frontiers in Education

TYPE Review
PUBLISHED 26 October 2026
DOI 10.3389/feduc.2026.1973928

Check for updates

OPEN ACCESS

EDITED BY
Luisa Losada-Puente,
University of A Coruña, Spain

REVIEWED BY
Fatih Bal,
Sakarya University, Türkiye
Feras Ali Al-Habies,
The University of Jordan, Jordan

*CORRESPONDENCE
Marijke Kley
marijke.kley@phbern.ch

RECEIVED 20 August 2026
REVISED 09 October 2026
ACCEPTED 13 October 2026
PUBLISHED 26 October 2026

CITATION
Kley M, Jenni G, Rodriguez B, Hoferichter F and Wettstein A (2026) Adolescents' mental health, well-being, and biopsychological stress in school: a narrative review of school-related correlates and interventions. Front. Educ. 11:1973928. doi: 10.3389/feduc.2026.1973928

COPYRIGHT
© 2026 Kley, Jenni, Rodriguez, Hoferichter and Wettstein. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Adolescents' mental health, well-being, and biopsychological stress in school: a narrative review of school-related correlates and interventions

Marijke Kley[1]*, Gabriel Jenni[1], Belén Rodriguez[1], Frances Hoferichter[2] and Alexander Wettstein[1]

[1]Department of Research and Development, University of Teacher Education Bern, Bern, Switzerland, [2]Department of School Pedagogy, University of Greifswald, Greifswald, Germany

Adolescents' mental health, well-being, and stress have become major concerns in educational research and practice. Schools play a central role in this context, as adolescents spend a substantial part of their daily lives in school and encounter both developmental opportunities and stressors within this setting. This narrative review provides an overview of current evidence on adolescents' mental health, well-being, and biopsychological stress in school. The review is informed by literature searches in peer-reviewed journals, focusing on systematic reviews, meta-analyses, longitudinal studies, and large-scale cross-national studies involving adolescents in school contexts. First, it clarifies these related but distinct constructs, emphasizing that mental health extends beyond the absence of mental illness, well-being captures positive subjective and functional experiences, and biopsychological stress refers to the interplay between psychological stress experiences and physiological stress responses. Second, the review summarizes contextual and individual factors associated with students' positive development. Contextual factors include teacher-student relationships, teacher support, and peer relationships, whereas individual factors include socio-emotional competencies, motivation, achievement goal orientation, engagement, coping, and academic buoyancy. Third, the review discusses school-based interventions targeting mental health, well-being, and stress, including approaches based on social and emotional learning, positive psychology, mindfulness, relaxation, cognitive-behavioral techniques, and physical activity. Overall, the reviewed literature suggests that students' academic development and their health and well-being should be understood as complementary rather than competing goals. At the same time, findings remain heterogeneous, particularly regarding intervention effectiveness and biopsychological stress indicators. Future research should therefore use longitudinal and methodologically rigorous designs, examine biopsychological stress markers more systematically, and consider how supportive school environments and targeted interventions can jointly promote adolescents' positive development.

KEYWORDS
adolescent mental health, biopsychological stress, positive student development, school well-being, school-based interventions

source: https://doi.org/10.57694/8183 | downloaded: 4.11.2026

1 Introduction

Now more than ever, adolescents' mental health, well-being, and stress seem to be topics of increased focus and importance. Youth mental health problems have continually increased since the beginning of the 21st century and are currently the leading cause of disease burden among adolescents globally (Baird et al., 2025). Around 13%–20% of children and adolescents worldwide suffer from mental disorders (Polanczyk et al., 2015; Sacco et al., 2024). The once documented U-shaped pattern in well-being, meaning that well-being decreases during middle age but is relatively high in younger and older years, appears to be changing. Compared to the early 2000s, recent findings suggest that well-being ratings are now lower among adolescents and young adults, while they only increase in later adulthood (VanderWeele et al., 2025). Further, cross-national data from the Health Behavior in School-aged Children (HBSC) study show an increase in school-related stress among adolescents in recent years (Balsiger and Delgrande Jordan, 2025).

In this review, mental health, well-being, and stress are treated as related but distinct constructs. *Mental health* refers not only to the absence of mental illness but also to adolescents' capacity to function, cope, and participate in social and educational life (Keyes, 2005; World Health Organization, 2005). *Well-being* captures broader subjective and psychological evaluations of feeling and functioning well (Diener, 1984; Ryff, 1989; Seligman, 2011), whereas *stress* refers to psychological and physiological responses to perceived demands or threats (Epel et al., 2018; Lazarus and Folkman, 1984). In line with this perspective, we use the term biopsychological stress to emphasize the interplay between psychological stress experiences and physiological stress responses.

Adolescence, often defined as the developmental period between ages 10 and 24 (Sawyer et al., 2018), serves as a transitional phase from childhood to adulthood and is characterized by rapid physical and psychological growth and development. During this time, adolescents face major tasks and changes in their lives, including hormonal and bodily changes due to puberty, an increased focus on forming peer relationships, transitioning from primary to secondary school, and building their own identity. These changes can be exciting but also challenging, and may lead to socio-emotional difficulties in some cases (Rapee et al., 2019). At the same time, during brain maturation, adolescents are more susceptible to stress and to developing psychiatric disorders (Chrousos, 2009; Lupien et al., 2009; Parker et al., 2020; Snyder et al., 2019). Epidemiological studies show that 35% of all mental disorders first appear before the age of 14, and 63% before the age of 25 (Solmi et al., 2022).

Poor mental health and well-being in childhood and adolescence have far-reaching consequences, often affecting developmental transitions and the general life trajectories of young people. As such, mental health problems in adolescents can not only cause significant distress and difficulties with social relationships but can also have a negative long-term impact on their academic and occupational development. It is therefore crucial to invest in the health and well-being of adolescents as early as possible, both from the perspective of the individual's suffering and as a contribution to a healthy society at large (McGorry et al., 2024).

The school setting has a central role in maintaining and promoting mental health and well-being among adolescents, as they spend a significant amount of their time in this environment. However, during the transition from primary to secondary school, new challenges may occur. Throughout this process, adolescents often must adjust to a new school environment, peer relationships become more complex, teacher-student relationships tend to become more distant, and academic pressure increases (Raufelder et al., 2022).

In the recent past, adolescents' mental health, well-being, and stress have received increased attention in educational research and practice. However, within the school setting, all three of these distinct yet strongly related constructs have rarely been examined together, and their relationships with one another are not yet well understood. Moreover, a plethora of frameworks exists that define student mental health, well-being, and biopsychological stress, their interplay, and their correlates in different ways. This calls for further clarification.

This review aims to synthesize current evidence on adolescent students' mental health, well-being, and biopsychological stress in school. First, we define mental health, well-being, and biopsychological stress, and summarize key evidence on these constructs in adolescence. Second, we review contextual and individual correlates of mental health, well-being, and stress in school. Third, we summarize selected school-based interventions designed to promote positive adolescent development.

This article is positioned as a narrative review informed by structured literature searches rather than a systematic review or meta-analysis. The review focuses on peer-reviewed literature and recent systematic reviews, meta-analyses, and large-scale longitudinal or cross-national studies that address adolescents in school contexts. Because the aim is integrative and conceptual, the evidence included is organized thematically rather than through a formal PRISMA-based search and screening procedure. Accordingly, causal claims are treated cautiously, and findings are interpreted with attention to study design, measurement heterogeneity, age range, gender, and cultural context.

2 Mental health, well-being, and biopsychological stress among adolescent students

2.1 Mental health

According to the World Health Organization (WHO), *health* refers to "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 2005). The WHO further defines *mental health* as "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community" (World Health Organization, 2005). Following these definitions, physical, mental, and social aspects of health are closely intertwined, and mental health is also more than the mere absence of mental illness.

Building on this definition, *the two continua model of mental illness and health* proposed by Keyes (2005) suggests that mental

health and mental illness are related yet distinct dimensions. One continuum indicates the presence or absence of mental health, while the other indicates the presence or absence of mental illness. According to this framework, individuals can report low levels of mental illness, but still also low levels of mental health, and vice versa. Mental health, therefore, describes a complete state in which an individual not only is free of psychopathology but is flourishing in a sense of high levels of emotional, psychological, and social well-being. This concept distinction is consistent with the biopsychosocial model first proposed by Engel (1977). Accordingly, while this review focuses on adolescents' mental and psychological health, it also considers the close interrelations with physical health, biological stress regulation, and the social school context.

In recent years, a declining trend in adolescents' mental health has been noted globally. During the COVID-19 pandemic, a marked deterioration in several mental health outcomes of adolescents was noted worldwide, including increased levels of depression and anxiety symptoms, psychological distress, loneliness, and negative affect (Kauhanen et al., 2023; Orban et al., 2024; Panchal et al., 2023; Wolf and Schmitz, 2024). However, this trend has already been apparent before the pandemic. International data from the HBSC study (Cosma et al., 2025) indicates a linear increase in adolescents' psychological complaints from 2010 to 2018, followed by a further substantial increase in psychological and somatic complaints by 2022. The results also show a greater decline in mental health among adolescent girls compared to boys. The pandemic may therefore have acted as a catalyst for already existing trends of declining mental health and well-being among adolescents. This poses a challenge for society, but especially for schools, which play a central role in supporting students' positive development.

2.2 Well-being

Building on this broader mental-health framework, well-being provides a more specific lens for examining adolescents' positive subjective and functional experiences, particularly within school contexts. Although the term well-being is currently defined in various ways, past research has predominantly approached it from two distinct perspectives. *Hedonic well-being* focuses on striving for happiness and positive experiences through the attainment of immediate pleasure and the avoidance of pain or discomfort. On the other hand, *eudaimonic well-being* focuses more on a person's functioning, self-realization, and the unfolding of their own potential in order to attain meaningful goals. Hence, the eudaimonic approach is about thriving for a deeper sense of personal fulfillment and goes beyond the attainment of mere pleasure as proposed by the hedonic approach (Ryan and Deci, 2001).

To date, a plethora of frameworks of general well-being exist, which differ in the number and type of domains of well-being. A fundamental framework of subjective well-being was proposed by Diener (1984), which includes life satisfaction, as one's cognitive evaluation of life in general, as well as the presence of positive and the absence of negative affect. Since then, other authors have placed greater emphasis on elements of positive functioning and flourishing, including autonomy, personal growth, purpose and meaning, engagement, and accomplishment, in their conceptualizations of well-being (Ryff, 1989; Seligman, 2011). A more recent and comprehensive understanding situates well-being within the satisfaction of different classes of basic human needs. In Martela's model (Martela, 2024), well-being is conceptualized through the dimensions of having, loving, doing, and being, referring respectively to physical and material conditions, connection and belonging, purposeful and competent activity, and self-realization or personal growth, alongside subjective feelings and evaluations of life. In this work, we align with the view of well-being as a broad, multidimensional construct, encompassing both hedonic and eudaimonic aspects.

This multidimensional understanding is also reflected in recent large-scale research on *flourishing*. The Global Flourishing Study (VanderWeele et al., 2025) includes longitudinal data on flourishing and well-being among 22 diverse countries from all six populated continents. Although well-being and flourishing are often used interchangeably, the authors of this study suggest that flourishing also includes the well-being of the environment and the community as part of an individual's flourishing. As mentioned above, the study suggests that the adult cohort under 50 (ages 18–49) reports lower levels of flourishing, while these scores tend to increase only in later adulthood. These results contrast with earlier findings on well-being, which followed a more U-shaped pattern (Blanchflower and Oswald, 2008).

In the last two decades, there has been a growing interest in educational research to study well-being specifically in the school context, which has led to the development of various frameworks of school well-being (e.g., Konu and Rimpelä, 2002; Fraillon, 2004; Hascher, 2004; OECD, 2019). School well-being can be understood as a multidimensional construct that captures students' subjective, cognitive, emotional, and social perceptions of school life. It is characterized by frequent positive experiences, such as joy, satisfaction, meaningful engagement in academic and social activities, and a sense of purpose and belonging, while negative experiences, such as worries, over- or underchallenge, social conflicts, stress, or health complaints, occur only infrequently. School well-being is also closely related to students' capacity to cope successfully with challenges and recover from setbacks (Hoferichter, 2025). Cross-national findings on school-related well-being are somewhat inconsistent, but include an increase in psychosomatic complaints, schoolwork pressure (Cosma et al., 2020), and school loneliness (Twenge et al., 2021) as well as a decline in life satisfaction among adolescents (Marquez et al., 2022; Marquez and Long, 2021). Further, other findings suggest that school well-being tends to decline over the course of a student's school years, with younger students in elementary school reporting higher levels of school well-being than older students in secondary school (Herke et al., 2019; Liu et al., 2016). This highlights school well-being as an important area of focus for research, particularly among adolescents.

Fostering school well-being is not only valuable in itself but also drives various positive student outcomes. It is positively associated with academic achievement (Kaya and Erdem, 2021) and a favorable academic self-concept (Torppa et al., 2024; Wu

et al. 2021). Furthermore, school well-being links to positive behavioral conduct and adaptability to uncertain situations (Putwain et al., 2020), while enhancing student motivation (Grassinger et al., 2024) and engagement (Datu and King, 2018; Schnell et al., 2025). Conversely, low well-being can trigger test anxiety (Steinmayr et al., 2016; Yatkin et al., 2023) and school alienation (Morinaj and Hascher, 2019). Consequently, promoting school well-being acts synergistically with, rather than competing against, traditional educational goals.

2.3 Biopsychological stress

Stress is closely related to mental and physical health and well-being, but it is a distinct construct (Epel et al., 2018). According to the transactional model, *stress* is the result of a cognitive process in which an individual assesses a situation or an event as stressful (Lazarus and Folkman, 1984). From an evolutionary perspective, stress is an adaptive response to a threat. However, an important distinction between acute and chronic stress has to be made, which will be explained in more detail below.

The acute stress response includes processes of the autonomic, neuroendocrine, metabolic, and immune systems (Chrousos, 2009). There are two predominant physiological stress responses, acting on different temporal scales. The faster response of the autonomic nervous system leads to parasympathetic and sympathetic reactions within milliseconds to minutes through the *sympathetic adrenomedullary (SAM) axis*, releasing noradrenaline and adrenaline. This is followed by a response of the *hypothalamic-pituitary-adrenal (HPA) axis*, acting within minutes to hours by releasing the stress hormone cortisol. The SAM and the HPA axis trigger mechanisms necessary to mobilize energy to immediately cope with a stressor and are therefore beneficial, particularly in the short term (Sapolsky et al., 2000). This temporally tailored and responsive stress system is essential for individuals to perform adequately in tasks, create positive social interactions, and for their overall well-being (Chrousos, 2009).

However, chronic stress comes with psychological and physiological costs and can manifest in psychological strain and allostatic overload. *Allostatic overload* refers to a physiological state that is no longer adaptive and does not effectively respond to stress (McEwen, 2007), indicated by biomarkers such as high cortisol, body mass index, and blood pressure (Juster et al., 2010). Therefore, severe or long-lasting stress can cause a diverse range of diseases, including neuropsychiatric (e.g., anxiety, depression, cognitive dysfunction), cardiovascular (e.g., hypertension), metabolic (e.g., obesity, diabetes), and sleep disorders (Chrousos, 2009).

