinsic motivations for engaging in an activity.

In contrast, extrinsic motivation is derived from goals that are external to the activity itself. SDT further differentiates extrinsic motivation into four types based on the degree to which this motivation has been internalized (Ryan and Deci, 2000a). The least autonomous type of extrinsic motivation is *external* regulation, which is driven by external rewards or punishments, like monetary rewards for academic achievements and physical punishment for bad exam scores. Another type of extrinsic motivation, *introjected* regulation, is best described as a partially internalized motivation in that it is regulated by a personal desire to affirm one's ego while still being driven by the external pressure of obtaining the approval of others. Examples of introjected regulation include learning motivated by trying to avoid the disappointment of one's parents or studying fueled by the belief that one's self-esteem is contingent upon one's exam performance.

The other two external motivations, *identified* regulation and *integrated* regulation, are more internalized and integrated into one's self, and hence more autonomous. People exhibiting an identified regulation style of extrinsic motivation engage in an activity because they accept the value of that activity as personally important as dictated by the goals they endorse. For example, the belief that learning is important. People driven by an integrated regulation style of extrinsic motivation, on the other hand, go

further in integrating the activity into other aspects of one's self such that, for example, they are motivated to learn because of their self-identity as a good learner.

External and introjected regulation styles of extrinsic motivation are classified as controlled motivation styles, whereas identified regulation, integrated regulation, and intrinsic motivation are considered autonomous motivation styles (Ryan and Deci, 2000a). There is ample and solid empirical evidence demonstrating that autonomous learning motivation is positively associated with students' well-being and academic performance. Conversely, controlled learning motivation is associated with depressive symptoms, mental problems, school disaffection, and academic setbacks (Chia et al., 2016).

Grit

Grit is defined as "perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087), and it's a character quality that can consistently predict success (Duckworth, 2016). Since it consists of both "perseverance of effort and consistency of interests over time" (Von Culin et al., 2014, p. 1), grit is highly correlated with but goes beyond Conscientiousness, one of the Big Five Personality Factors (Duckworth et al., 2007). Empirical research has consistently shown a positive association between grit and learning outcomes. For example, grittier junior students in high school were more likely to graduate from high school even after controlling for their academic conscientiousness, school motivation, and standardized test scores (Eskreis-Winkler et al., 2014). For Black male college students in a predominantly White institution, grit explained 24% of the variance in their grades (Strayhorn, 2014). Grit scores of undergraduate university students were also positively correlated with GPAs, and this relationship became even stronger when SAT scores were held constant (Duckworth et al., 2007).

Mediating Roles of Learning Motivations Between Growth Mindset and Grit

There are rich and dynamic relationships between growth mindset, learning motivations, and grit. First, growth mindset fosters autonomous motivations, and fixed mindset fosters controlled motivations. Growth mindset makes people view attributes as malleable through effort and facilitates a higher sense of control (Dweck and Leggett, 1988). According to SDT, the degree to which people perceive the significance of personal choices can impact the degree of autonomy of their motivations (Deci and Ryan, 1985). Therefore, people with growth mindset tend to have more autonomous motivations that enable them to improve their attributes through effort. On the contrary, people with fixed mindset view attributes as fixed and uncontrollable. They have a more controlled form of attribution style that would lead to more controlled motivations.

Second, the type of motivations can influence grit through pathways of both perseverance and passion. Ryan and Connell (1989) measured the learning motivations of elementary school students from urban, suburb as well as rural areas, and found that their external regulation were mostly negatively associated or uncorrelated with effort and enjoyment of learning, while

introjected, identified regulation and intrinsic motivation were mostly positively associated with effort and enjoyment of learning. Von Culin et al. (2014) examined the motivational correlates of grit for long-term goals and found that grit was positively associated with *engagement* and *meaning*, and negatively associated with *pleasure*. Since engagement overlaps with intrinsic motivation, meaning regulates people through self-identification and self-integration, and pleasure is typically an external goal, the more autonomous one's motivation is, the grittier this person might be.

Based on the prior research, we propose a mediation model in which learning motivations mediate the relationship between growth mindset and grit. Yet there might exist other mediators between growth mindset and grit. For example, Duckworth (2016) speculated that people with growth mindset tended to have a more optimistic explanatory style (Peterson and Steen, 2002), which would lead to higher grit. Therefore, we further hypothesize that the paths in our mediating model are mostly partial.

Influence of Age and Gender

Prior research has demonstrated positive correlations between the above mentioned variables and students' academic performance regardless of age or gender. In a review of research on participants ranging in age from 4 years old to university student age, Dweck (2006) found that growth mindset was positively associated with better academic performance in all age groups. Autonomous learning motivation has also been found to be associated with better learning behaviors in elementary and middle school students. Furthermore, controlled learning motivation was found to be associated with less optimal learning behaviors in the same students (Ryan and Deci, 2017). Grit has been found to predict the success of students in not only elementary and middle school but also in spelling bee competitions and even in the U.S. Military Academy (Duckworth, 2016).

Similarly, the literature mentioned above also demonstrates that the positive impact of growth mindset, intrinsic learning motivation, and grit on academic performance is consistently felt by both boys and girls. Furthermore, some research has found that the development of positive character traits and cognitions could help close the academic gender gap perpetuated by the stereotype that boys are better math learners than girls. In a field experiment testing this hypothesis, students in a group that were introduced to growth mindset saw a disappearance of the gender differential in math performance on a follow-up exam: both girls and boys did better than they did on the previous exam, and the improvement in girls' scores was significantly greater than that of the boys (Good et al., 2003). Zeng et al. (2016) tested the mediating role of resilience between growth mindset and school engagement among 1,279 Chinese primary schools and middle schools. They divided students into three age groups: under 12, between 13 and 15, and 16 and over. They found that the hypothesized mediation model in all three age groups, but the direct effects of growth mindset on school engagement in the 13-to-15 group were less significant than the other two age groups.

Therefore, we hypothesize that relationships between growth mindset, learning motivations, and grit are largely consistent across gender and age groups.

The Current Study

In light of past findings summarized above, the current study tests a mediating model in which learning motivations partially mediate the association between growth mindset and grit across different gender and age groups. This model has been implied by prior research but never empirically tested. Due to the nature of the model, we used Structural Equation Modeling (SEM) to conduct our analysis.

MATERIALS AND METHODS

Participants and Procedure

Participants were recruited from one public primary school and one public middle school in the city of Tianjin, China. A total of 1,842 students (884 males and 958 females) from third to ninth grade participated in this study. The average age of these students was 11.74 years old, representing a range from 8 to 17 years of age. Informed consent was obtained from participants.

Measures

The measures we used in this study were translated into Chinese by two graduate students majored in psychology. Translated measures were then back-translated by two other graduate students. Another graduate student majored in psychology checked to ensure the Chinese versions of the measures matched in meaning with the corresponding English versions.

Growth Mindset

The Growth Mindset Inventory (Dweck, 2006) was used to measure participants' tendency to have thoughts in line with a growth mindset (vs. a fixed mindset). The inventory consists of eight items. An example item is the statement, "You can learn new things, but you can't really change your basic level of talent." Each item, which had been translated into Chinese before being administered to participants, was accompanied by a 5-point response Likert scale. A confirmatory factor analysis with these items produced an acceptable fit: $\chi^2/df = 4.02$, $RMSEA = 0.07$, $GFI = 0.90$, $TLI = 0.90$, $CFI = 0.92$. The Cronbach's alpha for the scale was 0.75.

Learning Motivations

We administered the Academic version of the Self-Regulation Questionnaire (SRA-Academic, Ryan and Connell, 1989) to measure each participant's learning motivations. The questionnaire describes four learning-related activities, such as doing homework, and provides eight possible answer choices for why a participant would engage in that particular activity. Among the answer choices are responses that correspond to external regulation, introjected regulation, identified regulation, and intrinsic learning motivation. For example, "Because I'll get in trouble if I don't" (External), "Because I want the teacher

to think I'm a good student" (Introjected), "Because I want to understand the subject" (Identified), "Because I enjoy doing my homework" (Intrinsic). A response corresponding to an integrated regulation was not included in the questionnaire due to very strong similarities between responses corresponding to integrated regulation and responses corresponding to identified regulation. Participants were asked to rate their agreement with each answer choice according to a 5-point Likert scale. It's important to note that the four types of learning motivations are measured independently in this questionnaire as SDT posits that learning motivations are often intertwined, that is co-existing, rather than mutually exclusive. In this study, a confirmatory factor analysis produced an acceptable fit: $\chi^2/df = 3.15$, $RMSEA = 0.05$, $GFI = 0.95$, $TLI = 0.93$, $CFI = 0.96$. The Cronbach's alphas for external regulation, introjected regulation, identified regulation, and intrinsic motivation were 0.85, 0.81, 0.86, and 0.89 respectively.

Grit

The Short Form Grit Scale (Duckworth and Quinn, 2009) was used in this study to measure participants' levels of grit. The scale included eight items. For example, one item consisted of the statement, "I start whatever I begin". Participants were asked to respond by indicating on a 5-point Likert scale their level of agreement with each statement. A confirmatory factor analysis with these items produced an acceptable fit: $\chi^2/df = 4.49$, $RMSEA = 0.07$, $GFI = 0.90$, $TLI = 0.90$, $CFI = 0.90$. The Cronbach's alpha of this scale was 0.73.

Procedure

Research for this study was approved by the Human Research Ethics Committee of Tsinghua University. We also obtained the consent of the school administration, teachers, and students of both the public primary school and the public middle school from which we recruited participants. The participants were notified that all of their responses would only be accessible to the research group. The questionnaires were administered via an online survey. The students answered the survey on school-owned computers in the respective school's computer room in the 2nd week of September 2017.