The physiological stress response has also been investigated in adolescents, mainly by measuring levels of salivary alpha-amylase and heart-rate variability, reflecting the parasympathetic and sympathetic response of the autonomic nervous system, as well as increased cortisol levels, reflecting the response of the HPA axis. The stress response in infants and children is typically dominated by the faster stress response of the autonomic nervous system described above. With increasing age and biological changes, adolescents become more sensitive to environmental, especially psychosocial challenges, and the stress response starts to follow a more hierarchical coordination of the different reactions, including the slower stress response of the HPA axis (Glier et al., 2022).

Adolescence is a phase of increased vulnerability to stressors, which can lead to chronic stress and can have far-reaching consequences for their health and well-being. Brain development continues throughout adolescence, making adolescents particularly vulnerable to the effects of stress (Chrousos, 2009; Lupien et al., 2009). Periods of heightened stress are associated with emotional and behavioral problems (Eppelmann et al., 2016) and common psychopathology in adolescents (Snyder et al., 2019), therefore often preceding the development of mental disorders. There is also emerging evidence that adolescence is a phase of increased vulnerability to suicide, partly because it is marked by a recalibration of biological responses to acute stress (Miller and Prinstein, 2019).

The school context represents a particularly relevant setting in which stress may arise, accumulate, and affect adolescents' mental health and well-being. School is accompanied by multiple stressors for adolescents, such as the pressure to perform academically or interpersonal conflicts (Hellström et al., 2024). School-related stress and school burnout are risk factors, jeopardizing adolescent students' physical and mental health (Pascoe et al., 2020). Recent evidence also indicates that school-related stress is a key contributing factor to the widening gender health gap in adolescence, as it is associated with a greater increase in psychosomatic symptoms among girls compared to boys (Högberg et al., 2020). Furthermore, chronic stress among adolescent students may lead to *school burnout*, a severe form of school-related stress characterized by school exhaustion and a sense of inadequacy and cynicism towards school (Hoferichter et al., 2022b; Salmela-Aro et al., 2009). Stress and school burnout are also negatively associated with a range of behavioral outcomes in school, such as school engagement (Salmela-Aro and Upadyaya, 2014; Teuber et al., 2020), educational aspirations (Vasalampi et al., 2009), and academic achievement (Fiorilli et al., 2017; Liu and Lu, 2011). Stress among adolescent students is also linked to dissocial behaviors (Lüdeke and Linderkamp, 2021) and often precedes school dropout (Dupéré et al., 2018). To explain these compounding vulnerabilities within the school ecosystem, the comprehensive ATLAS model (Wettstein et al., 2026) posits that classroom interactions operate as a highly transactional space. It conceptualizes how teacher and student psychobiological stress systems recursively shape each other, suggesting that acute and chronic student distress cannot be viewed in isolation from the shared classroom environment.

3 Contextual and individual factors of adolescents' mental health, well-being, and biopsychological stress in school

Mental health, well-being, and stress among adolescent students are not isolated but interconnected themes with a range of associated factors. Understanding these factors outlined below is important, as they offer possibilities for educational practice to foster a positive development of adolescents in school contexts. Broadly, they can be categorized into contextual and

individual factors. Key *contextual factors* include students' relationships with teachers and their peers, while *individual factors* encompass a range of cognitive, emotional, or behavioral characteristics of adolescents themselves. An overview of these contextual and individual factors is provided in Figure 1. It should be noted that this overview is not exhaustive and may not include all potentially relevant factors. Notably, the evidence summarized in this section is predominantly correlational and partly longitudinal; thus, causal conclusions cannot be drawn, and some associations may be bidirectional. Moreover, only few studies examined physiological stress indicators.

3.1 Contextual factors

Contextual factors refer to features of the school environment that may influence adolescent students' mental health, well-being, and biopsychological stress. These factors include interpersonal relationships, perceived support, classroom climate, and broader school experiences that can either buffer or intensify students' exposure to stress. The following section focuses on teachers and peers as two central sources of contextual influence in school, given their relevance for students' sense of belonging, emotional support, academic demands, and social stress.

3.1.1 Teachers: relationships and support

Adolescents spend a large amount of time in school, where they interact with teachers. The relationships between teachers and students, the type and amount of support students receive from teachers, and teachers' instructional approaches are all aspects that shape students' academic and psychological development. These factors will be detailed in the following.

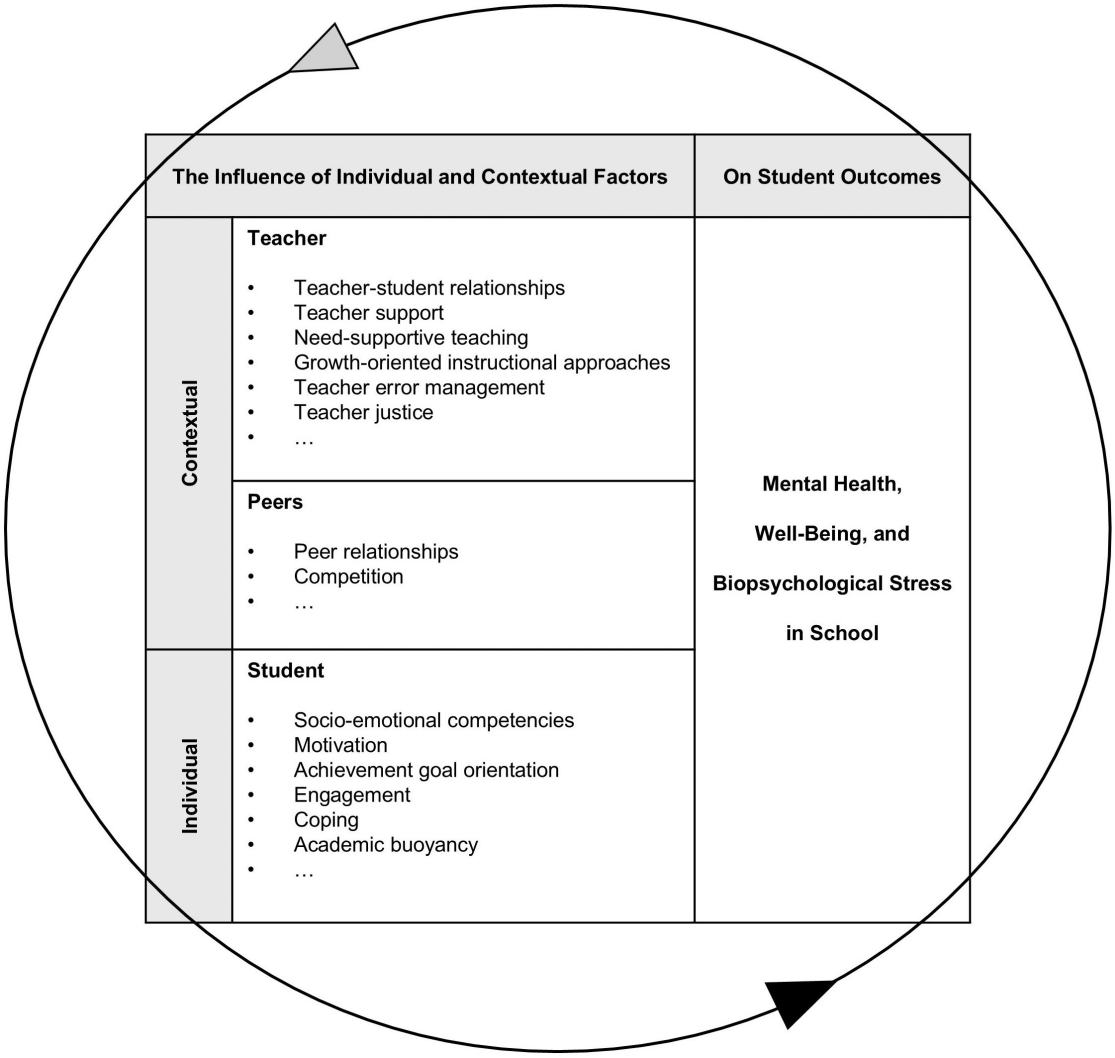


FIGURE 1
Contextual and individual factors of adolescents' mental health, well-being, and biopsychological stress in school. This figure provides a conceptual overview of contextual and individual factors associated with adolescents' mental health, well-being, and biopsychological stress in school. The black arrow represents the influence of contextual and individual factors on these three student outcomes, which are the focus of this review. The gray arrow indicates that these outcomes may in turn affect contextual and individual factors, reflecting potentially reciprocal relationships. The ellipses (…) indicate that the listed factors are not exhaustive.

Teacher-student relationships can take different forms that depend on the context. Some situations are more formal, such as in the classroom, while others are more informal, such as during breaks or excursions. In both settings, the deliberate and adaptive shaping of these interactions by the teacher is crucial for maintaining relational quality (Scherzinger and Wettstein, 2022). The quality of teacher-student relationships is often assessed by levels of closeness, conflict, and dependency (Sabol and Pianta, 2012). Furthermore, positive teacher-student relationships are characterized by high agency and communion. Teacher behavior in such relationships is less confrontational, dissatisfied and uncertain, and more directing, helpful, and understanding (Wubbels, 2017). Through their relationships with their students, teachers can create an environment characterized by warmth and community, enhancing students' sense of belonging (Nix et al., 2022). High-quality teacher-student relationships are further associated with a range of positive student outcomes, such as autonomy, perceived control, self-esteem, and self-regulation skills. In contrast, negative relationships with teachers are linked to emotional distress or depression in students (Wentzel, 2022).

Adolescence is marked by the transition to secondary school, during which students often experience more distant relationships with their teachers, as the number of teachers and academic pressure increases. However, research indicates that teacher-student relationships continue to play a significant role for adolescent students. As such, teacher-student relationships marked by a positive nature and more connectedness are associated with fewer depressive symptoms, reduced anxiety, higher self-esteem, and overall well-being among adolescent students (Demol et al., 2025; García-Moya et al., 2015; Salter et al., 2025). Further, positive and caring teacher-student relationships help adolescents to deal with stress (Grasaas et al., 2024; Mills-Webb and Hennessey, 2025). On the other hand, conflict in teacher-student relationships is linked to adolescents experiencing more physical complaints and social problems (Saxer et al., 2025).

Alongside positive teacher-student relationships in general, *teacher support* is also an important factor. Teachers may provide support in different ways, such as offering instructional or socio-emotional support, giving strength-based feedback, or providing students with praise, recognition, and appreciation. Teacher support is associated with a diverse range of positive outcomes for adolescent students, such as reducing their negative emotions, increasing their self-worth, strengthening their resources and resilience when dealing with stress, as well as lower rates of school exhaustion and burnout (Guo et al., 2020; Hoferichter et al., 2021b; Hoferichter et al., 2022a; Hoferichter et al., 2024; Hoferichter and Raufelder, 2022).

One beneficial instructional approach teachers can take is called *need-supportive teaching*. The idea of need-supportive teaching is grounded in the Self-Determination Theory (Ryan and Deci, 2017). It claims that teachers can support students' basic psychological needs for autonomy, competence, and relatedness in their instructional approach. This is achieved by listening to and acknowledging students' own views, perspectives, and suggestions (autonomy), by enhancing students' confidence in their abilities to succeed in tasks (competence), and by making students feel understood and valued (relatedness). Numerous studies have shown positive associations between need-supportive teaching and school well-being (Howard et al., 2024). These findings were also confirmed across diverse cultural, economic, and political contexts (King et al., 2024). Specifically, autonomy support from teachers is positively associated with well-being as well as negatively with academic stress (Kristensen and Jeno, 2024), and may lead to a reduction in depression and anxiety among students throughout secondary school years (Yu et al., 2016).

There is also evidence that teachers' *growth-oriented instructional approaches* are associated with a positive development in adolescent students. In contrast to a fixed mindset, a growth mindset is characterized by viewing intelligence as malleable and focuses on the progress students can make over time. A growth mindset also manifests in teachers' sensitivity to students' individual academic needs, founded on the belief that every student can achieve academic success, given the appropriate amount of time and effort (Bardach et al., 2024). Such a growth mindset in teachers, as reported by their students, is associated with growth-oriented instructional approaches, and these, in turn, are associated with better well-being among secondary school students (Wang et al., 2024). The growth mindset in teachers may also be closely linked to the growth mindset that students hold for themselves, because teachers are important socializers for their students, and they convey important messages to their students through their teaching practices. By adopting a growth-oriented instructional approach, teachers can therefore strengthen students' own beliefs that they can make progress in their academic abilities over time (Yu et al., 2022).

Lastly, teacher error management and teacher justice are also important factors. *Teacher error management* is characterized by teachers' adaptive and supportive responses and constructive feedback to errors, leading to the perception of errors as part of the learning process (Tulis, 2013). Affirmative responses to errors may increase adolescent students' motivation and resilience, whereas more critical reactions can lead to anxiety and physical complaints (Dogaru et al., 2025). *Teacher justice* refers to students' perception of being treated fairly by their teacher (Resh and Sabbagh, 2014). Studies indicate that perceived teacher unfairness in adolescence is linked to lower satisfaction with school, a diminished sense of safety in school, and is associated with more psychological and somatic problems (Gini et al., 2018), and even has long-lasting negative effects on mental and physical health into young adulthood (Chen et al., 2025). As argued by Hascher and Mori (2024), good teacher error management and high teacher justice might be especially important during secondary school, when academic demands and competitiveness through selection into ability groups increase. Their findings showed that perceived error management led to more well-being and perceived teacher justice reduced social problems among students in secondary school.

3.1.2 Peers: relationships and competition

Peer relationships are also closely linked to adolescent students' health, well-being, and stress. In adolescence, peer relationships and themes of peer acceptance or rejection become

increasingly important. Adolescents also rely more and more on peers as their primary source for social support (Rapee et al., 2019). Research findings consistently show that peer support in adolescence acts as a protective factor against several mental health problems, such as stress, anxiety, depression, and suicide, and is positively linked to mental well-being, optimism, and self-esteem (Roach, 2018).

Like relationships with teachers, positive peer relationships can ensure a secure and emotionally warm climate, facilitating learning and positive outcomes for adolescent students in the school context. Peer friendships, however, differ from teacher-student relationships in that they are characterized less by power and asymmetry, but more by symmetrical reciprocity and a voluntary nature. Therefore, peer friendships are often characterized by fellowship and more intimate exchange (Wentzel, 2022). Positive and supportive peer relationships in school not only increase adolescents' well-being and self-esteem, but also lead to more positive feelings such as joy and enjoyment associated with school, as well as higher overall satisfaction with school and better school adjustment (Hoferichter et al., 2021b; Sarkova et al., 2014; Tian et al., 2016; Tomás et al., 2020). In contrast, negative peer relationships in school, such as a low sense of school belonging, social exclusion, or bullying, in the context of both aggression and victimization, can have a detrimental effect on adolescents' well-being, highlighting the importance of anti-bullying strategies in school (Alcantara et al., 2017; Arslan and Allen, 2021).

The quality and nature of peer relationships are also important for adolescents' well-being when facing transitions from primary to secondary school. Supportive relationships with school friends before the transition may act as a resource to deal with transition-related challenges and adapt to the new school environment (Kiuru et al., 2020). The transition from primary to secondary school may also lead to an increase in *competition* regarding academic achievement. However, findings concerning the consequences of a competitive classroom and school environment for adolescent students are not yet fully clear. Several studies suggest that competition in school may have negative consequences for adolescents, as it may be associated with higher levels of stress, anxiety, and burnout (Becker and Börnert-Ringleb, 2025; Fülöp et al., 2025; Hoferichter and Raufelder, 2017). At the same time, students may differ in how they perceive and respond to competition, and some students might benefit from or even strive for competitive learning environments (Fülöp et al., 2025).

Taken together, teachers and peers foster adolescents' well-being mainly through support and belonging but can also become sources of stress, for instance through conflict, unfairness, exclusion, or bullying. Whereas the protective role of supportive relationships is consistently supported, the consequences of competition remain unclear and seem to depend on students' individual perceptions.

3.2 Individual factors

Individual factors refer to adolescent students' competencies, motivational orientations, engagement patterns, and self-regulatory resources that may shape how they experience and respond to school-related demands. The following section therefore reviews socio-emotional competencies, motivational factors including achievement goal orientations, school engagement, and adaptive resources such as coping and academic buoyancy.

3.2.1 Socio-emotional competencies

Alongside teacher and peer support, students' own *socio-emotional competencies* may influence their ability to form positive relationships at school. Social and emotional competencies encompass *self-awareness* of one's own thoughts, feelings, strengths and limitations; *self-management* including coping and emotion regulation skills; *social awareness* of other people and social norms; *relationship skills* as in the ability to form healthy relationships; and responsible decision making about one's own behavior (Weissberg et al., 2015). Further, adolescents' *interpersonal curiosity* also is positively associated with their socio-emotional skills (Han et al., 2025).

Social and emotional competencies are important for positive development, because they enable adolescents to build meaningful connections and friendships, and to be respected, included, and supported by others. Findings indicate that adolescents with higher socio-emotional competencies generally report a stronger sense of *school belonging*, which can be described as students' feelings and experiences of being connected to the school's social system (Allen et al., 2017, 2018). Moreover, they also report less stressful experiences at school, lower school anxiety, as well as higher life satisfaction, psychological adjustment, and overall well-being (Ayllón-Salas and Fernández-Martín, 2024; de la Barrera et al., 2019; Huttunen et al., 2025; Schoeps et al., 2019). However, different social aspects may have a more pronounced link to well-being, depending on the developmental phase. Results from a study by Shah et al. (2024) showed that, when differentiating between early and late adolescence, social acceptance in early adolescence and close friendships in late adolescence best predicted well-being in young adulthood.

Further, *perceived socio-emotional competence* can also be associated with more positive interactions, arguably even more than actual competence, because it leads students to take actions rooted in their belief that they are capable (Collie et al., 2024). Perceived socio-emotional competence among adolescents is associated with higher well-being and less psychological distress (Collie et al., 2024; Zhou et al., 2025). This may be explained by the fact that adolescents with higher perceived socio-emotional competence experience more positive peer and teacher-student relationships (Zhou et al., 2025).

3.2.2 Motivation

Motivation in school is closely linked to adolescents' mental health, well-being, and stress. However, depending on the type of motivation, the effects can vary. Compared to *extrinsic motivation*, which is connected to the need for external consequences such as goal achievement or a reward, *intrinsic motivation*, as in motivation out of mere interest or the sake of enjoyment, may be particularly beneficial for secondary students' well-being (Grassinger et al., 2024). The study by Grassinger et al. (2024) also showed that intrinsic motivation

and well-being in school both have a positive impact on each other during the school year. As shown by Raufelder et al. (2018), intrinsic motivation and learning goal orientation are further negatively linked to stress, while extrinsic motivation and avoidance achievement goal orientation are positively linked to stress among secondary students. However, a study by Parhiala et al. (2018) found that a high level of motivation is not automatically associated with well-being, as some students with high motivation still experience school burnout, internalizing and externalizing problems, or low self-esteem. This suggests that adolescent students' motivation and its link to health and well-being needs to be examined more closely in the future.

3.2.3 Achievement goal orientation

There has also been a focus on studying students' *achievement goal orientation* and its link to health, well-being, and stress. Whereas motivation describes students' general reasons, values, and expectations for engaging in schoolwork, achievement goal orientation represents how individuals cognitively relate to goals or desired outcomes (Scherrer et al., 2020). Students differ in their achievement goal orientation and consequently in their goal-directed behavior. Students holding *mastery goals* focus on developing their skills and competencies over time. Students holding *performance-approach goals* concentrate on demonstrating their competence, whereas *performance-avoidance goals* are oriented toward wanting to avoid being seen as incompetent (Chazan et al., 2022; Scherrer et al., 2020). Some findings suggest that it might be beneficial for adolescents to adopt mastery goals, because they are associated with fewer psychosomatic health problems and with higher psychological well-being compared to performance goals (Bergh and Giota, 2022; Mastrotheodoros et al., 2017). Furthermore, a longitudinal study by Madjar et al. (2021) found that, over a 6-year period, adolescent students' decrease in mastery goals was predicted by an increase in depression symptoms, while an increase in performance-approach and -avoidance goals was predicted by an increase in anxiety symptoms. However, other evidence indicates that adopting performance-approach goals is also associated with higher well-being, whereas performance-avoidance goals are negatively linked to well-being among adolescent students (Hoferichter and Schlesier, 2025; Tian et al., 2017). This may be explained through the fact that students with mastery or performance-approach goals tend to make more upward social comparisons, whereas students with performance-avoidance goals make fewer upward but more downward social comparisons, which seems to affect their well-being negatively (Tian et al., 2017). Further, by focusing on negative rather than positive outcomes, students with performance-avoidance goal orientation may experience increased stress, pressure to perform, and anxiety, as they fear negative feedback and associate learning with fewer positive connotations (Hoferichter and Schlesier, 2025).

3.2.4 Engagement

School engagement reflects the behavioral, emotional, and cognitive involvement through which motivational processes become visible in everyday school life (Fredricks et al., 2004). *Behavioral engagement* is characterized by involvement in academic and nonacademic activities. It includes behaviors such as effort, persevering in tasks, concentration, attentiveness, asking questions, and contributing to discussions, as well as behaviors concerning positive conduct, such as following rules and school norms. *Emotional engagement* describes students' emotional reactions that are associated with school, such as feelings of being interested, bored, happy, sad, or anxious. *Cognitive engagement* refers to students' cognitive investments or efforts in order to understand difficult concepts or master skills. School engagement is considered to be inversely related to school burnout. Students who feel burned out by school generally report lower levels of cognitive, emotional, and behavioral school engagement (Hoferichter et al., 2022b). However, adolescent students differ in their school engagement and school burnout profiles, depending on their levels of experienced engagement and burnout in school. The profiles reveal that some students experience both high levels of school engagement and burnout simultaneously and that an important distinction between beneficial and harmful engagement must be made. Exhaustive engagement may be related to high performance in the short-term, but can lead to harmful experiences of burnout in the long-term (Salmela-Aro, 2017; Salmela-Aro and Upadyaya, 2020; Virtanen et al., 2018). Nevertheless, findings consistently show that higher levels of school engagement among adolescent students are associated with better mental health (Clark et al., 2025; Rankine et al., 2026) and well-being (Clark et al., 2025; Datu and King, 2018). Therefore, providing students with opportunities to be more involved in activities and tasks in school may lead to higher levels of their mental health and well-being, which in turn may again enhance their school engagement. At the same time, students need adaptive resources to cope with academic demands, setbacks, and pressure, particularly when school engagement is accompanied by high performance expectations.

3.2.5 Coping

When dealing with school-related problems, adolescents also exhibit different *coping behaviors*. Specific coping strategies may not be inherently positive or negative across every situation. However, adolescent coping strategies are commonly categorized into productive and non-productive coping (Frydenberg, 2008). *Productive coping strategies* refer to adaptive behaviors that directly address the problem, such as finding solutions, working hard, or seeking social support. *Non-productive coping strategies* are more dysfunctional, in that they include behaviors such as withdrawal, worrying, rumination, or wishful thinking. Findings show that productive coping strategies are positively and non-productive coping strategies are negatively associated with adolescent students' well-being (Evans et al., 2018; Zammuner, 2019). In another study by Perez et al. (2023), adolescents using productive coping strategies even exhibited a less intense physiological stress response when faced with a stressful task, which was measured by adolescents' cortisol levels. Also, over a period of three months, these adolescent students showed a faster cortisol recovery after experiencing daily school hassles. Adolescents' personalities may facilitate the use of certain coping strategies. For example, extraversion and

conscientiousness are associated with productive coping, whereas neuroticism is linked to non-productive coping (Evans et al., 2018). However, irrespective of personality, the authors also emphasize that individuals can learn to use effective coping strategies, highlighting the need for learning opportunities and interventions to promote positive student development.

3.2.6 Academic buoyancy

Building on this broader perspective on coping, *academic buoyancy* represents a more school-specific adaptive resource related to students' health and well-being. Rooted in resilience research and originally introduced by Martin and Marsh (2008), academic buoyancy refers to students' capacity to deal with everyday academic challenges and setbacks. Conceptually, it differs from resilience, which describes a person's capability to handle major challenges and adversities in life. Academic buoyancy is situated in students' academic lives and concerns typical rather than extreme experiences. According to this understanding, academically buoyant students are expected to be better equipped to cope with challenges and setbacks in daily school life. Indeed, Wang et al. (2025) found that adolescent students with higher academic buoyancy perceive fewer daily academic hassles, experience higher levels of flourishing and fewer physical and mental health problems. Other findings suggest that students with high levels of academic buoyancy generally report higher school satisfaction, view school in a more positive light, and experience less school-related stress and school burnout (Hoferichter et al., 2021a; Lakkavaara et al., 2024). Lastly, academic buoyancy may help adolescents to experience less test anxiety and better cope with examination pressure (Putwain et al., 2023, 2024).

Comparing these individual factors reveals a common pattern: it is less the overall level of a characteristic than its quality that matters. Intrinsic motivation, mastery goals, beneficial forms of engagement, and productive coping are associated with better mental health and well-being, whereas extrinsic motivation, performance-avoidance goals, exhaustive engagement, and non-productive coping are linked to higher stress or burnout. Findings on performance-approach goals, however, remain mixed. Several longitudinal findings further suggest reciprocal relationships, as mental health and well-being may not only result from but also shape students' motivation and goal orientation (Grassinger et al., 2024; Madjar et al., 2021). Finally, individual and contextual factors are closely intertwined: for instance, perceived socio-emotional competence is linked to more positive relationships with peers and teachers (Zhou et al., 2025), and teachers' growth mindset may shape students' own beliefs about their abilities (Yu et al., 2022).

4 Interventions for adolescents in school

As described above, adolescent students' mental health, well-being, and biopsychological stress are associated with a range of school-related contextual and individual factors. These factors can be targeted to promote positive student development. Mental health problems among adolescents are recognized as a growing public health concern and have led to a rise in mental health and well-being interventions applied in the school context (Cilar et al., 2020). Different school-based interventions focus on the improvement of specific domains. These domains include, but are not limited to, general mental and emotional well-being or quality of life, social and emotional skills, positive school climate, prevention of bullying, mindfulness, problem-solving skills, stress reduction, and physical activity (Allen et al., 2022; Cilar et al., 2020; Hale et al., 2021; Juhász et al., 2024; Tejada-Gallardo et al., 2020; van Loon et al., 2022). In general, two types of school-based interventions can be distinguished (Cilar et al., 2020). While *universal interventions* aim at the general population of adolescents, *targeted interventions* are directed towards adolescents with a heightened risk for developing mental health problems. In the following, several relevant systematic reviews and meta-analyses on school-based interventions are described in more detail; an overview of their characteristics and main findings is provided in Table 1.

A systematic review (Cilar et al., 2020) examined the effectiveness of studies on different school-based interventions aimed at adolescents' *mental health and well-being*. Out of the 57 included interventions, more than half were considered effective in positively influencing adolescents' mental health and well-being. Effective interventions included a range of different approaches. The most common effective interventions used mindfulness (e.g., Kuyken et al., 2013; Devcich et al., 2017; Kang et al., 2018) and positive psychology (e.g., Shoshani and Steinmetz, 2014; Burckhardt et al., 2016; Carter et al., 2018; Roth et al., 2017) approaches. There were, however, also a diverse range of other effective approaches, including internet-based interventions (e.g., van Vliet and Andrews, 2009; Bannink et al., 2014; Huen et al., 2016), acceptance and commitment therapy (e.g., Tracey et al., 2018), cognitive behavior therapy (e.g., Weeks et al., 2017), physical activity (e.g., Bonhauser et al., 2005), relaxation (e.g., Foret et al., 2012), music therapy (e.g., Gold et al., 2017), drama group therapy (e.g., McArdle et al., 2011), and bullying prevention (e.g., Kärnä et al., 2011). This highlights the diversity of approaches that can be used to improve adolescents' well-being. However, a considerable number of interventions also had an unclear or even a negative impact, emphasizing the importance of assessing the effectiveness of interventions before their implementation in educational practice (Cilar et al., 2020).

Another systematic review (Allen et al., 2022) focused on interventions aimed at increasing the sense of *school belonging* among adolescents. The authors identified a total of 22 studies, out of which 14 provided evidence that the school-based interventions were effective in improving adolescents' school belonging. Effective interventions differed in their general features in that they were delivered either in person (e.g., Midgett and Doumas, 2019) or online (e.g., Acosta et al., 2019), involving group (e.g., Kuperminc et al., 2020) or individual sessions (e.g., Ferrer-Cascales et al., 2019), and taking different approaches, such as taking a whole school approach (e.g., Shoshani et al., 2016), being curriculum-based (e.g., McLoughlin, 2009), provided by teachers (e.g., Lewis et al., 2006), or involving mentoring (e.g., Holt et al., 2008). The duration of the intervention also differed greatly, ranging from a few days (e.g., Mann et al., 2015) to several years (e.g., Cross

TABLE 1 Overview of systematic reviews and meta-analyses on school-based interventions for adolescents.

Review	Design; included studies	Main intervention components	Outcomes	Key findings	Moderators and limitations
Cilar et al. (2020) General mental health and well-being	SR, thematic synthesis; 57 quantitative, qualitative, and mixed-methods studies (ages 10–19)	Mindfulness, positive psychology, internet-based, ACT, CBT, physical activity, relaxation, music/drama therapy, bullying prevention, gardening	Various mental health and well-being indicators	32 of 57 with positive effects; no pooled effect size	Not analyzed. Restricted to universal interventions; heterogeneity of intervention components precluded meta-analysis; only 4 of 57 studies rated high quality.
Allen et al. (2022) School belonging	SR, narrative; 22 controlled trials (14 RCTs, 8 non-randomized; mean ages 12–18)	Peer/school support, social skills, self-efficacy, problem-solving, emotion regulation, mindfulness, resilience; whole-school, curriculum-based, teacher-delivered, mentoring	School belonging; secondary: mental health, prosocial skills, risk behavior	14 of 22 with positive effects; no pooled effect size (d = 0.13–0.85 in 13 studies)	No intervention characteristic related to effectiveness. Evidence rated by the authors as generally strong, but small number of studies; inconsistent definitions of school belonging.
Tejada-Gallardo et al. (2020) Multicomponent positive psychology	SR + MA; 9 controlled trials (7 RCTs, 2 non-randomized; *N* = 4,898; ages 10–18)	Positive psychology only (7); combined with PYD (1) or ACT (1)	SWB, PWB, depression, anxiety (stress not analyzable)	g = 0.24 (SWB), 0.25 (PWB), 0.28 (depression); n.s. for anxiety; at follow-up, effects maintained for PWB and depression, diminished for SWB	Larger effects in non-randomized trials, combined interventions, placebo-controlled studies, and studies without follow-up (subgroups of 1–2 studies). Small number of studies; 3 of 9 studies at high risk of bias.
Juhász et al. (2024) Stress management, coping/resilience	MA; 55 RCTs only (grades 1–12; mostly adolescents)	SEL, psychoeducation, relaxation, mindfulness, CBT, yoga, exercise, counseling	Stress, coping/resilience	Without outliers: g = −0.15 (stress), 0.14 (coping/resilience); with outliers: g = −0.26 and 0.30	Coping: larger effects in older (vs. younger) adolescents and with CBT components, marginally in targeted (vs. universal) samples; stress: larger effects when delivered by professionals or researchers (vs. teachers). Very high heterogeneity; results sensitive to outliers; publication bias for coping/resilience.
van Loon et al. (2022) Physiological stress	Multilevel MA + qualitative review; 30 RCTs and non-randomized controlled studies (cortisol: k = 9; BP: k = 16; HR/HRV: k = 20; *N* = 4,460; ages 10–18)	CBT, relaxation, mindfulness/meditation	Cortisol, BP, HR/HRV	d = 0.17 (BP); n.s. for HR/HRV; no pooled effect size for cortisol (inconsistent results)	Larger effects with mindfulness/meditation components, without CBT components, and with higher intensity; for BP, also with relaxation components and only in (cluster) RCTs. Heterogeneous cortisol measurement did not allow for meta-analysis; limited reporting of intervention and sample characteristics.
Hale et al. (2021) Physical activity	SR, narrative; 28 studies (17 RCTs, 8 non-randomized, 3 without control group; mean ages 11–19)	Aerobic exercise, yoga, resistance training, team sports; 67.9% multicomponent (mostly with health education)	QoL, self-esteem, PWB, ill-being	Positive for PWB and QoL; mixed for self-esteem; unclear for ill-being (most support for anxiety); no pooled effect size	Larger effects in overweight, inactive, or at-risk samples and for resistance (vs. aerobic) training; mostly no effects in female-only samples. Setting not restricted to schools (9 of 28 in community or clinical settings); inadequate or unclear randomization as most common risk of bias.