Data Analysis

All the data were entered and sorted in SPSS. First, a confirmatory factor analysis was conducted to test common method bias. Next, analyses of the descriptive statistics and correlations contained within the data were calculated with SPSS. Third, SEM was adopted to analyze mediation effects using the Amos. Lastly, SPSS macro PROCESS with bootstrapping techniques was used to further test and calculate the mediating effects of variables. The effect was significant at the 95% CI. In our statistical analysis, age and gender were included as control variables in order to investigate their potential influence on mediating effects among variables.

The Control and Test of Common Method Bias

Since all data was collected through questionnaires, common method bias was necessary to test for. Though some techniques (e.g., assuring the respondent of protection of his anonymity) have been adopted to control for this bias, we conducted a confirmatory factor analysis to further ensure the reliability of our research results. Analysis testing the hypothesis that a single factor can account for all of the variance in the data (Podsakoff et al., 2003) revealed a poor model fit ($\chi^2/df = 20.43$, $RMSEA = 0.52$, $TLI = 0.55$, $CFI = 0.62$), which indicates that there were no serious biasing effects on estimates of the relationships between constructs.

RESULTS

Correlation Analyses

Pearson correlation coefficients were first calculated to examine the relationships among the investigated study variables (see **Table 1**). Gender had no or very small correlations with all variables. Age was negatively correlated with growth mindset and grit, with effect sizes between small and medium. It was not correlated with any of the learning motivations. There existed significant correlations between growth mindset, learning motivations, and grit, except those between growth mindset and introjected regulation and between grit and introjected regulation.

TABLE 1 | Correlation coefficients of the variables.

	1	2	3	4	5	6	7	8
(1) Gender	—							
(2) Age	0.03	—						
(3) Growth Mindset	−0.02	−0.15***	—					
(4) External regulation	0.06*	−0.05*	−0.33***	—				
(5) Introjected regulation	0.05*	−0.03	−0.03	0.68***	—			
(6) Identified regulation	0.02	−0.01	0.35***	0.25***	0.49***	—		
(7) Intrinsic Motivation	−0.01	−0.05*	0.38***	0.09**	0.38***	0.75***	—	
(8) Grit	−0.09**	−0.22***	0.51***	−0.27***	0.04	0.46***	0.49***	—

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

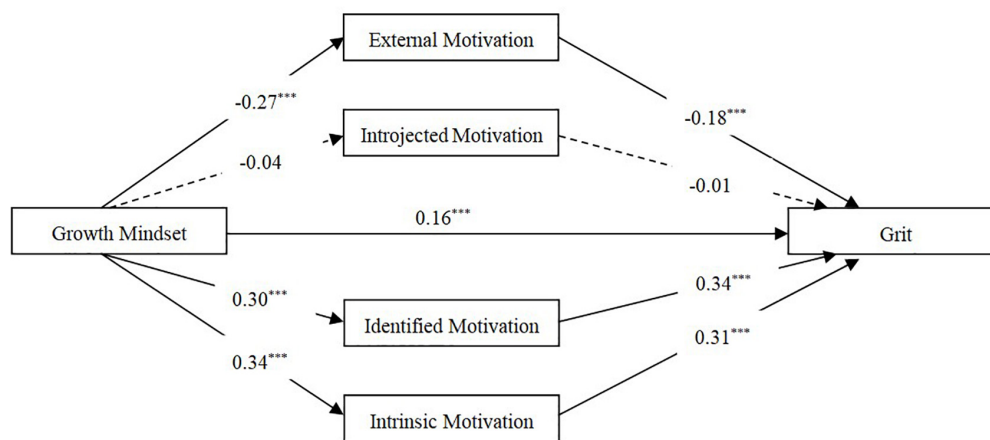


FIGURE 1 | Results of SEM (standardized estimates for paths). *** $p < 0.001$.

Mediating Model Analyses

Structural equation modeling was used to test the results of our correlation analyses according to our proposed mediating model, which posits that growth mindset influences grit through the mediating effects of learning motivations (external, introjected, identified, and intrinsic, respectively). Our model results revealed that external regulation, identified regulation, and intrinsic motivation could play significant mediating roles in the relationship between growth mindset and grit (see **Figure 1**). In fact, three significant mediating paths were found connecting growth mindset to grit: ① growth mindset – external regulation – grit, ② growth mindset – identified regulation – grit, ③ growth mindset – intrinsic motivation – grit.

Then, Hayes' (2013) SPSS macro PROCESS, a bootstrap program, was used to further test and calculate the mediating effects found in our structural equation model. It was found that all the three mediating paths did not include 0 in the 95% confidence interval, which means that each mediating path was significant. The total mediating effect value was 0.27; these seven mediating paths accounted for 62.94% of the total effect of growth mindset on grit, which is the ratio of indirect effects to the total effects (the predictive value of independent variable on dependent variable). The effect values for each mediating path are presented in **Table 2**. Gender and age were both included as control variables in these analyses.

TABLE 2 | Bootstrapping analysis of the mediating effects.

Indirect effect	Value	Bootstrap SE	BootstrapLLCI	BootstrapULCI	Relative value
Indirect effect ①	0.05	0.02	0.01	0.11	13.05%
Indirect effect ②	0.10	0.01	0.04	0.15	23.96%
Indirect effect ③	0.11	0.01	0.05	0.17	24.09%

* $p < 0.05$

DISCUSSION

This study attempts to investigate how the variables of growth mindset, learning motivations, and grit are specifically related to each other. The results support our hypotheses that specific types of learning motivation partially mediate the relationship between growth mindset and grit. The structural equation model we applied to our data demonstrated that having a growth mindset predicts higher degree of autonomy in students' learning motivations, which in turn positively impacts students' grit.

To the best of our knowledge, the paths in our mediating model had not been investigated before. Hochanadel and Finamore (2015) have speculated about the causal relationship between growth mindset and grit, and Duckworth (2016) has advocated for instilling growth mindset in children in order to foster their grit. No empirical research in the field, however, has examined the underlying mechanisms that connect growth mindset to grit. A central argument of SDT is that mindsets that foster an individual's sense of control can facilitate more autonomous types of motivation (Deci and Ryan, 1985). Subsequently, the more autonomous one's motivations are, the more likely one is to make an effort to persevere and maintain interest in the current activity in which one is engaged (Ryan and Connell, 1989; Ryan and Deci, 2000a). Our finding that learning motivations mediate the relationship between growth mindset and grit provides empirical evidence of the abovementioned theoretical relationships.

One notable outlier among the various learning motivations in our mediating model was introjected regulation, which didn't play any mediating role. In fact, it was not correlated with growth mindset or grit either. However, since the introjected regulation is somewhat internalized – not as integrated as the identified regulation but more autonomous than the external regulation – it is in line with the theoretical predictions of SDT. This duality of introjected regulation has also been demonstrated in empirical research; introjected regulation was positively associated with effort of learning in a correlational pattern similar to that of autonomous motivation styles, but it was also similar to external

motivation style in that it was positively associated with anxiety (Ryan and Connell, 1989).

This study also examined the potential influence of age and gender on these relationships. The results showed that gender was not correlated with any of the investigated variables. Age was negatively correlated with growth mindset, and grit, but not correlated with any specific learning motivations. Our additional finding that the paths in our mediating model were significant even after controlling for gender and age demonstrates that the relationship between growth mindset and grit mediated by learning motivations holds true regardless of gender or age for upper primary and middle school students.

In summary, the findings of this study support the use of a mediating model for explaining the relationships among growth mindset, learning motivations, and grit. This model, which hitherto had never been directly tested, has important implications in both research and practice. It is one of the first empirical studies to link learning motivations as understood in terms of autonomy in Self-Determination Theory to commonly investigated variables in positive education like growth mindset and grit. Evidence for the existence of such an explanatory model calls for future research on whether mechanisms of positive education can be better understood if assessed through SDT. For example, Dweck (2000) believed the impact of mindset was mediated by perceived competence, which is defined by SDT as the basic psychological need that facilitates both the well-being and autonomous learning motivation of students (Chen et al., 2014). Future research, therefore, including on the role of perceived competence in the relationship between growth mindset and learning motivations, should be conducted in order to determine the validity of an SDT-based explanatory framework in positive education.

This study has demonstrated that students who possess a growth mindset tend to find more self-directed and autonomous forms of motivations to learn, thereby increasing their overall grit. These findings highlight the critical importance of teaching growth mindset to primary and middle school students. Once students hold the belief that their intelligence, ability, and other attributes can be improved through their own efforts, they become less prone to the external manipulation of others, and gain a better sense of self through motivating themselves by values, meaning, self-identity, and passion. They will be more likely to persevere in the face of challenges and less likely to give up pursuing an interest in the face of a variety of temptations. Furthermore, the benefits of fostering such a mindset are as far reaching as increased academic performance over the long term. Positive education intervention programs that can effectively foster growth mindset, therefore, need to be designed and implemented in primary and middle schools to increase the well-being and academic performance of students.

Furthermore, this study highlights the importance of learning motivations in education. It replicates the findings of prior research that not all types of learning motivations are good in the long term. The external regulation of extrinsic learning motivation likely leads to less. Educators need to apply strategies to encourage autonomous learning motivations of students and refrain from using external conditions to regulate

students. These strategies include autonomy-supportive teaching, needs-supportive teaching, and directing students' attention to autonomous goals and learning processes (Ryan and Deci, 2017).

Limitations

The current study faces several limitations. Firstly, this study didn't consider cultural factors. Though Self-Determination Theory has been supported by many empirical cross-cultural studies (Chirkov et al., 2010), the relationships between some of the studied variables here may be moderated by the different types of self-construal associated with individuals of Eastern (vs. Western) cultural traditions (Markus and Kitayama, 1991). For example, since the self-construal of Chinese students tends to be more interdependent, they may consider expectations of others as expectations of their own, which converts introjected regulation into identified regulation. Future research is needed to examine the relationships we studied here in cross-cultural contexts.

Secondly, since this study is cross-sectional, the mediating model is insufficient for determining any causal relationships that may exist among growth mindset, learning motivations, and grit. More research utilizing experimental, prospective, and longitudinal approaches are needed to identify specific causal (as opposed to just correlational) relationships among the study variables.