SR, systematic review; MA, meta-analysis; RCT, randomized controlled trial; k, number of studies; N, number of participants; ACT, acceptance and commitment therapy; CBT, cognitive behavioral therapy; PYD, positive youth development; SEL, social-emotional learning; SWB, subjective well-being; PWB, psychological well-being; QoL, quality of life; BP, blood pressure; HR/HRV, heart rate/heart rate variability; g, Hedges' *g*; d, Cohen's *d*; n.s., not significant.

et al. 2015). The interventions focused to varying degrees on cognitive, emotional, or behavioral domains of school belonging. They included content such as fostering support from and interaction with peers, developing school support, enhancing self-efficacy, social skills, and empathy, strengthening skills in problem-solving, emotional regulation, stress coping, training mindfulness, awareness, gratitude, and meditation, and building resilience. Effective interventions led to increased school belonging and other positive outcomes, such as better mental health, improved prosocial skills, and reduced risk-taking behavior. The authors also compared different categorical attributes to one another, but they found no significant relationships between any of the intervention characteristics and whether the intervention was effective or not (Allen et al., 2022).

A systematic review that included a meta-analysis (Tejada-Gallardo et al., 2020) examined school-based multicomponent *positive psychology* interventions for adolescents. Positive psychology interventions focus on fostering positive emotions, thoughts, and behaviors, leading students to experience more positive relationships, be more engaged, and have a better sense of meaning and purpose in school. The authors found nine studies that implemented multicomponent positive psychology interventions among adolescent students. Seven of these interventions consisted purely of the positive psychology approach (Boniwell et al., 2016; Roth et al., 2017; Ruini et al., 2009; Shoshani et al., 2016; Shoshani and Steinmetz, 2014; Suldo et al., 2014; Tomba et al., 2010). The two remaining interventions were combined with positive youth development (Freire et al., 2018) and acceptance and commitment therapy approaches (Burckhardt et al., 2016). Results of the meta-analysis indicated small but significant effects in increasing adolescents' subjective well-being and psychological well-being, as well as reducing their depression symptoms post-intervention. The studies indicated no significant effects on anxiety symptoms. Interestingly, when examining long-term outcomes, the interventions led to sustained reductions in depression symptoms and enhanced eudaimonic (psychological) well-being, whereas the positive effects on hedonic (subjective) well-being diminished over time. One explanation is that positive psychology interventions offer a pleasant experience, enhancing students' immediate emotional well-being, which might be replaced by a more meaningful and sustained sense of well-being later on (Tejada-Gallardo et al., 2020).

The effectiveness of school-based interventions aiming to improve *stress management or coping/resilience* was examined in another meta-analysis (Juhász et al., 2024). In the final analysis, a total of 55 studies were included. The content of the interventions from most to least frequent consisted of socio-emotional learning (e.g., Castro-Olivo, 2014), psychoeducation (e.g., Puolakanaho et al., 2019), relaxation (e.g., Rentala et al., 2019), mindfulness (e.g., Volanen et al., 2020), cognitive behavioral techniques (e.g., Lowe and Wuthrich, 2021), yoga (e.g., Khalsa et al., 2012), exercise (e.g., Köroğlu and Yiğiter, 2016), and counseling (e.g., McArthur et al., 2013). The results revealed a very small but significant effect. The analysis further showed that for coping/resilience, the interventions were more effective in older than in younger adolescents, in targeted samples than in universal samples, and when they included cognitive behavioral techniques. Interventions for stress management were more effective when delivered by mental health professionals or researchers than by teachers.

Another meta-analysis evaluated the effects of school-based interventions promoting psychosocial functioning on *physiological stress* parameters in adolescents (van Loon et al., 2022). In total, 30 studies were assessed, including interventions reporting adolescents' cortisol levels (e.g., Schonert-Reichl et al., 2015; Calvete et al., 2019), blood pressure (e.g., Wright et al., 2011; Skoradal et al., 2018), and heart rate/heart rate variability (e.g., Bradley et al., 2010; Fishbein et al., 2016). Regarding the intervention characteristics, most studies included cognitive-behavioral techniques, relaxation, or mindfulness/meditation. When looking at the overall effectiveness, intervention programs reporting blood pressure showed a small but significant effect, whereas interventions reporting heart rate/heart rate variability did not show a significant effect. No meta-analysis was performed for interventions reporting cortisol levels due to a large methodological variability. The results of the primary studies on cortisol were inconsistent, with some interventions being effective and others not. Results further showed that for blood pressure, effects were larger for interventions that included a relaxation component. For blood pressure and heart rate/heart rate variability, intervention effects were larger when mindfulness and/or meditation components were included and smaller when a cognitive-behavioral component was applied. According to the authors, one possible explanation for this result is that cognitive-behavioral techniques are more beneficial for psychological stress, whereas techniques such as relaxation, mindfulness, and meditation may be more effective when targeting physiological stress.

There is also evidence that *physical activity* interventions can have a positive impact on adolescents' mental health. A systematic review (Hale et al., 2021) synthesized a total of 28 physical activity interventions aiming to improve different mental health outcomes. Interventions were mainly implemented in the school context, for example, as a replacement for regular physical exercise classes, or as a before- or after-school program. The type of activities encompassed cardiovascular or aerobic exercises, yoga, resistance training, or team sports. In most of the included interventions, educational sessions accompanied physical activity, which were primarily focused on health-related topics such as nutrition. Only a few interventions included educational sessions on mental health topics, and these were limited to topics of self-esteem, body image, or stress. The included studies assessed different outcomes, which can be categorized into quality of life, self-esteem, psychological well-being, and psychological ill-being. Studies measuring the effect of physical activity on quality of life showed that interventions were primarily effective among adolescent samples that were considered overweight/obese (e.g., Elnaggar and Shendy, 2016; Hainsworth et al., 2018; Roh et al., 2018) or physically inactive (e.g., Bahram et al., 2014; Ho et al., 2017). Results regarding self-esteem were mixed, but similarly, the impact was greater on vulnerable samples, such as overweight/obese adolescents (e.g., Eather et al., 2016) or those at risk of developing mental health problems (e.g., Smith et al., 2018). However, interventions were not effective for female-only samples (Lindwall and Lindgren, 2005; Lubans et al., 2012; Schneider et al., 2008), indicating that the impact on self-esteem

in this subgroup might be more complex. Further, a range of studies showed positive outcomes for adolescents' self-esteem through resistance training (e.g., Morgan et al., 2012; Schranz et al., 2014; Costigan et al., 2016). Studies examining psychological well-being have also found that resistance training had a more positive impact compared to aerobic training alone (e.g., Costigan et al., 2016; Lubans et al., 2016). For psychological ill-being, such as negative mood, psychological distress, depression, and anxiety, intervention effects were less clear. The authors found the most support for reducing anxiety (e.g., Bonhauser et al., 2005; Lindwall and Lindgren, 2005), although one intervention also led to a decrease in depressive symptoms (Dopp et al., 2012). In conclusion, physical activity interventions seem to have a positive impact on adolescents' well-being and may be especially helpful when implemented as multicomponent interventions, combining physical activity with health-related educational sessions (Hale et al., 2021).

In summary, a wide range of school-based interventions aimed at improving adolescents' mental health, well-being, and stress already exist. Some of these interventions are showing promising results. However, as shown, studies examining the effectiveness of these interventions are very heterogeneous in nature. First, intervention characteristics differ greatly, including various techniques (e.g., cognitive-behavioral, positive psychology, mindfulness/meditation, relaxation, or physical activity components), and diverse delivery formats (e.g., individual vs. group sessions, in person vs. online, or delivered by teachers vs. other professionals), making it difficult to compare the interventions in terms of their effectiveness (Allen et al., 2022; Cilar et al., 2020). Second, some sample characteristics (e.g., gender or vulnerable/at-risk vs. general sample) may also moderate the effectiveness of the interventions (Hale et al., 2021). Third, intervention outcomes are measured differently across studies (e.g., cortisol levels vs. blood pressure vs. heart rate as biomarkers of physiological stress), leading to different indicators of intervention effectiveness (van Loon et al., 2022). Lastly, the abovementioned interventions also differed in their methodological quality. A substantial proportion of the included interventions were of moderate to low quality; for example, they had limitations regarding the sample, lacked a control group, were not blinded, or did not include follow-up measures (Allen et al., 2022; Cilar et al., 2020; Hale et al., 2021; Tejada-Gallardo et al., 2020).

To clarify the strength of the conclusions drawn from these reviews, the evidence for each outcome can be categorized based on the study designs, the number of included studies, the consistency of findings, the reported effect sizes, and the methodological quality reported by the review authors (see Table 1). This categorization is not intended as a formal grading of individual studies but indicates how robust the respective conclusions are. Moderate evidence, that is, small but consistent effects based predominantly on controlled trials, was found for stress and coping/resilience (Juhász et al., 2024), subjective well-being and depressive symptoms (Tejada-Gallardo et al., 2020), blood pressure as a physiological stress marker (van Loon et al., 2022), school belonging (Allen et al., 2022), and psychological well-being and quality of life following physical activity interventions (Hale et al., 2021). Limited or inconsistent evidence, that is, non-significant or mixed findings, a small number of studies, or predominantly low study quality, was found for general mental well-being outcomes (Cilar et al., 2020), psychological well-being and anxiety symptoms (Tejada-Gallardo et al., 2020), heart rate/heart rate variability and cortisol (van Loon et al., 2022), and self-esteem and psychological ill-being (Hale et al., 2021). None of the outcomes met the criteria for strong evidence, that is, consistent moderate to large effects derived from multiple high-quality randomized controlled trials. Therefore, further research is needed to systematically evaluate the effectiveness of specific intervention characteristics across different samples and under various conditions.

5 Discussion

5.1 Aims

This review aimed to provide an overview of the current status of adolescent students' mental health, well-being, and biopsychological stress. Moreover, we summarized different contextual and individual factors that are associated with adolescents' mental health, well-being, and stress in school. In a last step, we took a closer look at different school-based interventions for adolescents intended to promote positive student development.

The present narrative review offers an integrative approach by bringing together the closely related constructs of adolescents' mental health, well-being, and biopsychological stress in school. Educational research has rarely examined all three constructs jointly, so little is known about how they relate to one another in the school context. In addition, existing frameworks define these constructs and their correlates inconsistently, which makes findings difficult to compare across studies.

We decided to focus on adolescent students in this review mainly for two reasons. First, adolescence as a developmental phase is characterized by an increased vulnerability for low well-being, stress, and mental health problems. Adolescents are undergoing numerous hormonal and physical changes during puberty (Rapee et al., 2019). Furthermore, brain maturation is still ongoing, making adolescents more susceptible to stress and mental disorders (Lupien et al., 2009; Parker et al., 2020; Snyder et al., 2019; Solmi et al., 2022). At the same time, adolescents face diverse socio-emotional and academic tasks, such as building a stronger sense of self, forming peer relationships, and dealing with higher academic demands and transitions from primary to secondary school (Rapee et al., 2019; Raufelder et al., 2022). As a second reason, in recent years there has been a considerable decline in youth mental health and well-being, and an increase in stress worldwide (Baird et al., 2025; Balsiger and Delgrande Jordan, 2025; VanderWeele et al., 2025). This demands further attention from a general societal perspective, but also from a research perspective to shed more light on specific factors that can counteract these declining trends (McGorry et al., 2024).

5.2 Adolescent students' mental health, well-being, and biopsychological stress

As mentioned, there has been a trend of declining mental health and well-being among adolescents, especially among girls,

but also among boys, in recent decades (Cosma et al., 2025). This development is presumably a result of a combination of different societal phenomena. These changes include the rise of social media (Meier and Reinecke, 2021) and increasing worries about the future, due to global crises such as climate change, the COVID-19 pandemic, and war (Hickman et al., 2021; Lass-Hennemann et al., 2024). Moreover, societal change towards more individualism and social competitiveness may be a driving force for increasing academic pressure (Löfstedt et al., 2020; Steare et al., 2023) and perfectionism (Curran and Hill, 2019) alongside higher parental expectations and criticism (Curran and Hill, 2022). Further, better mental health awareness may also partly explain this development, with some authors even arguing for an overinterpretation of milder forms of distress (Foulkes and Andrews, 2023). However, this hypothesis certainly needs empirical evidence. With regard to the gender health gap, school stress has been shown to be a key contributor to girls experiencing more psychosomatic symptoms compared to boys and can explain about half of the gender gap in symptoms (Högberg et al., 2020). However, these findings need further testing, and more research is necessary to systematically test the different contributing factors to the declining trend in youth mental health and the increasing gender health gap.

Taken together, the reviewed literature suggests that adolescents' mental health, well-being, and biopsychological stress should not be considered as isolated outcomes. Rather, they appear to be embedded in a dynamic interplay between developmental changes, school-related demands, interpersonal experiences, and individual resources. Schools may therefore function both as contexts in which stress emerges and accumulates and as settings in which protective relationships, supportive instructional practices, and adaptive competencies can be strengthened.

5.3 Contextual and individual factors in school

School can come with many possibilities to promote positive student development. This was shown in this review by summarizing different contextual and individual factors that are linked to adolescent students' health, well-being, and biopsychological stress. Regarding contextual factors, teachers and peers are important, and two main themes become apparent when looking at students' positive development. First, teacher and peer relationships can create an environment where students feel seen, cared for, and supported by others (Wentzel, 2022). This enhances students' sense of school belonging, a feeling of being part of the school community, which is an important foundation for adolescents' psychosocial functioning and learning development (Allen et al., 2018). The second theme concerns how to approach academic performance and foster a culture of feedback. Teachers play a central role in this regard. It has been shown to be especially beneficial when teachers hold growth-oriented instructional approaches, provide strength-based feedback, and see errors as part of the learning process, providing adolescent students with a higher sense of agency and competence (Hascher and Mori, 2024; Howard et al., 2024; Wang et al., 2024; Yu et al., 2016). These themes also strongly align with Self-Determination Theory, claiming that autonomy, competence, and relatedness are the central psychological human needs for healthy development (Ryan and Deci, 2017).

Taking these contextual factors together, it can be concluded that, even in adolescence, when peer relationships become increasingly important, teachers still play a fundamental role in students' well-being, making teaching an impactful, responsible, and at times challenging profession. In turn, stress and stress-related symptoms such as fatigue and depressed mood in teachers are negatively associated with secondary students' development, as they experience less school satisfaction and feel less cared for by their teachers (Ramberg et al., 2020). This highlights the need to also invest in teachers' health.

However, there has been a tendency in the research field of school well-being to dismiss the influence of other support staff who work alongside teaching staff in schools (Littlecott et al., 2018). When problems arise, support staff may be able to provide more time and space for one-to-one interactions with students; they often have more specialized training in mental health and well-being-related matters, and there may be less of a power imbalance than with teacher-student relationships. In the best case, students can choose between teaching and support staff to approach in case of specific concerns. Future research needs to take a more holistic approach to examine the roles and influences of support staff on the well-being of adolescents in school.

Finally, the focus in this review was on contextual factors within the school environment, while acknowledging that factors outside of school undoubtedly influence adolescents' well-being as well. For example, adolescents' well-being has also been associated positively with parental support (Hoferichter et al., 2021b; Wentzel, 2024) and with socioeconomic status (Herke et al., 2019; Navarro-Carrillo et al., 2020). A particularly high socioeconomic status may, however, be a risk factor for mental health problems, such as substance use, depression, and anxiety, especially when experiencing high academic pressure from parents (Matar et al., 2024). Therefore, it should be kept in mind that the sole responsibility must not lie on schools when it comes to maintaining or promoting adolescents' mental health and well-being.

Adolescents further differ from each other on a range of individual factors. Better social and emotional competencies increase students' abilities in building positive relationships with peers or teachers, enhancing students' sense of school belonging (Allen et al., 2017). Further, students' motivation and engagement are also positively linked to adolescent students' positive development, although findings point towards a more complex relationship, differentiating between varying motivation and engagement profiles among adolescent students. Less sustainable forms of motivation and engagement may therefore even be a risk factor for stress and burnout (Parhiala et al., 2018; Virtanen et al., 2018). Students also differ in their achievement goal orientation, where mastery and, to some extent, performance-approach goals have been shown to be more beneficial (Madjar et al., 2021; Tian et al., 2017). Lastly, students' higher levels of academic buoyancy and the use of productive coping strategies enable adolescent students to better handle daily academic hassles and challenges (Wang et al., 2025; Zammuner, 2019).

Although the focus in this review was on factors that can be influenced, it needs to be mentioned that adolescent students' health, well-being, and stress also depend on other factors. For example, when looking at adolescents' personality traits, higher levels of agreeableness, emotional stability, extraversion, and conscientiousness are linked to higher well-being (Evans et al., 2018; Lampropoulou, 2018), whereas the latter three are also associated with more productive coping strategies (Evans et al., 2018). Moreover, extraversion and emotional stability among adolescents also relate to better mental health, protecting against anxiety, depression, and overall distress (Tian et al., 2019; Zhu et al., 2025). Preliminary evidence even points towards weaker biological stress reactivity among more extraverted adolescents (Ecker et al., 2025). Furthermore, cognitive ability and emotional intelligence are also linked to higher well-being and lower psychological distress among adolescents (Jokela, 2022; Mancini et al., 2024).

When comparing these factors, it becomes apparent that contextual factors can be directly shaped by schools, whereas individual factors range from competencies that can be fostered, such as coping strategies, to relatively stable traits such as personality. Although much of the evidence on these factors is correlational, longitudinal findings suggest that they are promising starting points for promoting adolescents' mental health and well-being (e.g., Grassinger et al., 2024; Yu et al., 2016). Nevertheless, further intervention studies are needed to examine which factors can be most effectively changed in practice.

In conclusion, a diverse range of contextual and individual factors have been identified in the research field, offering many possibilities for schools to address adolescents' mental health, well-being, and stress. Further, it must be emphasized that students' academic achievement and students' health and well-being can be seen as complementary, rather than competing, goals of positive student development. However, more research, especially regarding adolescent students' biopsychological stress, is needed on how to foster positive student development more specifically.

5.4 Interventions for adolescents in school

As shown, there are a variety of school-based interventions for promoting the positive development of adolescent students. Given the multifaceted nature of mental health, well-being, and stress, most interventions focus on the improvement of specific aspects, such as students' sense of school belonging (Allen et al., 2022), positive psychology (Tejada-Gallardo et al., 2020), stress (Juhász et al., 2024; van Loon et al., 2022), or physical activity (Hale et al., 2021). A substantial number of interventions proved to be effective in improving adolescent students' positive development, but the reported effects were mostly small. There were also interventions that showed an unclear or even negative impact.

At the same time, the findings across reviews were not entirely consistent, which points to potential mechanisms underlying intervention effects. For example, interventions including cognitive-behavioral components were associated with larger effects on coping and resilience (Juhász et al., 2024) but with smaller effects on physiological stress parameters (van Loon et al., 2022). This suggests that cognitive-behavioral techniques may primarily act on the appraisal of stressors and on coping strategies, whereas techniques such as relaxation, mindfulness, or meditation may more directly target physiological arousal. Similarly, the effects of positive psychology interventions on hedonic well-being diminished over time, whereas effects on eudaimonic well-being and depressive symptoms were maintained (Tejada-Gallardo et al., 2020), indicating that immediate positive experiences may gradually give way to a more lasting sense of meaning and purpose. Variations in results may also be explained by differences in target groups: effects tended to be larger among adolescents at risk or with higher initial levels of difficulties (Hale et al., 2021; Juhász et al., 2024), possibly because universal samples leave less room for improvement, whereas no such differences were found for physiological stress outcomes (van Loon et al., 2022). For practice, this implies that interventions should be selected according to the specific outcome they are intended to improve and that targeted approaches may complement universal programs.

To note, the quality of evidence in the included studies was not always sufficient, with some studies having a high risk of bias. Accordingly, the evidence for most outcomes can be considered moderate at best, and for several outcomes, such as anxiety (Tejada-Gallardo et al., 2020), self-esteem (Hale et al., 2021), or physiological stress markers other than blood pressure (van Loon et al., 2022), it remains limited or inconsistent. This highlights the importance of implementing only school-based interventions grounded in substantial evidence of their effectiveness. High-quality studies should provide evidence of effectiveness, such as randomized studies, including blinding and follow-up evaluations. Furthermore, interventions may benefit from being implemented or supported by appropriately trained professionals, especially when they address students' mental health, stress, or well-being (Cilar et al., 2020; Juhász et al., 2024).

Furthermore, interventions are heterogeneous in nature, which includes different approaches or attributes in the way they are implemented. It might therefore be beneficial in future research to not only evaluate the effectiveness of school-based interventions as a whole, but also to compare different categories of intervention attributes, and to examine interventions across different conditions and samples more systematically. It is also important to take into consideration that students differ in various characteristics, and therefore, a one-size-fits-all approach in interventions may not lead to effective improvements for every adolescent. Nevertheless, recent student-voice research highlights that adolescents value school-based mental health initiatives that address both mental health problems and positive mental well-being and that are delivered in flexible, age-appropriate, student-centered, and psychologically safe ways (Uvhagen et al., 2026). At the same time, digital devices have become increasingly relevant in both school contexts and intervention delivery, creating new opportunities to implement social and emotional learning programs in flexible, scalable, and engaging formats. Recent intervention approaches therefore illustrate the growing interest in integrating social and emotional learning with digital and game-based formats (Hoferichter et al., 2026; Schoeps et al., 2025).

Taken together, school-based interventions appear to be promising approaches for promoting adolescents' positive development, but further research is needed to determine their long-term effectiveness and sustainability. Intervention effectiveness may also depend on the quality of implementation, the characteristics of the target group, and the broader school environment in which they are embedded.

5.5 Limitations and future directions

Several limitations should be considered when interpreting the findings of this review. First, the review does not aim to provide a systematic or exhaustive synthesis of all available studies, but rather offers a narrative overview of central constructs, associated factors, and intervention approaches. Therefore, the quality of the included studies was not assessed systematically, and there is an increased risk of selection bias. Second, the literature included is heterogeneous in terms of study designs, samples, operationalizations, and outcomes, which limits direct comparability across findings. Third, much of the available evidence is cross-sectional, making it difficult to draw firm conclusions about causal mechanisms or developmental pathways. Finally, biopsychological stress has been examined less consistently than psychological indicators of mental health and well-being, and studies differ considerably in the biomarkers and assessment procedures used.

Future intervention research must move away from isolated, individualistic approaches and adopt a more systematic, transactional perspective to better understand how schools can effectively reduce stress and promote health and well-being among adolescent students. In particular, biopsychological stress among adolescent students has received considerably less attention in research and has been studied inconsistently. Future research should further examine the complex interplay of biological and psychological markers of stress and their relationship to mental health and well-being in the educational context. Further, while some interventions show promising outcomes, they are unlikely to compensate for unfavorable conditions such as low support, high pressure, social exclusion, or poor instructional climate. Therefore, a supportive school environment should be considered as a foundation for promoting students' mental health, fostering well-being, and preventing stress. Schools serve as a fundamental developmental context for adolescent students in which teachers play a pivotal role. However, sustainable student support presupposes that teachers themselves possess the necessary psychological resources and health (Wettstein et al., 2026). Consequently, future studies should increasingly focus on the transactional processes inherent in daily classroom realities to create healthier, relationally supportive educational environments. Within such environments, targeted interventions may provide valuable additional benefits by strengthening students' school belonging, socio-emotional competencies, adaptive coping, and resilience-related resources.

Author contributions

MK: Conceptualization, Writing – original draft. GJ: Writing – review & editing. BR: Writing – review & editing. FH: Writing – review & editing. AW: Conceptualization, Supervision, Writing – review & editing, Funding acquisition.

Funding

The author(s) declared that financial support was received for this work and/or its publication. This work is part of a larger project that was funded by the Swiss National Science Foundation, grant number 10002004. The APC was funded by the Swiss National Science Foundation.

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was used in the creation of this manuscript. Generative AI tools were used solely as supplementary tools during the preparation of this manuscript. Grammarly was used for grammar, spelling, and language editing. Consensus was used as a supplementary tool to support the identification and exploration of relevant literature. Neither tool was used to generate the study's original ideas, arguments, or conclusions. The authors reviewed and verified all AI-assisted outputs and take full responsibility for the content of the manuscript.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

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

References

Acosta, J., Chinman, M., Ebener, P., Malone, P. S., Phillips, A., and Wilks, A. (2019). Evaluation of a whole-school change intervention: findings from a two-year cluster-randomized trial of the restorative practices intervention. *J. Youth Adolesc* 48, 876–890. doi: 10.1007/s10964-019-01013-2

Alcantara, S. C., González-Carrasco, M., Montserrat, C., Viñas, F., Casas, F., and Abreu, D. P. (2017). Peer violence in the school environment and its relationship with subjective well-being and perceived social support among children and adolescents in northeastern Brazil. *J. Happiness Stud* 18, 1507–1532. doi: 10.1007/s10902-016-9786-1

Allen, K.-A., Jamshidi, N., Berger, E., Reupert, A., Wurf, G., and May, F. (2022). Impact of school-based interventions for building school belonging in adolescence: a systematic review. *Educ. Psychol. Rev* 34, 229–257. doi: 10.1007/s10648-021-09621-w

Allen, K.-A., Kern, M. L., Vella-Brodrick, D., Hattie, J., and Waters, L. (2018). What schools need to know about fostering school belonging: a meta-analysis. *Educ. Psychol. Rev* 30, 1–34. doi: 10.1007/s10648-016-9389-8

Allen, K.-A., Vella-Brodrick, D., and Waters, L. (2017). "School belonging and the role of social and emotional competencies in fostering an adolescent's Sense of connectedness to their school," in *Social and Emotional Learning in Australia and the Asia-Pacific*, eds. E. Frydenberg, A. J. Martin, and R. J. Collie (Singapore: Springer Singapore), 83–99.

Arslan, G., and Allen, K.-A. (2021). School victimization, school belongingness, psychological well-being, and emotional problems in adolescents. *Child Indic. Res* 14, 1501–1517. doi: 10.1007/s12187-021-09813-4

Ayllón-Salas, P., and Fernández-Martín, F. D. (2024). The role of social and emotional skills on adolescents' Life satisfaction and academic performance. *Psychol. Soc. Educ* 16, 49–56. doi: 10.21071/pse.v16i1.16625

Bahram, M. E., Akkasheh, G., and Akkasheh, N. (2014). Aerobics, quality of life, and physiological indicators of inactive male students' Cardiovascular endurances, in Kashan. *Nurs. Midwifery. Stud.* 3, e10911. doi: 10.5812/nms.10911

Baird, S., Choonara, S., Azzopardi, P. S., Banati, P., Bessant, J., Biermann, O., et al. (2025). A call to action: the second lancet commission on adolescent health and well-being. *Lancet* 405, 1945–2022. doi: 10.1016/S0140-6736(25)00503-3

Balsiger, N, and Delgrande Jordan, M. (2025). Gesundheit und Gesundheitsverhalten von 11-, 13- und 15-jährigen Jugendlichen im Jahr 2022 und Entwicklung über die Zeit: Die Schweiz im internationalen Vergleich [Health and health behaviors of 11-, 13-, and 15-year-olds in 2022 and trends over time: Switzerland in international comparison]. Lausanne: Sucht Schweiz.