Lastly, since grit only moderately correlates with academic performance, our findings are limited in their direct implications for positive education, a discipline ultimately focused on improving the well-being and academic performance of students. Future research, therefore, can supplement our findings by investigating the predictive power of growth mindset on actual academic achievement directly while still taking into account the possible roles learning motivations and grit may play.

CONCLUSION

This study found that learning motivations partially mediate the relationship between growth mindset and grit. It study provides insight into the underlying mechanisms behind the positive effects of growth mindset and grit on positive education from the perspective of Self-Determination Theory. As for practical implications, it calls for the design of positive education interventions targeted at fostering students' growth mindset.

AUTHOR CONTRIBUTIONS

YZ and GN contributed equally to this paper. YZ, GN, and GZ designed the study. GN and HH collected and analyzed the data. YZ, GN, and LX wrote the manuscript. KP and FY supervised the study and edited the final draft of the manuscript.

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School-Related and Individual Predictors of Subjective Well-Being and Academic Achievement

Ricarda Steinmayr*, Anke Heyder, Christian Naumburg, Josi Michels and Linda Wirthwein

Department of Psychology, Technical University Dortmund, Dortmund, Germany

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Mercedes Inda-Caro,
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Sciences, Iran

*Correspondence:

Ricarda Steinmayr
ricarda.steinmayr@tu-dortmund.de

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Recent research in the educational context has focused not only on academic achievement but also on subjective well-being (SWB) as both play a major role in students' lives. Whereas the determinants of academic achievement have been extensively investigated, little research has been conducted on school-related determinants of SWB in comparison with other students' characteristics. In the present cross-sectional study, we set out to investigate whether perceived school climate predicts school grades and SWB above and beyond other variables that are important for SWB and academic achievement. A sample of 767 8th and 9th grade students ($n = 361$ female adolescents; age: $M = 14.07$ years, $SD = 0.92$) completed measures of SWB, perceived school climate, test anxiety, self-efficacy, and interest. Grade point average (GPA) indicated students' academic achievement. Data were analyzed with latent structural equation models in which GPA and SWB were regressed on the school climate variables and students' characteristics. Results indicated that a positive school climate as well as self-efficacy and the worry component of test anxiety predicted SWB and/or GPA after all other variables were controlled for. Directions for future research and the importance of school climate variables on adolescents' SWB and academic achievement are discussed.

Keywords: subjective well-being (SWB), academic achievement, school climate, self-efficacy, interest, test anxiety

INTRODUCTION

Positive psychology seeks to shed light on the conditions and processes that contribute to the optimal functioning of human-beings and organizations (Gable and Haidt, 2005). A central construct examined in the context of positive psychology is that of subjective well-being. According to Seligman (2011) subjective well-being is a multidimensional construct and consists of positive emotions, engagement, positive relationships, meaning, and accomplishments or achievements. For adolescents, school is an important source of subjective well-being and recently more emphasis is placed on the fact that schoolchildren should feel comfortable in order to achieve optimal learning

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conditions (Organisation for Economic Cooperation Development [OECD], 2017). However, it is not only important to find out to what extent an optimal performance is achieved through a climate of well-being but also to explore which individual factors might contribute to a high subjective well-being (Lewis et al., 2011). Researchers as well as practitioners have long acknowledged that both subjective well-being (SWB) and academic achievement are favorable outcomes for students. Concerning the determinants of these outcomes, mostly student characteristics (i.e., individual determinants) have been investigated so far. However, creating a school climate that enables learning and well-being has also been considered important for healthy academic and personal development (e.g., Cohen, 2006). Even though there are strong theoretical assumptions of a link between school climate and these aspects, empirical evidence supporting this association has been scarce. Research on the association between school climate and general SWB has been particularly difficult to find. Thus, so far, little to nothing is known about whether school-related determinants (e.g., school climate) contribute to the prediction of SWB and academic achievement beyond and independently from student characteristics. The aim of the present study is to investigate whether school climate predicts SWB and academic achievement both (a) when important student characteristics that are also known to be important for SWB and academic achievement are controlled for and (b) when they are not.

On the Role of School Climate

There is a huge number of different conceptualizations of school climate (Wang and Degol, 2016). Many authors agree that school climate is a multidimensional construct. According to the National School Climate Council (2007), “school climate is based on patterns of people’s experiences of school life and reflects norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures” (p. 4), most of them including interpersonal variables (e.g., student-teacher relationships) as well as other characteristics (e.g., the atmosphere of a school; see Cohen et al., 2009). In this context, it is important to differentiate between the classroom climate (i.e., the climate surrounding a homogeneous group of students) and the school climate in general (Eder, 2018). The classroom climate, on the one hand, refers to aspects of teaching, how involved the students are, peer relationships, and peer-teacher relationships in rather small groups of students (i.e., a specific class). The school climate, on the other hand, consists of more global dimensions that focus on the school in general (Cohen et al., 2009). In an extensive literature review, Wang and Degol (2016) distinguished between four school climate domains: Academic (quality of the academic atmosphere), community (quality of interpersonal relationships), safety (emotional security, e.g., disciplinary practices), and institutional environment (organizational features of the school environment).

Practitioners and researchers have recently developed great interest in school climate and have acknowledged its importance for students’ learning and healthy development (Eccles et al., 1993; Thapa et al., 2013). In what follows, we

summarize empirical evidence on the role of school climate for SWB and academic achievement.

School Climate and SWB

Different theoretical approaches to SWB exist and can be differentiated into a hedonic and an eudaimonic view of SWB (e.g., Ryan and Deci, 2001; Eid and Larsen, 2008). The hedonic view defines SWB as the presence of joy or happiness. In this context, most authors differentiate between a cognitive and an affective component of SWB (see Diener et al., 1999; Diener, 2012). The cognitive component describes individuals’ cognitive evaluations of their lives as a whole (i.e., global life satisfaction). The affective component comprises affective experiences, including individuals’ reports of pleasant emotions (e.g., joy, enthusiasm) and negative emotions (e.g., sadness, nervousness; e.g., Watson et al., 1988). The eudaimonic view focuses on self-realization and defines well-being as the degree to which an individual is fully functioning. As there are different conceptualizations regarding eudaimonic well-being and empirical uncertainties concerning the factorial structure of eudaimonic well-being measures (Springer and Hauser, 2006), we refer to SWB as defined in the hedonic approach. Hence, we focus on SWB conceptualized as cognitive as well as affective components. There are already some studies investigating individual determinants of school students’ SWB such as different personality variables (e.g., Anglim and Grant, 2014). However, research focusing on different school variables such as school climate as determinants of adolescents’ SWB is still scarce. In the following, we refer to different theoretical approaches linking school climate and SWB.

Ecological system theories assume an impact of family, school, and other layers of the environment on children’s and adolescents’ positive development (e.g., Bronfenbrenner, 1979). In this context, schools might have an important influence as an environment that contributes to a healthy and positive adjustment and hence, to the well-being of children and adolescents (Baker et al., 2003). Baker et al. (2003) refer to different aspects of school climate as distal environmental aspects that influence well-being.

The stage-environment fit approach by Eccles et al. (1993) is grounded in the person-environment fit paradigm and is consistent with this theory. According to this approach, children’s healthy development is possible only if the environment fulfills the prerequisites for a healthy development. On the basis of these theoretical approaches, one might assume that SWB, as one sign that a student is developing in a healthy way, is impacted by a positive school climate because schools constitute a very important environment for children and adolescents given the amount of time they spend in school.

Indeed, research investigating the association between a positive school climate and students’ SWB is scarce. Only a few studies have investigated the relationships between the two components of SWB (i.e., cognitive and affective) and school climate and found them to be positively correlated (e.g., Waaler et al., 2013; Newland et al., 2014). However, the school climate measures used by these authors were either very short (Newland et al., 2014) or they did not directly measure school climate but

instead measured constructs associated with it in a broader sense (Waalder et al., 2013). Most studies using established measures of school climate have focused on either life satisfaction or symptoms associated with the affective component of SWB (e.g., depression and anxiety symptoms). To our knowledge, only one study investigated school climate (e.g., teacher support, school connectedness) with an established measure of the affective component of SWB and found significant and direct, albeit small effects of school climate variables on affective SWB (Aldridge et al., 2016). Concerning life satisfaction, Suldo and Huebner (2006) demonstrated that students with very high life satisfaction perceived the greatest social support from teachers, which is one component of school climate. Furthermore, high-school students' life satisfaction was positively associated with order and discipline, the sharing of resources, parental involvement, the appearance of school buildings, students' interpersonal relationships, and student-teacher relationships (Suldo et al., 2006, 2008).

Also, findings from studies that did not explicitly measure SWB have supported the link between school climate and the affective component of SWB. These studies differed regarding the assessment of school climate and used either a global school climate score or scores from specific subfacets of school climate. Lee et al. (2017) focused on depression when investigating the criterion validity of the School Climate and School Identification Measure-Student measure (SCSIM-St). The total score, comprising student-student relationships, student-staff relationships, academic emphasis, and shared values was significantly negatively correlated with depression in an adolescent student sample. However, the authors considered only the total score and did not report the correlations between the subscales of the SCSIM-St and depression. Similar results were found when teacher-reported school climate was assessed, that is, teacher-reported school climate was also negatively associated with students' depression scores (Pössel et al., 2016). Salmela-Aro et al. (2008) considered three subscales of school climate and regressed them on school burnout, which might also be interpreted as an indicator of the affective component of SWB. All school climate factors were correlated with school burnout (positive correlation: negative school climate; negative correlation: support from school, positive motivation from teachers). Correlations between the school climate factors were high: $r > |0.5|$. However, when all three school climate factors were simultaneously regressed on school burnout, all of them significantly contributed to the prediction of school burnout on an individual level but not on the school level. On each level, the path weights for the different school climate factors differed from each other, as well. Thus, whereas most studies have explored a global school climate factor, considering specific factors of school climate may provide a better understanding of how school climate contributes to the explanation of individual differences in SWB or related aspects. The global school climate factor might mask effects of single school climate factors. In summary, studies have supported a positive association between positive components of school climate and SWB or constructs associated with SWB such as depression. These correlations have usually been medium to large in size.

School Climate and Academic Achievement

School climate and academic achievement are thought to be positively associated because a good school climate is a prerequisite for learning (Thapa et al., 2013). Likewise, Osher and Kendziora (2010) stated that a negative school climate may limit students' school engagement, which might subsequently lead to worse academic achievement. In line with these thoughts, studies have demonstrated a positive relation between school climate variables such as student-teacher relationships and prerequisites for learning such as students' academic motivation, school engagement, or attitudes towards school (e.g., Fraser and Fisher, 1982; Wang and Holcombe, 2010; Van Ryzin, 2011). Moreover, academic self-efficacy has also been found to be positively associated with a good school climate as assessed by feelings of connectedness with students' schools (McMahon et al., 2009) or perceived support from teachers (Alivernini and Lucidi, 2011). But school climate is associated not only with prerequisites for academic achievement but also with academic achievement itself. Several studies have demonstrated a positive association between school climate and different indicators of academic achievement (GPA: e.g., Suldo et al., 2008; standardized school achievement: e.g., Lee et al., 2017). An association with academic achievement was found at both the individual and school levels (e.g., Salmela-Aro et al., 2008), but the associations were small in size ($r < |0.3|$). Furthermore, students who were held back a grade also felt less connected to school (e.g., Fan et al., 2011). So there is some evidence that a positive school climate is associated with important prerequisites for academic achievement and academic achievement itself, or in other words, that a negative school climate might have a negative impact on academic achievement and its prerequisites. However, it also makes sense to expect that academic difficulties might lead to a negative perception of school climate. Longitudinal studies are needed to investigate this relation. We are aware of only one study that investigated the reciprocal effect between academic achievement and school climate by assessing both constructs over time. McCoy et al. (2013) found that school climate predicted change in academic achievement but not vice versa on a school level. Even though school level results are not necessarily applicable to the individual level, we propose that school climate is a predictor of academic achievement rather than vice versa on the basis of Osher and Kendziora (2010) and Thapa et al. (2013) rationales and McCoy et al.'s (2013) study.

On the Role of Student Characteristics

Besides school climate, student characteristics are also important for students' SWB and students' academic achievement. In the following paragraphs, we summarize the empirical findings on the student characteristics that predict SWB and achievement. We thereby focus on three constructs that are assumed to be relevant for both outcome variables (i.e., self-efficacy, interest, and test anxiety). In motivation research, there is a problem with jingle-jangle fallacies as theoretically very similar constructs are given different names (Marsh et al., 2003). Marsh et al. (2003) proposed that motivational constructs can be attributed to either a learning factor (e.g., intrinsic motivation or related constructs)

or to a performance factor (e.g., achievement motivation). By choosing interest and self-efficacy, we considered both motivation factors in the present study. Self-efficacy is defined as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p. 3). Individual interest can be defined as a relatively enduring preference for a certain type of object, activity, or subject (e.g., Schiefele, 1991).

Furthermore, personality variables have been found to be the most important individual characteristics for SWB (e.g., Anglim and Grant, 2014). However, we did not include broader personality factors such as the Big Five in our study because only conscientiousness has been found to be related to GPA in adolescence (Poropat, 2009), and conscientiousness is not related to SWB (Gomez et al., 2009). On the other hand, neuroticism is related to SWB (Gomez et al., 2009) but not to GPA (Poropat, 2009). An important construct in the context of school that shows substantial associations with personality variables is test anxiety. It is an important indicator of neuroticism, it has the highest association with SWB of all personality variables (e.g., Weiss et al., 2008), and it has substantial associations with academic achievement (e.g., Hembree, 1988; Zeidner, 1998; Steinmayr et al., 2016). Test anxiety refers to a set of different “phenomenological, physiological, and behavioral responses that accompany concern about possible negative consequences” in an evaluative situation (Zeidner, 2007, p. 166). It can be conceptualized as a state or trait, whereby a frequently used definition refers to test anxiety as a situation-specific personality trait (Spielberger and Vagg, 1995). Test anxiety consists of two components: emotionality and worry (e.g., Hembree, 1988; Cassady and Johnson, 2002). Emotionality comprises a person’s physiological state such as nervousness, an accelerated heart rate, or tension when confronted with tests. The worry component is comprised of cognitive elements of test anxiety such as negative thoughts, self-criticism, or concerns about the effects of failure (Zeidner, 1998).

Student Characteristics Predicting SWB

Research has shown that individual variables are strong predictors of SWB (Diener, 2012). However, individual variables focusing on the academic or school context have still rarely been examined so far (Huebner and Diener, 2008). This is surprising given the fact that children and adolescents spend most of their time in school, and hence, school-related individual determinants would have to play an important role in predicting SWB. Concerning self-efficacy, Correia and Dalbert (2007) found a correlation of $r = 0.49$ between school-related self-efficacy and life satisfaction in a sample of school students. Drawing on a sample of undergraduate students, academic self-efficacy was positively related to life satisfaction ($r = 0.40$) as well as to positive affect ($r = 0.39$) and negative affect ($r = -0.26$; Denovan and Macaskill, 2017).

Further, several studies investigated the relations between SWB in school or university and interest or related constructs such as intrinsic motivation and revealed positive relations (e.g., Baker, 2004; Ruus et al., 2007). Given that Suldo et al. (2008) demonstrated a medium to high correlation between school

satisfaction and general life satisfaction, we expected that interest would also be associated with general SWB. However, even less is known about other school-related determinants of SWB besides motivational variables.

Regarding the influence of test anxiety on SWB, the transactional model of test-related emotions (Spielberger and Vagg, 1995; Zeidner, 1998; Ringeisen and Buchwald, 2010) suggests that test anxiety is associated not only with appraisals of threat but also with other negative emotions, and hence, test anxiety may predict changes in SWB. Steinmayr et al. (2016) focused on the associations between two components of test anxiety (worry, emotionality) and SWB. The authors found that worry negatively predicted changes in life satisfaction and changes in affective well-being. Studies focusing on variables considered to also indicate emotional well-being have additionally shown associations with test anxiety (e.g., Pekrun et al., 2002). Taken together, various studies have suggested that self-efficacy and interest are positive predictors of SWB, whereas test anxiety, and worry in particular, is a negative predictor.

Student Characteristics Predicting Academic Achievement

Much research has studied the role of student characteristics such as students’ motivation and emotions in students’ achievement (e.g., Eccles and Wigfield, 2002; Gogol et al., 2017; Pekrun et al., 2017). Students’ self-efficacy has been found to influence students’ choice of activities, effort, persistence, and eventually achievement (e.g., Zimmerman, 2000). This means that regardless of their prior achievement, students who judge their own capability for learning and achievement as high choose more challenging tasks, put more effort into them, show higher persistence, and thus show higher performance than students who judge their self-efficacy as low (for a summary, see Zimmerman, 2000). Empirical research has underscored the power of self-efficacy beliefs, which explain around 25% of the variance in academic outcomes (Pajares, 2006). Prior research has suggested that self-efficacy is an even stronger predictor of achievement than other motivational constructs such as self-concept or utility value (Pajares and Miller, 1994; but see Steinmayr et al., 2018). Note, however, that due to the very strong correlations between self-efficacy and self-concept, researchers should be cautious when making such interpretations (see Marsh et al., 2004).

Research has also demonstrated that interest increases attention, recall, task persistence, and effort (e.g., Ainley et al., 2002; Hidi and Renninger, 2006). A meta-analysis on the relation between interest and performance revealed moderate, positive correlations between the two constructs (Schiefele et al., 1992).

Regarding the role of students’ emotions for learning and achievement, most research has focused on test anxiety (e.g., Hembree, 1988; Zeidner, 1998). Generally, negative activating emotions such as anxiety distract attention and reduce interest, intrinsic motivation, and deep learning, but sometimes they can also increase students’ extrinsic motivation in an attempt to avoid failure (Pekrun, 2017). In cross-sectional studies, negative small to moderate correlations have been found between test anxiety and achievement with stronger relations for the worry

component than the emotionality component (e.g., Hembree, 1988). In longitudinal research, results on the effects of test anxiety on achievement outcomes have been less conclusive. Older studies revealed an indirect negative effect of test anxiety on achievement via students' motivation but no direct effect (Meece et al., 1990). More recently, worry but not emotionality was found to predict a decrease in students' GPA (Steinmayr et al., 2016), reflecting the correlational pattern established in prior research (Hembree, 1988).

Taken together, self-efficacy, individual interest, and test anxiety are well-researched motivational-affective key constructs in educational psychology research. Self-efficacy and interest positively predict achievement, whereas test anxiety—particularly the worry component—seems to decrease academic achievement.

Academic Achievement and SWB

Prior research has suggested that school climate, students' self-efficacy, interest, and test anxiety show significant associations with SWB and with achievement in the same direction. So how are these two student outcomes related? Several studies have already explored the link between SWB and academic achievement. Life satisfaction, in particular, seems to be positively related to adolescents' academic achievement (e.g., Gilman and Huebner, 2006; Proctor et al., 2010; Heffner and Antaramian, 2016). More specifically, the correlations between life satisfaction and grade point average (GPA) were found to range from $r = 0.12$ (Verkuyten and Thijs, 2002) to $r = 0.32$ (Gilman and Huebner, 2006). Regarding affective measures of SWB, the associations with GPA have been more heterogeneous and usually smaller. Whereas Heffner and Antaramian (2016) found significant, albeit small correlations ($r = -0.15$ with negative affect and $r = 0.07$ with positive affect) in a sample of school students, no significant correlation between positive affect and GPA was found in studies with university students (Liao and Wei, 2014). Taken together, life satisfaction has been found to be positively related to grades in school, and the association tends to be higher than for the affective component of SWB.