Bannink, R., Broeren, S., Joosten-van Zwanenburg, E., Van As, E., Van De Looij-Jansen, P., and Raat, H. (2014). Effectiveness of a web-based tailored intervention (E-health4Uth) and consultation to promote adolescents' Health: randomized controlled trial. *J. Med. Internet Res* 16, e143. doi: 10.2196/jmir.3163

Bardach, L., Bostwick, K. C. P., Fütterer, T., Kopatz, M., Hobbi, D. M., Klassen, R. M., et al. (2024). A meta-analysis on teachers' Growth mindset. *Educ. Psychol. Rev* 36, 84. doi: 10.1007/s10648-024-09925-7

Becker, S. J., and Börnert-Ringleb, M. (2025). Stress and anxiety in schools: a multilevel analysis of individual and class-level effects of achievement and competitiveness. *Front. Educ* 9, 1519161. doi: 10.3389/feduc.2024.1519161

Bergh, D., and Giota, J. (2022). Student achievement goals and psychosomatic health complaints among Swedish adolescents: the role of sex. J. *Public. Health.* 30, 1011–1022. doi: 10.1007/s10389-020-01374-0

Blanchflower, D. G., and Oswald, A. J. (2008). Is well-being U-shaped over the life cycle? *Soc. Sci. Med* 66, 1733–1749. doi: 10.1016/j.socscimed.2008.01.030

Bonhauser, M., Fernandez, G., Püschel, K., Yañez, F., Montero, J., Thompson, B., et al. (2005). Improving physical fitness and emotional well-being in adolescents of low socioeconomic status in Chile: results of a school-based controlled trial. *Health Promot. Int* 20, 113–122. doi: 10.1093/heapro/dah603

Boniwell, I., Osin, E. N., and Martinez, C. (2016). Teaching happiness at school: non-randomised controlled mixed-methods feasibility study on the effectiveness of personal well-being lessons. *J. Posit. Psychol* 11, 85–98. doi: 10.1080/17439760.2015.1025422

Bradley, R. T., McCraty, R., Atkinson, M., Tomasino, D., Daugherty, A., and Arguelles, L. (2010). Emotion self-regulation, psychophysiological coherence, and test anxiety: results from an experiment using electrophysiological measures. *Appl. Psychophysiol. Biofeedback* 35, 261–283. doi: 10.1007/s10484-010-9134-x

Burckhardt, R., Manicavasagar, V., Batterham, P. J., and Hadzi-Pavlovic, D. (2016). A randomized controlled trial of strong minds: a school-based mental health program combining acceptance and commitment therapy and positive psychology. *J. Sch. Psychol* 57, 41–52. doi: 10.1016/j.jsp.2016.05.008

Calvete, E., Fernández-Gonzalez, L., Orue, I., Echezarraga, A., Royuela-Colomer, E., Cortazar, N., et al. (2019). The effect of an intervention teaching adolescents that people can change on depressive symptoms, cognitive schemas, and hypothalamic-pituitary-adrenal axis hormones. *J. Abnorm. Child Psychol* 47, 1533–1546. doi: 10.1007/s10802-019-00538-1

Carter, P. J., Hore, B., McGarrigle, L., Edwards, M., Doeg, G., Oakes, R., et al. (2018). Happy thoughts: enhancing well-being in the classroom with a positive events diary. *J. Posit. Psychol* 13, 110–121. doi: 10.1080/17439760.2016.1245770

Castro-Olivo, S. M. (2014). Promoting social-emotional learning in adolescent latino ELLs: a study of the culturally adapted strong teens program. *Sch. Psychol. Q* 29, 567–577. doi: 10.1037/spq0000055

Chazan, D. J., Pelletier, G. N., and Daniels, L. M. (2022). Achievement goal theory review: an application to school psychology. Can. *J. Sch. Psychol* 37, 40–56. doi: 10.1177/08295735211058319

Chen, S., Koning, S., Polos, J., Lam, P., Hargrove, T., Ebner, N., et al. (2025). Teacher unfairness in adolescence, educational attainment, and adult health: the role of school- and individual-level perceptions tested in a national cohort study. *SSM Popul. Health.* 30, 101810. doi: 10.1016/j.ssmph.2025.101810

Chrousos, G. P. (2009). Stress and disorders of the stress system. *Nat. Rev. Endocrinol* 5, 374–381. doi: 10.1038/nrendo.2009.106

Cilar, L., Štiglic, G., Kmetec, S., Barr, O., and Pajnkihar, M. (2020). Effectiveness of school-based mental well-being interventions among adolescents: a systematic review. *J. Adv. Nurs* 76, 2023–2045. doi: 10.1111/jan.14408

Clark, K. N., Blyth, G. A., Wilson, K. P., and Plant, M. Z. (2025). A dual-factor examination of adolescent mental health and school engagement. *Contemp. Sch. Psychol* 29, 346–359. doi: 10.1007/s40688-024-00533-4

Collie, R. J., Martin, A. J., Renshaw, L., and Caldecott-Davis, K. (2024). Students' perceived social-emotional competence: the role of autonomy-support and links with well-being, social-emotional skills, and behaviors. *Learn. Instr* 90, 101866. doi: 10.1016/j.learninstruc.2023.101866

Cosma, A., Martin, G., De Looze, M. E., Walsh, S. D., Paakkari, L., Bilz, L., et al. (2025). Cross-national trends in adolescents psychological and somatic complaints before and after the onset of COVID-19 pandemic. *J. Adolesc. Health* 76, 254–264. doi: 10.1016/j.jadohealth.2024.09.028

Cosma, A., Stevens, G., Martin, G., Duinhof, E. L., Walsh, S. D., Garcia-Moya, I., et al. (2020). Cross-national time trends in adolescent mental well-being from 2002 to 2018 and the explanatory role of schoolwork pressure. *J. Adolesc. Health* 66, S50–S58. doi: 10.1016/j.jadohealth.2020.02.010

Costigan, S. A., Eather, N., Plotnikoff, R. C., Hillman, C. H., and Lubans, D. R. (2016). High-intensity interval training for cognitive and mental health in adolescents. *Med. Sci. Sports Exerc* 48, 1985–1993. doi: 10.1249/MSS.0000000000000993

Cross, D., Lester, L., Barnes, A., Cardoso, P., and Hadwen, K. (2015). If it's about me, why do it without me? Genuine student engagement in school cyberbullying education. *Int. J. Emot. Educ* 7, 35–51. Available online at: https://www.um.edu.mt/library/oar/handle/123456789/6691

Curran, T., and Hill, A. P. (2019). Perfectionism is increasing over time: a meta-analysis of birth cohort differences from 1989 to 2016. *Psychol. Bull* 145, 410–429. doi: 10.1037/bul0000138

Curran, T., and Hill, A. P. (2022). Young people's perceptions of their parents' expectations and criticism are increasing over time: implications for perfectionism. *Psychol. Bull* 148, 107–128. doi: 10.1037/bul0000347

Datu, J. A. D., and King, R. B. (2018). Subjective well-being is reciprocally associated with academic engagement: a two-wave longitudinal study. *J. Sch. Psychol* 69, 100–110. doi: 10.1016/j.jsp.2018.05.007

De La Barrera, U., Schoeps, K., Gil-Gómez, J.-A., and Montoya-Castilla, I. (2019). Predicting adolescent adjustment and well-being: the interplay between socio-emotional and personal factors. *Int. J Environ. Res. Public Health* 16, 4650. doi: 10.3390/ijerph16234650

Demol, K., Verschueren, K., and Colpin, H. (2025). Do profiles of relationships with peers and teachers matter for early adolescents' mental health? *J. Res. Adolesc* 35, e70039. doi: 10.1111/jora.70039

Devcich, D. A., Rix, G., Bernay, R., and Graham, E. (2017). Effectiveness of a mindfulness-based program on school children's self-reported well-being: a pilot study comparing effects with an emotional literacy program. *J. Appl. Sch. Psychol* 33, 309–330. doi: 10.1080/15377903.2017.1316333

Diener, E. (1984). Subjective well-being. *Psychol. Bull* 95, 542–575. doi: 10.1037/0033-2909.95.3.542

Dogaru, M., Pisică, O., and Vaşcu, J.-E. (2025). Ensuring quality inclusive and equitable education by increasing emotional intelligence through positive attitudes in students' learning from mistakes. *Front. Educ* 10, 1636887. doi: 10.3389/feduc.2025.1636887

Dopp, R. R., Mooney, A. J., Armitage, R., and King, C. (2012). Exercise for adolescents with depressive disorders: a feasibility study. *Depress. Res. Treat* 2012, 257472. doi: 10.1155/2012/257472

Dupéré, V., Dion, E., Leventhal, T., Archambault, I., Crosnoe, R., and Janosz, M. (2018). High school dropout in proximal context: the triggering role of stressful life events. *Child. Dev.* 89, e107–e122. doi: 10.1111/cdev.12792

Eather, N., Morgan, P. J., and Lubans, D. R. (2016). Effects of exercise on mental health outcomes in adolescents: findings from the CrossFit™ teens randomized controlled trial. *Psychol. Sport Exerc* 26, 14–23. doi: 10.1016/j.psychsport.2016.05.008

Ecker, A., Jarvers, I., Jacob, R., Kandsperger, S., Brunner, R., and Schleicher, D. (2025). Temperament and personality: preliminary evidence of possible relationships with multifactorial stress reactivity in healthy adolescents. *Front. Psychol* 16, 1613000. doi: 10.3389/fpsyg.2025.1613000

Elnaggar, R. K., and Shendy, M. A. (2016). Aerobic interval exercises versus dietary control induced changes of adipokines levels, lipid profile and quality of life in overweight or obese children. Int. *J. Physiother* 3, 587–593. doi: 10.15621/ijphy/2016/v3i5/117445

Engel, G. L. (1977). The need for a new medical model: a challenge for biomedicine. *Science* 196, 129–136. doi: 10.1126/science.847460

Epel, E. S., Crosswell, A. D., Mayer, S. E., Prather, A. A., Slavich, G. M., Puterman, E., et al. (2018). More than a feeling: a unified view of stress measurement for population science. *Front. Neuroendocrinol* 49, 146–169. doi: 10.1016/j.yfrne.2018.03.001

Eppelmann, L., Parzer, P., Lenzen, C., Bürger, A., Haffner, J., Resch, F., et al. (2016). Stress, coping and emotional and behavioral problems among German high school students. *Ment. Health Prev* 4, 81–87. doi: 10.1016/j.mhp.2016.03.002

Evans, P., Martin, A. J., and Ivcevic, Z. (2018). Personality, coping, and school well-being: an investigation of high school students. *Soc. Psychol. Educ* 21, 1061–1080. doi: 10.1007/s11218-018-9456-8

Ferrer-Cascales, R., Albaladejo-Blázquez, N., Sánchez-SanSegundo, M., Portilla-Tamarit, I., Lordan, O., and Ruiz-Robledillo, N. (2019). Effectiveness of the TEI program for bullying and cyberbullying reduction and school climate improvement. *Int. J. Environ. Res. Public Health* 16, 580. doi: 10.3390/ijerph16040580

Fiorilli, C., De Stasio, S., Di Chiacchio, C., Pepe, A., and Salmela-Aro, K. (2017). School burnout, depressive symptoms and engagement: their combined effect on student achievement. *Int. J. Educ. Res* 84, 1–12. doi: 10.1016/j.ijer.2017.04.001

Fishbein, D., Miller, S., Herman-Stahl, M., Williams, J., Lavery, B., Markovitz, L., et al. (2016). Behavioral and psychophysiological effects of a yoga intervention on high-risk adolescents: a randomized control trial. *J. Child Fam. Stud* 25, 518–529. doi: 10.1007/s10826-015-0231-6

Foret, M. M., Scult, M., Wilcher, M., Chudnofsky, R., Malloy, L., Hasheminejad, N., et al. (2012). Integrating a relaxation response-based curriculum into a public high school in Massachusetts. *J. Adolesc* 35, 325–332. doi: 10.1016/j.adolescence.2011.08.008

Foulkes, L., and Andrews, J. L. (2023). Are mental health awareness efforts contributing to the rise in reported mental health problems? A call to test the prevalence inflation hypothesis. *New. Ideas. Psychol.* 69, 101010. doi: 10.1016/j.newideapsych.2023.101010

Fraillon, J. (2004). Measuring student well-being in the context of Australian schooling: Discussion paper. Melbourne.

Fredricks, J. A., Blumenfeld, P. C., and Paris, A. H. (2004). School engagement: potential of the concept, state of the evidence. *Rev. Educ. Res* 74, 59–109. doi: 10.3102/00346543074001059

Freire, T., Lima, I., Teixeira, A., Araújo, M. R., and Machado, A. (2018). Challenge: to be+. A group intervention program to promote the positive development of adolescents. *Child Youth Serv. Rev* 87, 173–185. doi: 10.1016/j.childyouth.2018.02.035

Frydenberg, E. (2008). *Adolescent Coping: Advances in Theory, Research and Practice*. London, New York: Routledge.

Fülöp, M., Varga, B. A., and Sebestyén, N. (2025). Competitive and non-competitive school climate and students' well-being. *Learn. Instr* 95, 102036. doi: 10.1016/j.learninstruc.2024.102036

García-Moya, I., Brooks, F., Morgan, A., and Moreno, C. (2015). Subjective well-being in adolescence and teacher connectedness: a health asset analysis. *Health Educ. J* 74, 641–654. doi: 10.1177/0017896914555039

Gini, G., Marino, C., Pozzoli, T., and Holt, M. (2018). Associations between peer victimization, perceived teacher unfairness, and adolescents' adjustment and well-being. *J. Sch. Psychol* 67, 56–68. doi: 10.1016/j.jsp.2017.09.005

Glier, S., Campbell, A., Corr, R., Pelletier-Baldelli, A., Yefimov, M., Guerra, C., et al. (2022). Coordination of autonomic and endocrine stress responses to the trier social stress test in adolescence. *Psychophysiology* 59, e14056. doi: 10.1111/psyp.14056

Gold, C., Saarikallio, S., Crooke, A. H. D., and McFerran, K. S. (2017). Group music therapy as a preventive intervention for young people at risk: cluster-randomized trial. *J. Music Ther* 54, 133–160. doi: 10.1093/jmt/thx002

Grasaas, E., Ostojic, S., Sandbakk, Ø, Bjørnsen, G., Sylta, Ø, Høgli Major, D., et al. (2024). The relationship between perceived school stress and satisfaction with life among Norwegian school-based adolescents and the moderating role of perceived teacher care: a cross-sectional study. *BMC Public Health* 24, 2771. doi: 10.1186/s12889-024-20246-w

Grassinger, R., Landberg, M., Määttä, S., Vasalampi, K., and Bieg, S. (2024). Interplay of intrinsic motivation and well-being at school. *Motiv. Emot* 48, 147–154. doi: 10.1007/s11031-024-10057-2

Guo, J., Liu, L., Zhao, B., and Wang, D. (2020). Teacher support and mental well-being in Chinese adolescents: the mediating role of negative emotions and resilience. *Front. Psychol* 10, 3081. doi: 10.3389/fpsyg.2019.03081

Hainsworth, K. R., Liu, X. C., Simpson, P. M., Swartz, A. M., Linneman, N., Tran, S. T., et al. (2018). A pilot study of iyengar yoga for pediatric obesity: effects on gait and emotional functioning. *Children.* 5, 92. doi: 10.3390/children5070092

Hale, G. E., Colquhoun, L., Lancastle, D., Lewis, N., and Tyson, P. J. (2021). Review: physical activity interventions for the mental health and well-being of adolescents—a systematic review. *Child Adolesc. Ment. Health* 26, 357–368. doi: 10.1111/camh.12485

Han, J., Way, N., Yoshikawa, H., and Clarke, C. (2025). Interpersonal curiosity and its association with social and emotional skills and well-being during adolescence. *J. Adolesc. Res* 40, 636–668. doi: 10.1177/07435584231162572

Hascher, T. (2004). *Wohlbefinden in der Schule [Well-being in School]*. Münster: Waxmann.

Hascher, T., and Mori, J. (2024). Student well-being, perceived teacher error management, and perceived teacher justice. *Learn. Instr* 92, 101901. doi: 10.1016/j.learninstruc.2024.101901

Hellström, L., Sjöman, M., and Enskär, K. (2024). Conceptualizing adolescents' everyday stressors to underscore areas for support. *Front. Educ* 9, 1370791. doi: 10.3389/feduc.2024.1370791

Herke, M., Rathmann, K., and Richter, M. (2019). Trajectories of students' well-being in secondary education in Germany and differences by social background. *Eur. J. Public Health* 29, 960–965. doi: 10.1093/eurpub/ckz049

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., et al. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. *Lancet Planet Health* 5, e863–e873. doi: 10.1016/S2542-5196(21)00278-3

Ho, F. K. W., Louie, L. H. T., Wong, W. H.-, Chan, K. L., Tiwari, A., Chow, C. B., et al. (2017). A sports-based youth development program, teen mental health, and physical fitness: an RCT. *Pediatrics* 140, e20171543. doi: 10.1542/peds.2017-1543

Hoferichter, F. (2025). "Schulisches Wohlbefinden [school well-being]," in *Schulpsychologie—ein Lehrbuch für die Praxis*, eds. J. Pfetsch, G. Steffgen, and M. Böhmer (Berlin, Heidelberg: Springer Berlin Heidelberg), 161–168.