The Present Study

As outlined, the association between school climate and SWB has seldom been investigated with established measures of the two components of SWB (i.e., affective and cognitive) and school climate. However, research on the relations between school climate and constructs related to SWB has supported the notion that school climate and SWB are related. However, most studies have investigated either one aspect of school climate (e.g., Shochet et al., 2006; Suldo and Huebner, 2006) or a global school climate score (Lee et al., 2017). Little is known about the importance of specific aspects of school climate for the different components of SWB (but see Aldridge et al., 2016). Salmela-Aro et al. (2008) demonstrated that the school climate subscales differ in their criterion validity concerning SWB when considered simultaneously. However, they did not test whether the highly correlated scales would also have incremental validity after a general school climate factor was controlled for. Thus, one aim of the present study is to investigate whether the school climate

subscales differ in their associations with SWB and whether they predict SWB above and beyond a general school climate factor. Because very few studies have investigated school climate and SWB, and most studies have considered either a global measure of school climate or its subscales, we have no specific hypotheses regarding which subscale should best predict SWB or whether the subscales should predict SWB beyond a general school climate factor.

Research Question 1a: Can the school climate subscales predict SWB beyond a general school climate factor?

Research Question 1b: Can the school climate subscales predict academic achievement beyond a general school climate factor?

As described above, school climate is an important predictor not only of SWB but also of academic achievement. However, only a few studies have investigated both criteria simultaneously with regard to their associations with school climate. In one study, school climate had a stronger association with SWB than with academic achievement when bivariate correlations were considered (see Salmela-Aro et al., 2008). This result is supported by comparisons of different studies that have investigated (aspects of) either SWB or academic achievement. Theories explaining SWB or students' healthy development (e.g., Bronfenbrenner, 1979; Eccles et al., 1993) have put more focus on the environment than theories explaining academic achievement (for an overview, see Steinmayr et al., 2014). In these theories, a positive environment is one prerequisite for academic achievement among many others. On the basis of these theoretical considerations and the empirical support for them, we expected that school climate would be more strongly associated with SWB than with academic achievement.

Hypothesis 1: School climate will be a stronger predictor of SWB than of academic achievement.

This finding should also hold true when further determinants of SWB and academic achievement are considered. Here, we concentrated on how students' characteristics should be important for both SWB and academic achievement. We are not aware of a study that has investigated the incremental validity of school climate variables beyond individual students' characteristics such as self-efficacy, test anxiety, and interest, when explaining individual differences in the two components of SWB (i.e., affective and cognitive) and academic achievement. However, due to the importance of school climate for students' SWB, we would expect school climate to predict SWB above and beyond other important individual student characteristics such as self-efficacy, interest, and test anxiety. This view is supported by the study by Suldo et al. (2008) who found that school climate predicted global life satisfaction beyond personal academic beliefs and other predictors of SWB. However, we predict that school climate will be less important for academic achievement when simultaneously considered with individual student characteristics that are important for school success. In their opportunity-propensity framework for explaining academic achievement, Byrnes and Miller (2007) included school climate as an opportunity factor, whereas student characteristics such

as motivation were considered as propensity factors. When regressed together on academic achievement, the opportunity factors were frequently demonstrated to be less important for academic achievement than the propensity factors (e.g., Byrnes and Miller, 2007; Lewis and Farkas, 2017). In line with these thoughts is the result that school climate does not predict academic achievement above and beyond other variables, such as self-efficacy (Alivernini and Lucidi, 2011; Wang et al., 2013). On the basis of these findings, we derived the following hypothesis:

Hypothesis 2: School climate will predict SWB above and beyond self-efficacy, interest, and test-anxiety but not academic achievement.

MATERIALS AND METHODS

Sample and Procedure

The sample comprised 775 students from four different schools (two comprehensive schools and two schools of the school type “Gymnasium,” the school type attended by academic track students) in Germany that were contacted by research assistants. Eight students were excluded from the analyses because they either did not answer most parts of the questionnaires or just made patterns with their answers. We further checked for outliers via regression analysis but no exclusion was necessary. Thus, the final sample consisted of 767 students (361 female adolescents). Of those, 390 students attended a comprehensive school and 377 a Gymnasium. At each school, the entire 8th and 9th grades participated (i.e., 33 classes in total). Students were on average 14.07 ($SD = 0.82$) years old, and 152 students reported an immigration background (i.e., they were not born in Germany, did not learn German as a first language, or spoke a language other than German at home). Most students who had an immigration background were associated with Turkey. Students indicated that $n = 293$ fathers and $n = 232$ mothers had a school leaving certificate that qualified them for university. However, $n = 186$ gave no information about the highest school leaving certificate of their fathers, and $n = 174$ gave no information about the highest school leaving certificate of their mothers. Thus, parents’ education was on average higher and immigration background lower than would be the case in a representative student sample, a finding that can be explained by the high percentage of students attending a Gymnasium in the present sample (cf. Steinmayr et al., 2018). We checked for outliers but no exclusion was necessary.

All achievement criteria and all predictors were assessed at the end of 2015 or at the beginning of 2016. Participation in the study was voluntary, and students were allowed to participate only if they provided an informed consent form from one of their parents. More than 95% of all parents agreed that their child was allowed to participate. In addition to parent refusals, another 10% of the overall student population did not participate due to illness, extra-curricular activities, or other reasons unrelated to the testing. Questionnaire administration

took place during a regular class in schools. The measures were administered by trained research assistants and lasted about 95 min.

Measures

School Climate

School climate was measured using the German *Linz Questionnaire of School and Class Climate for grades 8-13* (LFSK, Eder, 1998). The school climate questionnaire consists of 27 items. These items can either be summed into a total score indicating school climate in general or into four subscales (*discipline/control*, *stimulation/activities*, *warmth*, and *performance orientation*) indicating correlated but specific aspects of school climate. Students were asked to indicate on a 5-point Likert rating scale ranging from 1 (*totally disagree*) to 5 (*totally agree*) how the items applied to them. The *discipline/control* scale assesses the extent to which rules are clearly defined at school and the extent to which they are enforced (e.g., “At this school, there are clear rules for how students should behave”; six items). The second scale *stimulation/activities* assesses the extent to which the school provides extracurricular activities for its students (e.g., “There are many opportunities for students to pursue their hobbies at this school”; five items). The third scale *warmth* measures the extent to which students rate their school, especially their teachers, as supportive and caring. It comprises the quality of student-teacher relationships (e.g., “In general, our teachers are supportive,” six items) and the atmosphere at the school (e.g., “Mostly the atmosphere at our school is friendly”; three items). The fourth scale *performance orientation* assesses the level of performance expectations in the school (e.g., “Students are expected to work hard and perform well”; seven items). The internal consistency of all subscales was at least satisfactory with the exception of *discipline/control* (*discipline/control*: $\alpha = 0.62$; *stimulation/activities*: $\alpha = 0.72$; *warmth*: $\alpha = 0.87$; *performance orientation*: $\alpha = 0.76$). The internal consistency of the total school climate score was high ($\alpha = 0.83$).

Self-Efficacy

Self-efficacy was measured with the German translation of the *self-efficacy* subscale taken from the *self-regulation questionnaire* by O’Neil and Herl (1998). This scale was already successfully applied in PISA 2000 in Germany (Kunter et al., 2002, p. 166). It consists of four items that are rated on a 5-point Likert rating scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). An example item is “I am certain I can understand the most difficult material presented in the reading for school.” The internal consistency of the scale was high ($\alpha = 0.80$).

Interest

To assess students’ interest in school in general, we adapted the three German items included in PISA 2000 to measure students’ interest in math (Kunter et al., 2002, p. 166). This means that we replaced “math” with “school” in the wording of the items (e.g., “When I work on my school work, I sometimes get totally absorbed”). Each item was rated on a scale ranging from 1 (*totally*

disagree) to 5 (*totally agree*). Cronbach's alpha was satisfactory ($\alpha = 0.74$).

Test Anxiety

This construct was assessed with a short version (Schwarzer and Jerusalem, 1999) of the *German Test Anxiety Inventory* (TAI-G; Hodapp, 1991, 1995), a revised multidimensional version of *Spielberger's Test Anxiety Inventory* (TAI; Spielberger et al., 1981). The short version consists of the scales *worry*, which assesses how much a person worries in test situations (five items), and *emotionality*, which assesses the physiological and excitement-related components of a test situation (five items). The students were instructed to use a 4-point Likert rating scale ranging from 1 (*almost never*) to 4 (*almost always*) to rate how they typically feel (e.g., "My heart is in my mouth") and what they usually think (e.g., "I ask myself whether my performance will be sufficient") in test situations. The internal consistencies of both scales were good (emotionality: $\alpha = 0.78$; worry: $\alpha = 0.84$).

Academic Achievement

Academic achievement was measured with grade point average (GPA) as indicated by students' self-reports. In Germany, grades are coded so that 1 indicates outstanding achievement and 6 indicates the poorest achievement. Grades were reversed to facilitate interpretation of the results so that higher scores indicated better performance.

Subjective Well-Being (SWB)

Subjective well-being was measured with a short version of the German Habitual SWB Scale (HSWBS; Dalbert, 2003). The original scale consists of a mood-level scale (Dalbert, 1992) (six items) and a satisfaction with life scale (Dalbert et al., 1984) (seven items). The mood level scale assesses the affective (i.e., emotional) component of SWB, whereas the satisfaction with life scale assesses the cognitive component of SWB. Due to the time restrictions that are common in school testing, we used a short version of each scale, which comprised five items for each subscale (mood level scale: e.g., "Mostly I am happy"; life satisfaction: e.g., "I am content with my life").

Statistical Analyses

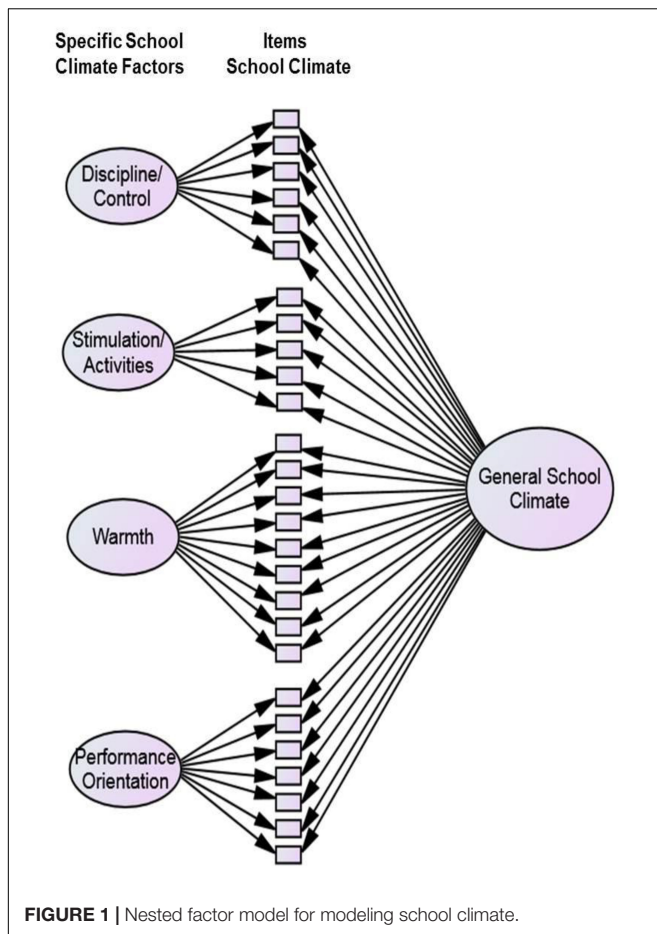
Data were nested in schools but only partly in classes. Students attending a Gymnasium were organized in classes. However, students attending comprehensive school were still organized in classes but main subjects (e.g., English, mathematics, and German) were taught at different achievement levels (basic and advanced) realizing arrangements for differentiated education which involves tailoring the curriculum to different ability groups of students within the same school (Mitter and Shaw, 1991). Thus, comprehensive school students attending the same class attended different courses in each of these subjects. As a consequence, an indicator based on grades in different subjects as the GPA was not nested into classes for the Comprehensive school students. Thus, the class level was not considered in the analysis as not all data were nested in classes. However,

even though all data were nested in schools we did not apply any features of multilevel modeling, as four schools were not enough clusters on the second level (Nezlek, 2011). To account for variance due to different schools, all data were z-standardized within schools before the analyses were run. Data were analyzed with latent Structural Equation Modeling (SEM) computed with Amos 25.0. For the evaluation of overall model fit, three different fit indices were used (see Hu and Bentler, 1999): χ^2 value, Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI). Hu and Bentler (1999) proposed the following cut-off scores for two of these indices: $CFI \geq 0.95$ and $RMSEA \leq 0.05$. According to Browne and Cudeck (1993), $RMSEA \leq 0.05$ indicates a very good model fit and $RMSEA \leq 0.09$ is still an indicator of a reasonable error of approximation. According to Hu and Bentler (1995), it is difficult to provide a recommended range for the CFI because, in some cases, even $CFI < 0.90$ can indicate a reasonable model fit (see also Heene et al., 2011).

There were only small amounts of missing data for individual items (less than 1%) with the exception of self-reported GPA (5%). We compared data for those students who reported GPA versus those students who did not. The two groups did not show statistically significant differences on any of the variables we investigated. Thus, as proposed by several authors, we accounted for missing data by applying full information maximum likelihood (FIML) estimation (Enders and Bandalos, 2001; Newman, 2003).

Research Questions 1a and 1b were tested with SEM in which school climate was specified as a nested factor model (e.g., Gustafsson and Balke, 1993; Brunner et al., 2012). As described above, the items can either be summed into a general score or into four subscales (discipline/control, stimulation/activities, warmth, and performance orientation). The nested factor models allowed us to test the relative importance of both the general and specific factors of school climate in one model. **Figure 1** illustrates how we modeled school climate in the present study. To answer Research Questions 1a and 1b, either SWB or academic achievement was regressed on the general school climate factor as well as on the other four specific school climate factors depicted in **Figure 1**.

To test Hypothesis 1, both SWB and academic achievement were regressed on the general school climate factor and the school climate subscales (see **Figure 2**, constructs depicted by light gray symbols). Then, the paths from school climate to SWB and academic achievement were set equal to each other. A significantly poorer fit of the constrained model with equated path weights compared with the baseline model in which all paths were freely estimated would indicate that criterion validity differs for the dependent variables. The change in model fit was evaluated by calculating the scaled chi-square difference test (Satorra and Bentler, 2001). In the case of a poorer fit of the constrained model, pairwise comparisons were performed to examine which paths differed from each other. Hypothesis 3 was tested in one model in which SWB and academic achievement were simultaneously regressed on school climate, self-efficacy, interest, and test anxiety. This whole model is presented in **Figure 2**.



RESULTS

Descriptive Statistics

The means, standard deviations, and internal consistencies for all measures as well as their intercorrelations are presented in **Table 1**. Most correlations were comparable to those found in the literature beside the following correlations: interest did not correlate with mood and emotionality did not correlate with GPA.

Incremental Validity of Specific School Climate Scales

Research Questions 1a and 1b addressed the incremental validity of specific school climate scales above and beyond the general school climate factor. First, we checked on the model fit of the nested school climate factor model depicted in **Figure 1**. Model fit was very good, $\chi^2(291) = 632.89$, $p < 0.001$; RMSEA = 0.039, 90% CI [0.035, 0.043]; CFI = 0.936. Then we set up two models in which either SWB or academic achievement was regressed on school climate modeled as depicted in **Figure 1** [Model 1: SWB and Model 2: GPA]. SWB was modeled as two correlated factors (i.e., mood and life satisfaction), each indicated by five manifest variables (i.e., items). Academic achievement was modeled as a manifest variable. For both models, the

model fit indices indicated an excellent fit to the data, SWB: $\chi^2(585) = 1037.73$, $p < 0.001$; RMSEA = 0.032, 90% CI [0.029, 0.035]; CFI = 0.945; Academic Achievement: $\chi^2(319) = 766.75$, $p < 0.001$; RMSEA = 0.043, 90% CI [0.039, 0.047]; CFI = 0.917. **Table 2** displays the path coefficients for the general school climate factors as well as for the specific school climate factors in predicting SWB and academic achievement. Only the general school climate factor was a significant predictor of both SWB and GPA. In both models, the specific school climate factors did not contribute to the prediction.

Differential Effects of School Climate

To test Hypothesis 1, we set up a model with three correlated criteria (mood, life satisfaction, and GPA) that were regressed on school climate [Model 3: SWB + GPA; see also **Figure 2**, light gray]. In order to test Hypothesis 2, the paths from general school climate to the two components of SWB and academic achievement were set equal. Then the constrained model was tested against the baseline model in which these paths were freely estimated. Setting the paths from the general school climate factor to the three criteria to equality led to a significant deterioration in model fit ($\Delta\chi^2 = 212.758$, $\Delta df = 2$, $p < 0.001$). A subsequent analysis demonstrated that the path coefficient from general school climate to mood was significantly higher than the ones from general school climate to academic achievement ($\Delta\chi^2 = 6.249$, $\Delta df = 1$, $p = 0.012$) and to life satisfaction ($\Delta\chi^2 = 12.745$, $\Delta df = 1$, $p < 0.001$). The path coefficients from general school climate to life satisfaction and academic achievement were not significantly different ($\Delta\chi^2 = 0.192$, $\Delta df = 1$, $p = 0.661$). Thus, Hypothesis 1 was supported for mood but not for life satisfaction.

Incremental Validity of School Climate and Students' Characteristics

To test Hypothesis 2, we set up a latent SEM in which SWB and academic achievement were regressed on school climate, self-efficacy, interest, and test anxiety (see **Figure 2**, the whole model). The residuals of GPA and both SWB components were correlated, and so were all exogenous factors beside the school climate factors which were only correlated with self-efficacy, interest, and test anxiety but not with themselves (cf. **Figure 1**). Except for GPA, all constructs in the model were latent. The data fit the model very well: $\chi^2(1348) = 2399.64$, $p < 0.001$; RMSEA = 0.032, 90% CI [0.030, 0.034]; CFI = 0.923. Results are displayed in **Table 3**.