Hoferichter, F., Hirvonen, R., and Kiuru, N. (2021a). The development of school well-being in secondary school: high academic buoyancy and supportive class- and school climate as buffers. *Learn. Instr* 71, 101377. doi: 10.1016/j.learninstruc.2020.101377

Hoferichter, F., Kulakow, S., and Hufenbach, M. C. (2021b). Support from parents, peers, and teachers is differently associated with middle school students' well-being. *Front. Psychol* 12, 758226. doi: 10.3389/fpsyg.2021.758226

Hoferichter, F., Kulakow, S., and Raufelder, D. (2022a). How teacher and classmate support relate to students' stress and academic achievement. *Front. Psychol* 13, 992497. doi: 10.3389/fpsyg.2022.992497

Hoferichter, F., Lohilahti, J., Hufenbach, M., Grabe, H. J., Hageman, G., and Raufelder, D. (2024). Support from parents, teachers, and peers and the moderation of subjective and objective stress of secondary school student. *Sci. Rep* 14, 1161. doi: 10.1038/s41598-024-51802-4

Hoferichter, F., and Raufelder, D. (2017). "Competition in class hinders scholastic well-being effects on test anxiety in secondary school students," in *Stress and Anxiety: Coping and Resilience*, eds. K. A. Moore, and P. Buchwald (Berlin: Logos Verlag Berlin), 105–114.

Hoferichter, F., and Raufelder, D. (2022). Kann erlebte Unterstützung durch Lehrkräfte schulische Erschöpfung und Stress bei Schülerinnen und Schülern abfedern? [Can perceived support from teachers mitigate school burnout and stress in students?]. *Z. Pädagog. Psychol* 36, 101–114. doi: 10.1024/1010-0652/a000322

Hoferichter, F., Raufelder, D., Schweder, S., and Salmela-Aro, K. (2022b). Validation and reliability of the German version of the school burnout inventory. *Z. Entwicklungspsychol. Pädagog. Psychol* 54, 1–14. doi: 10.1026/0049-8637/a000248

Hoferichter, F., Savolainen, H., Zurbriggen, C., and Schoeps, K. (2026). "Innovative practices to strengthen socio-emotional development of primary school students," in *Foundations of Learning*, eds. J. Schlesier, A. Frey, F. Hoya, R. Parade, and A. Rank (Bad Heilbrunn: Klinkhardt), 403–421.

Hoferichter, F., and Schlesier, J. (2025). Striving to learn and feeling well? The effects of students' achievement goal-orientation on their psychological and physical well-being over one school year. *Z. Erziehungswiss* 28, 397–418. doi: 10.1007/s11618-024-01270-3

Högberg, B., Strandh, M., and Hagquist, C. (2020). Gender and secular trends in adolescent mental health over 24 years—the role of school-related stress. *Soc. Sci. Med* 250, 112890. doi: 10.1016/j.socscimed.2020.112890

Holt, L. J., Bry, B. H., and Johnson, V. L. (2008). Enhancing school engagement in at-risk, urban minority adolescents through a school-based, adult mentoring intervention. *Child Fam. Behav. Ther* 30, 297–318. doi: 10.1080/07317100802482969

Howard, J. L., Slemp, G. R., and Wang, X. (2024). Need support and need thwarting: a meta-analysis of autonomy, competence, and relatedness supportive and thwarting behaviors in student populations. *Pers. Soc. Psychol. Bull* 51, 1552–1573. doi: 10.1177/01461672231225364

Huen, J. M. Y., Lai, E. S. Y., Shum, A. K. Y., So, S. W. K., Chan, M. K. Y., Wong, P. W. C., et al. (2016). Evaluation of a digital game-based learning program for enhancing youth mental health: a structural equation modeling of the program effectiveness. *JMIR Ment. Health* 3, e46. doi: 10.2196/mental.5656

Huttunen, I., Upadyaya, K., and Salmela-Aro, K. (2025). Adolescents' social-emotional skills profiles, relationships at school, school anxiety, and educational aspirations. *Eur. J. Psychol. Educ* 40, 57. doi: 10.1007/s10212-025-00954-6

Jokela, M. (2022). Why is cognitive ability associated with psychological distress and well-being? Exploring psychological, biological, and social mechanisms. *Pers. Individ. Dif* 192, 111592. doi: 10.1016/j.paid.2022.111592

Juhász, Á, Sebestyén, N., Árva, D., Barta, V., Pártos, K., Vokó, Z., et al. (2024). We need better ways to help students avoid the harms of stress: results of a meta-analysis on the effectiveness of school-based stress management interventions. *J. Sch. Psychol* 106, 101352. doi: 10.1016/j.jsp.2024.101352

Juster, R.-P., McEwen, B. S., and Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neurosci. Biobehav. Rev* 35, 2–16. doi: 10.1016/j.neubiorev.2009.10.002

Kang, Y., Rahrig, H., Eichel, K., Niles, H. F., Rocha, T., Lepp, N. E., et al. (2018). Gender differences in response to a school-based mindfulness training intervention for early adolescents. *J. Sch. Psychol* 68, 163–176. doi: 10.1016/j.jsp.2018.03.004

Kärnä, A., Voeten, M., Little, T. D., Poskiparta, E., Kaljonen, A., and Salmivalli, C. (2011). A large-scale evaluation of the KiVa antibullying program: grades 4–6. *Child. Dev.* 82, 311–330. doi: 10.1111/j.1467-8624.2010.01557.x

Kauhanen, L., Wan Mohd Yunus, W. M. A., Lempinen, L., Peltonen, K., Gyllenberg, D., Mishina, K., et al. (2023). A systematic review of the mental health changes of children and young people before and during the COVID-19 pandemic. *Eur. Child Adolesc. Psychiatry* 32, 995–1013. doi: 10.1007/s00787-022-02060-0

Kaya, M., and Erdem, C. (2021). Students' well-being and academic achievement: a meta-analysis study. *Child Indic. Res* 14, 1743–1767. doi: 10.1007/s12187-021-09821-4

Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *J. Consult Clin. Psychol* 73, 539–548. doi: 10.1037/0022-006X.73.3.539

Khalsa, S. B. S., Hickey-Schultz, L., Cohen, D., Steiner, N., and Cope, S. (2012). Evaluation of the mental health benefits of yoga in a secondary school: a preliminary randomized controlled trial. *J. Behav. Health Serv. Res* 39, 80–90. doi: 10.1007/s11414-011-9249-8

King, R. B., Haw, J. Y., and Wang, Y. (2024). Need-support facilitates well-being across cultural, economic, and political contexts: a self-determination theory perspective. *Learn. Instr* 93, 101978. doi: 10.1016/j.learninstruc.2024.101978

Kiuru, N., Wang, M.-T., Salmela-Aro, K., Kannas, L., Ahonen, T., and Hirvonen, R. (2020). Associations between adolescents' interpersonal relationships, school well-being, and academic achievement during educational transitions. *J. Youth Adolesc* 49, 1057–1072. doi: 10.1007/s10964-019-01184-y

Konu, A., and Rimpelä, M. (2002). Well-being in schools: a conceptual model. *Health Promot. Int* 17, 79–87. doi: 10.1093/heapro/17.1.79

Köroğlu, M., and Yiğiter, K. (2016). Effects of swimming training on stress levels of the students aged 11–1s. *Univ. J. Educ. Res* 4, 1881–1884. doi: 10.13189/ujer.2016.040818

Kristensen, S. M., and Jeno, L. M. (2024). The developmental trajectories of teacher autonomy support and adolescent mental well-being and academic stress. *Soc. Psychol. Educ* 27, 1–32. doi: 10.1007/s11218-024-09923-1

Kuperminc, G. P., Chan, W. Y., Hale, K. E., Joseph, H. L., and Delbasso, C. A. (2020). The role of school-based group mentoring in promoting resilience among vulnerable high school students. *Am. J. Community Psychol* 65, 136–148. doi: 10.1002/ajcp.12347

Kuyken, W., Weare, K., Ukoumunne, O. C., Vicary, R., Motton, N., Burnett, R., et al. (2013). Effectiveness of the mindfulness in schools programme: non-randomised controlled feasibility study. *Br. J. Psychiatry* 203, 126–131. doi: 10.1192/bjp.bp.113.126649

Lakkavaara, A., Upadyaya, K., Tang, X., and Salmela-Aro, K. (2024). The role of stress mindset and academic buoyancy in school burnout in middle adolescence. *Eur. J. Dev. Psychol* 21, 847–864. doi: 10.1080/17405629.2024.2382398

Lampropoulou, A. (2018). Personality, school, and family: what is their role in adolescents' subjective well-being. *J. Adolesc* 67, 12–21. doi: 10.1016/j.adolescence.2018.05.013

Lass-Hennemann, J., Sopp, M. R., Ruf, N., Equit, M., Schäfer, S. K., Wirth, B. E., et al. (2024). Generation climate crisis, COVID-19, and Russia-Ukraine-war: global crises and mental health in adolescents. *Eur. Child Adolesc. Psychiatry* 33, 2203–2216. doi: 10.1007/s00787-023-02300-x

Lazarus, R. S., and Folkman, S. (1984). *Stress, Appraisal, and Coping*. New York: Springer.

Lewis, K. M., Sullivan, C. M., and Bybee, D. (2006). An experimental evaluation of a school-based emancipatory intervention to promote African American well-being and youth leadership. *J. Black. Psychol* 32, 3–28. doi: 10.1177/0095798405283229

Lindwall, M., and Lindgren, E.-C. (2005). The effects of a 6-month exercise intervention programme on physical self-perceptions and social physique anxiety in non-physically active adolescent Swedish girls. *Psychol. Sport Exerc* 6, 643–658. doi: 10.1016/j.psychsport.2005.03.003

Littlecott, H. J., Moore, G. F., and Murphy, S. M. (2018). Student health and well-being in secondary schools: the role of school support staff alongside teaching staff. *Pastor. Care. Educ.* 36, 297–312. doi: 10.1080/02643944.2018.1528624

Liu, W., Mei, J., Tian, L., and Huebner, E. S. (2016). Age and gender differences in the relation between school-related social support and subjective well-being in school among students. *Soc. Indic. Res* 125, 1065–1083. doi: 10.1007/s11205-015-0873-1

Liu, Y., and Lu, Z. (2011). The Chinese high school student's stress in the school and academic achievement. *Educ. Psychol* 31, 27–35. doi: 10.1080/01443410.2010.513959

Löfstedt, P., García-Moya, I., Corell, M., Paniagua, C., Samdal, O., Välimaa, R., et al. (2020). School satisfaction and school pressure in the WHO European region and North America: an analysis of time trends (2002–2018) and patterns of co-occurrence in 32 countries. *J. Adolesc. Health* 66, S59–S69. doi: 10.1016/j.jadohealth.2020.03.007

Lowe, C., and Wuthrich, V. M. (2021). Randomised controlled trial of study without stress: a cognitive behavioural therapy program to reduce stress in students in the final year of high school. *Child Psychiatry Hum. Dev* 52, 205–216. doi: 10.1007/s10578-020-01099-x

Lubans, D. R., Morgan, P. J., Okely, A. D., Dewar, D., Collins, C. E., and Batterham, M. (2012). Preventing obesity among adolescent girls: one-year outcomes of the nutrition and enjoyable activity for teen girls (NEAT girls) cluster randomized controlled trial. *Arch. Pediatr. Adolesc. Med* 166, 821–827. doi: 10.1001/archpediatrics.2012.41

Lubans, D. R., Smith, J. J., Morgan, P. J., Beauchamp, M. R., Miller, A., Lonsdale, C., et al. (2016). Mediators of psychological well-being in adolescent boys. *J. Adolesc. Health* 58, 230–236. doi: 10.1016/j.jadohealth.2015.10.010

Lüdeke, S., and Linderkamp, F. (2021). Zusammenhänge zwischen dissozialen Verhaltensweisen und Stresserleben bei Jugendlichen [Associations between dissocial behavior and stress experience in adolescents]. *Z. Pädagog. Psychol* 35, 249–260. doi: 10.1024/1010-0652/a000273

Lupien, S. J., McEwen, B. S., Gunnar, M. R., and Heim, C. (2009). Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nat. Rev. Neurosci* 10, 434–445. doi: 10.1038/nrn2639

Madjar, N., Ratelle, C. F., and Duchesne, S. (2021). A longitudinal analysis of the relationships between students' internalized symptoms and achievement goals. *Motiv. Sci* 7, 207–218. doi: 10.1037/mot0000195

Mancini, G., Özal, Z., Biolcati, R., Trombini, E., and Petrides, K. V. (2024). Trait emotional intelligence and adolescent psychological well-being: a systematic review. *Int. J. Adolesc. Youth* 29, 2292057. doi: 10.1080/02673843.2023.2292057

Mann, M. J., Smith, M. L., and Kristjansson, A. L. (2015). Improving academic self-efficacy, school connectedness, and identity in struggling middle school girls: a preliminary study of the REAL girls program. *Health Educ. Behav* 42, 117–126. doi: 10.1177/1090198114543005

Marquez, J., Inchley, J., and Long, E. (2022). Cross-country and gender differences in factors associated with population-level declines in adolescent life satisfaction. *Child Indic. Res* 15, 1405–1428. doi: 10.1007/s12187-022-09930-8

Marquez, J., and Long, E. (2021). A global decline in adolescents' subjective well-being: a comparative study exploring patterns of change in the life satisfaction of 15-year-old students in 46 countries. *Child Indic. Res* 14, 1251–1292. doi: 10.1007/s12187-020-09788-8

Martela, F. (2024). Being as having, loving, and doing: a theory of human well-being. *Pers. Soc. Psychol. Rev* 28, 372–397. doi: 10.1177/10888683241263634

Martin, A. J., and Marsh, H. W. (2008). Academic buoyancy: towards an understanding of students' everyday academic resilience. *J. Sch. Psychol* 46, 53–83. doi: 10.1016/j.jsp.2007.01.002

Mastrotheodoros, S., Talias, M. A., and Motti-Stefanidi, F. (2017). "Goal orientation profiles, academic achievement and well-being of adolescents in Greece," in *Well-being of Youth and Emerging Adults Across Cultures*, ed. R. Dimitrova (Cham: Springer), 105–120.