In line with Hypothesis 2, school climate predicted both SWB component above and beyond self-efficacy, interest, and test anxiety. Here, general school climate yielded the highest effect of all exogenous variables on both SWB factors. Furthermore, mood was still significantly associated with self-efficacy after all other variables were controlled for. Life satisfaction was additionally significantly associated with worry. When all other variables were controlled for, GPA was only significantly associated with self-efficacy and only marginally with school climate and test

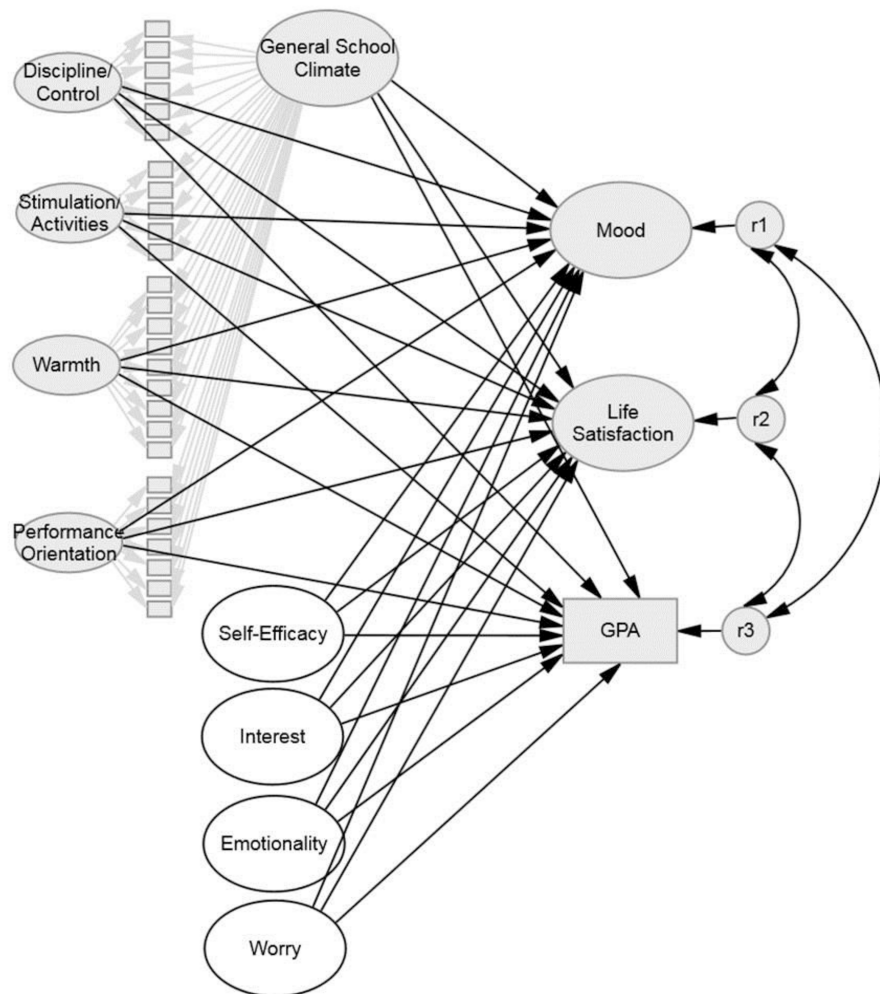


FIGURE 2 | The whole model that was tested. For reasons of clarity, correlations between exogenous factors are not depicted. Results are displayed in **Table 3**. Constructs displayed with a gray background were tested in Model 1: SWB, Model 2: GPA, and Model 3: SWB + GPA. These results are displayed in **Table 2**.

anxiety but none of the other specific school climate variables or interest were.

DISCUSSION

The aim of the present paper was to shed further light on the importance of school-related and individual factors for two important school outcomes (i.e., academic achievement and SWB). To this end, we investigated the bivariate and incremental criterion validity of school climate, academic self-efficacy, interest, and test anxiety in explaining interindividual differences in academic achievement and SWB.

The Construct and Criterion Validity of School Climate

Research Questions 1a and 1b addressed the construct validity of school climate and its association with SWB and academic

achievement. With a nested factor school climate model, we demonstrated that specific school climate factors did not incrementally contribute to explaining variance in SWB or in academic achievement. The general school factor was the only predictor of both criteria. Consequently, even when school climate is assessed with different subscales, future studies should use a global school climate factor rather than different school climate subscales because the subscales are highly correlated (e.g., Salmela-Aro et al., 2008). When using highly correlated predictors, the problem of multicollinearity might occur, and this makes it difficult to interpret the different paths to a criterion or criteria (see Marsh et al., 2004). Furthermore, when modeling specific but correlated factors, one does not know whether the explained variance can be attributed to this specific school factor or to a higher order factor that can explain both the correlations between the specific factors and the correlations with the criterion or criteria (see Brunner et al., 2012). Nested factor models (e.g., Brunner et al., 2012) solve this problem. Thus, we strongly encourage other researchers

TABLE 1 | Means (*M*), standard deviations (*SD*), internal consistencies (α), and intercorrelations among all observed predictors and criteria.

	Descriptives			Intercorrelations											
	<i>M</i>	<i>SD</i>	α	2	3	4	5	6	7	8	9	10	11	12	
(1) GPA	2.40	0.65	–	0.23	0.18	0.12	–0.02	0.09	0.21	> 0.01	0.30	0.08	–0.05	–0.12	
(2) Mood	4.33	0.88	0.74		0.58	0.23	0.00	0.23	0.25	0.07	0.25	0.06	–0.11	–0.16	
(3) Life satisfaction	4.86	0.89	0.83			0.25	0.02	0.21	0.27	0.12	0.24	0.08	–0.12	–0.17	
(4) General school climate	3.24	0.46	0.83				0.54	0.73	0.73	0.69	0.21	0.19	–0.03	–0.02	
(5) Discipline/control	3.26	0.64	0.62					0.23	0.09	0.30	0.00	0.11	0.04	0.11	
(6) Stimulation/activities	2.85	0.81	0.72						0.42	0.36	0.16	0.13	–0.02	–0.07	
(7) Warmth	3.46	0.65	0.87							0.24	0.24	0.11	–0.11	–0.14	
(8) Performance-orientation	3.22	0.64	0.76								0.14	0.19	0.04	0.11	
(9) Self-efficacy	3.35	0.73	0.80									0.40	–0.20	–0.14	
(10) Interest	2.59	0.88	0.74										–0.09	–0.01	
(11) Emotionality	1.94	0.62	0.78											0.55	
(12) Worry	2.72	0.80	0.84											–	

N = 767; The SWB scales (life satisfaction and mood) ranged from 1 to 6, the school climate scales ranged from 1 to 5 (Discipline/Control, Stimulation/Activities, Warmth, Performance Orientation), the self-efficacy scale ranged from 1 to 5, the interest scale ranged from 1 to 5, the test anxiety scales (Emotionality and Worry) ranged from 1 to 4 with 1 indicating lower emotionality/worry. GPA: grades were recoded so that higher values indicate higher academic achievement; $r \geq |0.08|$, $p < 0.05$; $r \geq |0.09|$, $p < 0.01$.

TABLE 2 | Model Fit Indices and unstandardized (*b*) as well as standardized (β) path weights of the SEM in which SWB and academic achievement were regressed on school climate.

Model	χ^2/df	CFI	RMSEA	Predictor	Mood			Life satisfaction			GPA		
					<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β
(1) SWB	1.943	0.932	0.035	SC-general	1.127*	0.192	0.424	0.743*	0.137	0.368			
				SC – d/c	–0.128	0.096	–0.061	–0.057	0.073	–0.036			
				SC – s/a	0.179	0.109	0.08	0.076	0.082	0.044			
				SC – w	0.055	0.045	0.073	0.026	0.034	0.046			
				SC – po	–0.06	0.105	–0.026	0.006	0.079	0.003			
(2) GPA	2.404	0.917	0.043	SC-general							0.683*	0.185	0.19
				SC – d/c							–0.077	0.131	–0.028
				SC – s/a							0.043	0.144	0.015
				SC – w							–0.013	0.06	–0.013
				SC – po							–0.07	0.142	–0.024
(3) SWB + GPA	1.940	0.929	0.035	SC-general	1.127*	0.192	0.424	0.744*	0.137	0.367	0.667*	0.18	0.19
				SC – d/c	–0.128	0.096	–0.061	–0.057	0.073	–0.036	–0.091	0.131	–0.033
				SC – s/a	0.181	0.109	0.081	0.077	0.082	0.045	0.025	0.147	0.009
				SC – w	0.055	0.045	0.073	0.026	0.034	0.046	–0.027	0.06	–0.027
				SC – po	–0.06	0.104	–0.026	0.006	0.079	0.003	–0.072	0.143	–0.024

SC, school climate; d/c, discipline/control; s/a, stimulation/activities; w, warmth and po, performance orientation; GPA, Grade Point Average, grades were recoded so that higher GPA reflects better academic achievement. * $p \leq 0.001$.

to also use nested factor models when investigating school climate.

The bivariate correlations demonstrated that general school climate was associated with GPA and both SWB components. Several theories for explaining SWB refer to the relevance of the environment (e.g., family, peers, school; see Bronfenbrenner, 1979; Baker et al., 2003). However, regarding academic achievement, there is a lot of empirical research demonstrating that individual characteristics such as students' motivation play a particularly important role (Steinmayr et al., 2014). Hence, in Hypothesis 1, we supposed that the school environment (i.e., the school climate) would be a stronger predictor of

different components of SWB than of academic achievement. This hypothesis was only partly confirmed. Our analyses showed that just the path coefficient from general school climate to mood was significantly higher than the coefficients from general school climate to academic achievement and from general school climate to life satisfaction. Even though Hypothesis 1 was only partly corroborated, the results still extend our knowledge on how school climate is associated with SWB and academic achievement. Importantly, this is one of the first studies to demonstrate the relevance of school climate for SWB by considering not only affective but also cognitive SWB components. Previous studies on school climate have focused

TABLE 3 | Model fit indices and path weights of the SEM in which SWB and academic achievement were regressed on school climate, self-efficacy, interest, and test anxiety.

Predictor	Mood			Life satisfaction			GPA		
Path weight	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β
SC-general	0.973**	0.191	0.35	0.588**	0.132	0.277	0.29	0.18	0.079
SC – d/c	–0.052	0.097	–0.024	0.009	0.074	0.005	0.015	0.13	0.005
SC – s/a	0.175	0.104	0.081	0.066	0.078	0.04	–0.001	0.136	< 0.001
SC – w	0.066	0.044	0.087	0.024	0.033	0.041	0.005	0.058	0.005
SC – po	–0.054	0.102	–0.025	0.029	0.077	0.017	–0.15	0.136	–0.052
Self-Efficacy	0.176*	0.068	0.158	0.088	0.051	0.103	0.531**	0.092	0.361
Interest	0.012	0.059	0.013	0.053	0.044	0.072	0.035	0.078	0.028
Emotionality	0.053	0.081	0.045	0.03	0.061	0.033	0.205	0.107	0.131
Worry	–0.139	0.073	–0.123	–0.147*	0.056	–0.171	–0.14	0.097	–0.094

Model Fit: CMIN = 1.780; CFI = 0.923; RMSEA = 0.032 (90%-CI: 0.030–0.034). Model is depicted in **Figure 2**. SC, school climate; d/c, discipline/control; s/a, stimulation/activities; w, warmth, and po, performance orientation; GPA, Grade Point Average, grades were recoded so that higher GPA reflects better academic achievement. Correlations of the residuals: $r_1 \times r_2: r = 0.25$; $r_1 \times r_3: r = 0.06$; $r_2 \times r_3: r = 0.03$. * $p \leq 0.01$ and ** $p \leq 0.001$.

on variables that are strongly related to SWB such as school burnout (e.g., Salmela-Aro et al., 2008) rather than on SWB itself. Hence, our study extends previous findings and demonstrates the relevance of assessing affective as well as cognitive components of SWB because they have differential associations with their various determinants (Diener, 2012), among them school climate (see Aldridge et al., 2016). In this context, our results support the theoretical assumptions about the relevance of the environment for children's and adolescents' well-being (Eccles et al., 1993). In this context, our findings tentatively suggest that positive surroundings including school climate might be more relevant for enhancing happiness and positive feelings (the affective component of SWB) than for enhancing life satisfaction or academic achievement. Regarding life satisfaction, research has demonstrated that personality and other individual variables seem to be especially relevant (see Lucas, 2008), whereas, for example, family variables, as another aspect of the environment, play a more important role in affective variables of well-being (Lucas, 2008). Thus, school climate might indeed be more important for the affective component of well-being than for the cognitive component as our results suggest. In addition, the fact that the path from school climate to life satisfaction was not statistically different from the path from school climate to GPA might also be explained by methodological issues. As reported above, the highest percentage of missing values occurred for GPA. Thus, among all variables, most of the missing values had to be estimated here. Estimating missing values for a variable leads to an increase in the standard error, which makes it harder to find significant associations between two variables or to find differences in path weights. The path from school climate to life satisfaction and the path from school climate to academic achievement may have been significantly different if less data had been missing for GPA. Summing up, the present study demonstrated the importance of general school climate for both components of SWB and academic achievement even though its importance varies between criteria. Given that a central goal of our society is to further enhance children's and adolescents' SWB beside academic achievement,

our study shows a promising approach for reaching this goal by focusing on a positive school climate (see Suldo et al., 2013).

The Incremental Validity of School Climate

Whether school climate explains more variance in SWB and academic achievement than individual characteristics do has been an open question. In the present study, we focused on student characteristics (e.g., self-efficacy, interest, and test anxiety) as important for both SWB and academic achievement (e.g., Pekrun et al., 2017). No previous study has investigated school climate variables as well as important student characteristics simultaneously with regard to different components of SWB and academic achievement. On the basis of Suldo et al. (2008) assumptions, we expected school climate to predict SWB above and beyond self-efficacy, interest, and test-anxiety (Hypothesis 2). In line with this assumption, general school climate was the strongest predictor of both of the SWB components above and beyond self-efficacy, interest, and test anxiety. Mood was still significantly associated with self-efficacy after all other variables were controlled for. Regarding life satisfaction, just self-efficacy showed effects after we controlled for the other student characteristics and school climate as the most relevant factor. These results point to the fact that SWB is a multicausal phenomenon, and no single variable can explain whether a person is happy or satisfied (see Eid and Larsen, 2008).

Furthermore, on the basis of the opportunity-propensity framework by Byrnes and Miller (2007), we hypothesized that individual student characteristics important for school success such as self-efficacy, interest, and test anxiety would predict academic achievement above and beyond school climate (Hypothesis 3). This part of the hypothesis was only partly confirmed: Although self-efficacy and test anxiety components (marginally significantly) explained variance in academic achievement above and beyond school climate, interest did not. Thus, our results especially confirm the

relevance of self-efficacy beliefs for academic achievement in relation to other motivational variables and school climate (Pajares, 2006). The fact that interest did not longer yield an effect on GPA after all other variables were controlled for might partly be attributable to its high correlations with self-efficacy (see also Steinmayr et al., 2018). In case of multicollinearity it might be that the importance of predictors are underestimated as both predictors explain a share of variance in the criterion together (cf. Steinmayr and Spinath, 2009). However, school climate was also correlated with self-efficacy (see also Henry et al., 2011) but, as expected, did not predict academic achievement after all other variables were controlled for (see also Alivernini and Lucidi, 2011; Wang et al., 2013). Thus, it might be that fostering, for example, students' school climate might also have a positive impact on other variables related to academic achievement such as self-efficacy (see Henry et al., 2011 for results pointing in that direction). Given that longitudinal research has shown that school climate is a determinant of academic achievement (see McCoy et al., 2013), when other variables are not controlled for, interventions enhancing a positive climate at school might not only enhance students' SWB but also, indirectly via factors such as self-efficacy, their academic achievement. Longitudinal studies show an impact on school climate factors such as student-teacher relationship on students' self-efficacy (Alivernini and Lucidi, 2011) which further underlines this thought.

Limitations and Directions for Future Research

Although the findings are promising, our study also has several limitations. First, the study was cross-sectional. Thus, no causal conclusions can be drawn from the present study. Nonetheless, the study provides valuable insights into the relations of school climate, self-efficacy, interest, test anxiety, SWB, and academic achievement, constructs that hitherto have not been investigated in concert. Showing significant correlations is the first step in investigating their relations because a correlation is a necessary albeit not a sufficient precondition for demonstrating a causal relationship.

Second, we measured school climate with only one questionnaire. Thus, the specification of school climate as a nested factor model has thus far been shown only for this particular measure. Even though it is a well-established and validated German measure (Eder, 1998), future studies should determine whether a nested factor model also fits the data equally well when other school climate questionnaires are used. This would also open up the opportunity to investigate the importance of other specific school climate factors, for example, student-student relationships for predicting SWB and academic achievement beyond a general school climate factor.

Third, we demonstrated that school climate predicted academic achievement beyond other student characteristics that are relevant for academic achievement. Here, we chose only constructs that had the potential to be related to both SWB and academic achievement. We did not include broader personality

factors such as the Big Five, which are powerful predictors of SWB (e.g., Soto, 2015) because the personality trait that has the strongest association with SWB (i.e., neuroticism) is not related to academic achievement (e.g., Poropat, 2009). Moreover, the only personality trait that was previously found to be associated with grades in the age range comparable to the age range in our sample (i.e., conscientiousness) does not appear to be related to SWB (Gomez et al., 2009). Besides not considering the Big Five, we excluded student characteristics that are important for academic achievement (e.g., intelligence) because such characteristics have not been found to be associated with SWB (for intelligence, see Fischbach et al., 2013). However, future studies that concentrate on either SWB or academic achievement should investigate whether school climate also incrementally contributes to the prediction of academic achievement and SWB when additional student characteristics that were not considered in the present study (e.g., personality traits) are included. Furthermore, we did not consider constructs that are conceptually close to the investigated constructs that are related to both grades and SWB (e.g., self-concept or expectations of success). Given that a recent study demonstrated that expectations of success explained more variance in GPA than self-efficacy did (Steinmayr et al., 2018), it might be the case that results would turn out differently, at least concerning the prediction of GPA, if constructs other than the ones chosen in the present study were considered.

Fourth, we demonstrated the importance of school climate and the other variables for academic achievement operationalized as GPA. However, if other indicators of academic achievement such as standardized achievement tests are considered, the results might change because both student characteristics and school-related factors show differential associations with different indicators of school achievement (Steinmayr et al., 2014).

Last but not least the sample was only recruited from four schools. This had at least two implications. First, data were nested in schools (not for all students in classes as described above) but due to the low amount of schools we could not control for this data structure in the analysis. Even though we controlled for potential school effects by z-standardizing, due to the low number of clusters we did not apply a statistical procedure properly taking into account non-independence of the investigated schools samples, which might have affected standard errors. Thus, future studies should investigate larger cohorts covering more schools to deal with that problem. Furthermore, the sample we investigated was representative for the schools we investigated but the investigated student population was not representative for all students of the age range investigated. Students in the present study were from families with higher educational background and more rarely had a migration background. These background variables are known for influencing academic achievement (for example Steinmayr et al., 2010) whereas studies are inconsistent regarding their relationship to SWB (for an overview, see Crede et al., 2015). Thus it might be that results in a representative sample would differ from those reported here, which should be addressed in future studies.

CONCLUSION

Summing up, this cross-sectional study offers valuable insights into the interplay of school-related and individual characteristics with regard to SWB and academic achievement. SEM revealed that a positive school climate, self-efficacy, and the worry component of test anxiety predicted SWB and/or GPA after other important variables were controlled for. Thus, our findings suggest that it is not enough to concentrate on only environmental aspects (e.g., school climate) or student characteristics when explaining interindividual differences in adolescents' SWB and academic achievement. Instead, both criteria are related to both school-related and individual characteristics and should be taken into account in future studies. The associations revealed in this cross-sectional study further form the basis for future research testing for causal relations among the constructs and developing potential approaches to foster students' healthy academic development and their personal development simultaneously. Our findings thereby speak to the relevance of creating a positive school climate (see Baker et al., 2003; Cohen et al., 2009) for enhancing well-being and, indirectly for example via self-efficacy, educational attainments such as GPA.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the German Research Foundation. The protocol was not approved by an ethic committee as this was not required. However, we followed all guidelines given by the local

ethic committee of the TU Dortmund regarding studies with human-beings, especially children. All parents of subjects gave written informed consent in accordance with the Declaration of Helsinki.

AUTHOR CONTRIBUTIONS

RS had the idea and provided a first draft of the manuscript and finalized the paper. AH wrote the section on individual characteristics predicting academic achievement and gave valuable suggestions for improving the first draft. JM wrote part of the method section and read and commented the first draft. CN set up the study together with RS, went to schools and tested, data management, read and commented the first draft. LW wrote the section on individual characteristics predicting subjective well-being and discussed Hypotheses 3 and 4, gave valuable suggestions for improving the first draft.

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