Matar, J. L., Laletas, S., and Lubman, D. I. (2024). Mental health concerns and help-seeking behaviors among adolescents in high socioeconomic status groups: a scoping review. *Adolesc. Res. Rev* 9, 93–134. doi: 10.1007/s40894-023-00214-y

McArdle, P., Young, R., Quibell, T., Moseley, D., Johnson, R., and LeCouteur, A. (2011). Early intervention for at risk children: 3-year follow-up. *Eur. Child Adolesc. Psychiatry* 20, 111–120. doi: 10.1007/s00787-010-0148-y

McArthur, K., Cooper, M., and Berdondini, L. (2013). School-based humanistic counseling for psychological distress in young people: pilot randomized controlled trial. *Psychother. Res* 23, 355–365. doi: 10.1080/10503307.2012.726750

McEwen, B. S. (2007). Physiology and neurobiology of stress and adaptation: central role of the brain. *Physiol. Rev* 87, 873–904. doi: 10.1152/physrev.00041.2006

McGorry, P. D., Mei, C., Dalal, N., Alvarez-Jimenez, M., Blakemore, S.-J., Browne, V., et al. (2024). The lancet psychiatry commission on youth mental health. *Lancet Psychiatry.* 11, 731–774. doi: 10.1016/S2215-0366(24)00163-9

McLoughlin, C. S. (2009). Positive peer group interventions: an alternative to individualized interventions for promoting prosocial behavior in potentially

disaffected youth. *Electron. J. Res. Educ. Psychol* 7, 1131–1156. doi: 10.25115/ejrep.v7i19.1338

Meier, A., and Reinecke, L. (2021). Computer-mediated communication, social media, and mental health: a conceptual and empirical meta-review. *Commun. Res* 48, 1182–1209. doi: 10.1177/0093650220958224

Midgett, A., and Doumas, D. M. (2019). The impact of a brief bullying bystander intervention on depressive symptoms. *J. Couns. Dev* 97, 270–280. doi: 10.1002/jcad.12267

Miller, A. B., and Prinstein, M. J. (2019). Adolescent suicide as a failure of acute stress-response systems. *Annu. Rev. Clin. Psychol* 15, 425–450. doi: 10.1146/annurev-clinpsy-050718-095625

Mills-Webb, K., and Hennessey, A. (2025). Perceptions of teacher-student relationships predict reductions in adolescent distress via increased trait mindfulness. *Front. Educ* 10, 1430197. doi: 10.3389/feduc.2025.1430197

Morgan, P. J., Saunders, K. L., and Lubans, D. R. (2012). Improving physical self-perception in adolescent boys from disadvantaged schools: psychological outcomes from the physical activity leaders randomized controlled trial. *Pediatr. Obes* 7, e27–e32. doi: 10.1111/j.2047-6310.2012.00050.x

Morinaj, J., and Hascher, T. (2019). School alienation and student well-being: a cross-lagged longitudinal analysis. *Eur. J. Psychol. Educ* 34, 273–294. doi: 10.1007/s10212-018-0381-1

Navarro-Carrillo, G., Alonso-Ferres, M., Moya, M., and Valor-Segura, I. (2020). Socioeconomic status and psychological well-being: revisiting the role of subjective socioeconomic status. *Front. Psychol* 11, 1303. doi: 10.3389/fpsyg.2020.01303

Nix, T., Pendergast, D., and O'Brien, M. (2022). Belonging in school—the effect of teacher-student relationships: a systematic quantitative review of the literature. *Educ. Think* 2, 63–90. Available online at: https://analytrics.org/article/belonging-in-school-the-effect-of-teacher-student-relationships-a-systematic-quantitative-review-of-the-literature/

OECD (2019). *PISA 2018 Results (Volume III): What School Life Means for Students' Lives*. Paris: OECD Publishing.

Orban, E., Li, L. Y., Gilbert, M., Napp, A.-K., Kaman, A., Topf, S., et al. (2024). Mental health and quality of life in children and adolescents during the COVID-19 pandemic: a systematic review of longitudinal studies. *Front. Public Health* 11, 1275917. doi: 10.3389/fpubh.2023.1275917

Panchal, U., De Pablo, S., Franco, G., Moreno, M., Parellada, C., Arango, M., et al. (2023). The impact of COVID-19 lockdown on child and adolescent mental health: systematic review. *Eur. Child Adolesc. Psychiatry* 32, 1151–1177. doi: 10.1007/s00787-021-01856-w

Parhiala, P., Torppa, M., Vasalampi, K., Eklund, K. M., Poikkeus, A.-M., and Aro, T. (2018). Profiles of school motivation and emotional well-being among adolescents: associations with math and Reading performance. *Learn. Individ. Differ* 61, 196–204. doi: 10.1016/j.lindif.2017.12.003

Parker, N., Patel, Y., Jackowski, A. P., Pan, P. M., Salum, G. A., Pausova, Z., et al. (2020). Assessment of neurobiological mechanisms of cortical thinning during childhood and adolescence and their implications for psychiatric disorders. *JAMA. Psychiatry.* 77, 1127–1136. doi: 10.1001/jamapsychiatry.2020.1495

Pascoe, M. C., Hetrick, S. E., and Parker, A. G. (2020). The impact of stress on students in secondary school and higher education. *Int. J. Adolesc. Youth* 25, 104–112. doi: 10.1080/02673843.2019.1596823

Perez, V. M., Gonzales, N. A., Tein, J.-Y., Ibrahim, M. H., Luecken, L. J., and Losoya, S. (2023). Dispositional active coping predicts patterns of adolescents' cortisol responsivity in the context of school-related stressors. *J. Clin. Child Adolesc. Psychol* 52, 604–615. doi: 10.1080/15374416.2021.1969651

Polanczyk, G. V., Salum, G. A., Sugaya, L. S., Caye, A., and Rohde, L. A. (2015). Annual research review: a meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *J. Child Psychol. Psychiatry* 56, 345–365. doi: 10.1111/jcpp.12381

Puolakanaho, A., Lappalainen, R., Lappalainen, P., Muotka, J. S., Hirvonen, R., Eklund, K. M., et al. (2019). Reducing stress and enhancing academic buoyancy among adolescents using a brief web-based program based on acceptance and commitment therapy: a randomized controlled trial. *J. Youth Adolesc* 48, 287–305. doi: 10.1007/s10964-018-0973-8

Putwain, D. W., Daumiller, M., Hussain, T., and Pekrun, R. (2024). Revisiting the relation between academic buoyancy and coping: a network analysis. *Contemp. Educ. Psychol* 78, 102283. doi: 10.1016/j.cedpsych.2024.102283

Putwain, D. W., Jansen in de Wal, J., and Van Alphen, T. (2023). Academic buoyancy: overcoming test anxiety and setbacks. *J. Intell* 11, 42. doi: 10.3390/jintelligence11030042

Putwain, D. W., Loderer, K., Gallard, D., and Beaumont, J. (2020). School-related subjective well-being promotes subsequent adaptability, achievement, and positive behavioural conduct. *Br. J. Educ. Psychol* 90, 92–108. doi: 10.1111/bjep.12266

Ramberg, J., Brolin Låftman, S., Åkerstedt, T., and Modin, B. (2020). Teacher stress and students' school well-being: the case of upper secondary schools in Stockholm. Scand. *J. Educ. Res* 64, 816–830. doi: 10.1080/00313831.2019.1623308

Rankine, J., Coulter, R. W. S., Culyba, A., Miller, E., Switzer, G., Arellano, G., et al. (2026). School engagement and mental health in adolescence: longitudinal and bidirectional relationships. *Pediatr. Res* 99, 590–597. doi: 10.1038/s41390-025-04481-4

Rapee, R. M., Oar, E. L., Johnco, C. J., Forbes, M. K., Fardouly, J., Magson, N. R., et al. (2019). Adolescent development and risk for the onset of social-emotional disorders: a review and conceptual model. *Behav. Res. Ther* 123, 103501. doi: 10.1016/j.brat.2019.103501

Raufelder, D., Hoferichter, F., Hirvonen, R., and Kiuru, N. (2022). How students' motivational profiles change during the transition from primary to lower secondary school. *Contemp. Educ. Psychol* 71, 102117. doi: 10.1016/j.cedpsych.2022.102117

Raufelder, D., Lazarides, R., and Lätsch, A. (2018). How classmates' stress affects student's quality of motivation. *Stress Health* 34, 649–662. doi: 10.1002/smi.2832

Rentala, S., Lau, B. H. P., Aladakatti, R., and Thimmajja, S. G. (2019). Effectiveness of holistic group health promotion program on educational stress, anxiety, and depression among adolescent girls—a pilot study. *J. Family Med. Prim. Care* 8, 1082–1089. doi: 10.4103/jfmpc.jfmpc_378_18

Resh, N., and Sabbagh, C. (2014). Sense of justice in school and civic attitudes. *Soc. Psychol. Educ* 17, 51–72. doi: 10.1007/s11218-013-9240-8

Roach, A. (2018). Supportive peer relationships and mental health in adolescence: an integrative review. *Issues Ment. Health Nurs* 39, 723–737. doi: 10.1080/01612840.2018.1496498

Roh, H.-T., Cho, S.-Y., and So, W.-Y. (2018). Taekwondo training improves mood and sociability in children from multicultural families in South Korea: a randomized controlled pilot study. *Int. J. Environ. Res. Public Health* 15, 757. doi: 10.3390/ijerph15040757

Roth, R. A., Suldo, S. M., and Ferron, J. M. (2017). Improving middle school students' subjective well-being: efficacy of a multicomponent positive psychology intervention targeting small groups of youth. Sch. *Psychol. Rev* 46, 21–41. doi: 10.1080/02796015.2017.12087610

Ruini, C., Ottolini, F., Tomba, E., Belaise, C., Albieri, E., Visani, D., et al. (2009). School intervention for promoting psychological well-being in adolescence. *J. Behav. Ther. Exp. Psychiatry* 40, 522–532. doi: 10.1016/j.jbtep.2009.07.002

Ryan, R. M., and Deci, E. L. (2001). On happiness and human potentials: a review of research on hedonic and eudaimonic well-being. *Annu. Rev. Psychol* 52, 141–166. doi: 10.1146/annurev.psych.52.1.141

Ryan, R. M., and Deci, E. L. (2017). *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness*. New York: Guilford Press.

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *J. Pers. Soc. Psychol* 57, 1069–1081. doi: 10.1037/0022-3514.57.6.1069

Sabol, T. J., and Pianta, R. C. (2012). Recent trends in research on teacher-child relationships. *Attach. Hum. Dev* 14, 213–231. doi: 10.1080/14616734.2012.672262

Sacco, R., Camilleri, N., Eberhardt, J., Umla-Runge, K., and Newbury-Birch, D. (2024). A systematic review and meta-analysis on the prevalence of mental disorders among children and adolescents in Europe. *Eur. Child Adolesc. Psychiatry* 33, 2877–2894. doi: 10.1007/s00787-022-02131-2

Salmela-Aro, K. (2017). Dark and bright sides of thriving—school burnout and engagement in the Finnish context. *Eur. J. Dev. Psychol* 14, 337–349. doi: 10.1080/17405629.2016.1207517

Salmela-Aro, K., Kiuru, N., Leskinen, E., and Nurmi, J.-E. (2009). School burnout inventory (SBI). *Eur. J. Psychol. Assess* 25, 48–57. doi: 10.1027/1015-5759.25.1.48

Salmela-Aro, K., and Upadyaya, K. (2014). School burnout and engagement in the context of demands-resources model. *Br. J. Educ. Psychol* 84, 137–151. doi: 10.1111/bjep.12018

Salmela-Aro, K., and Upadyaya, K. (2020). School engagement and school burnout profiles during high school—the role of socio-emotional skills. *Eur. J. Dev. Psychol* 17, 943–964. doi: 10.1080/17405629.2020.1785860

Salter, D., Neelakandan, A., and Wuthrich, V. M. (2025). Anxiety and teacher-student relationships in secondary school: a systematic literature review. *Child Psychiatry Hum. Dev* 56, 1870–1888. doi: 10.1007/s10578-024-01665-7

Sapolsky, R. M., Romero, L. M., and Munck, A. U. (2000). How do glucocorticoids influence stress responses? Integrating permissive, suppressive, stimulatory, and preparative actions. *Endocr. Rev* 21, 55–89. doi: 10.1210/edrv.21.1.0389

Sarkova, M., Bacikova-Sleskova, M., Madarasova Geckova, A., Katreniakova, Z., Van Den Heuvel, W., and Van Dijk, J. P. (2014). Adolescents' Psychological well-being and self-esteem in the context of relationships at school. *Educ. Res* 56, 367–378. doi: 10.1080/00131881.2014.965556

Sawyer, S. M., Azzopardi, P. S., Wickremarathne, D., and Patton, G. C. (2018). The age of adolescence. *Lancet Child Adolesc. Health* 2, 223–228. doi: 10.1016/S2352-4642(18)30022-1

Saxer, K., Schnell, J., Mori, J., and Hascher, T. (2025). The relationship between student well-being and teacher–student and student–student relationships: a

longitudinal approach among secondary school students in Switzerland. *Educ. Sci* 15, 384. doi: 10.3390/educsci15030384

Scherrer, V., Preckel, F., Schmidt, I., and Elliot, A. J. (2020). Development of achievement goals and their relation to academic interest and achievement in adolescence: a review of the literature and two longitudinal studies. *Dev. Psychol* 56, 795–814. doi: 10.1037/dev0000898

Scherzinger, M., and Wettstein, A. (2022). *Beziehungen in der Schule gestalten: Für ein gelingendes Miteinander [Shaping Relationships at School: For a Successful Togetherness]*. Stuttgart: Kohlhammer.

Schneider, M., Dunton, G. F., and Cooper, D. M. (2008). Physical activity and physical self-concept among sedentary adolescent females; an intervention study. *Psychol. Sport Exerc* 9, 1–14. doi: 10.1016/j.psychsport.2007.01.003

Schnell, J., Saxer, K., Mori, J., and Hascher, T. (2025). Feeling well and doing well. The mediating role of school engagement in the relationship between student well-being and academic achievement. *Eur. J. Psychol. Educ* 40, 48. doi: 10.1007/s10212-025-00947-5

Schoeps, K., Montoya-Castilla, I., and Raufelder, D. (2019). Does stress mediate the association between emotional intelligence and life satisfaction during adolescence? *J. Sch. Health* 89, 354–364. doi: 10.1111/josh.12746

Schoeps, K., Postigo-Zegarra, S., Signorelli, A., Morganti, A., Lozano-Quilis, J. A., and Hoferichter, F. (2025). SEL4@ll program for social and emotional development among European adolescents: a study protocol for a randomized controlled trial. *BMC. Psychol.* 13, 1318. doi: 10.1186/s40359-025-03678-w

Schonert-Reichl, K. A., Oberle, E., Lawlor, M. S., Abbott, D., Thomson, K., Oberlander, T. F., et al. (2015). Enhancing cognitive and social-emotional development through a simple-to-administer mindfulness-based school program for elementary school children: a randomized controlled trial. *Dev. Psychol* 51, 52–66. doi: 10.1037/a0038454

Schranz, N., Tomkinson, G., Parletta, N., Petkov, J., and Olds, T. (2014). Can resistance training change the strength, body composition and self-concept of overweight and obese adolescent males? A randomised controlled trial. *Br. J. Sports Med* 48, 1482–1488. doi: 10.1136/bjsports-2013-092209

Seligman, M. E. P. (2011). *Flourish: A Visionary new Understanding of Happiness and Well-being*. New York: Free Press.

Shah, E. N., Szwedo, D. E., and Allen, J. P. (2024). Adolescent close friendships, self-perceived social acceptance, and peer-rated likeability as predictors of well-being in young adulthood. Front. *Dev. Psychol* 2, 1435727. doi: 10.3389/fdpys.2024.1435727

Shoshani, A., and Steinmetz, S. (2014). Positive psychology at school: a school-based intervention to promote adolescents' mental health and well-being. *J. Happiness Stud* 15, 1289–1311. doi: 10.1007/s10902-013-9476-1

Shoshani, A., Steinmetz, S., and Kanat-Maymon, Y. (2016). Effects of the maytiv positive psychology school program on early adolescents' well-being, engagement, and achievement. *J. Sch. Psychol* 57, 73–92. doi: 10.1016/j.jsp.2016.05.003

Skoradal, M-B, Purkhús, E., Steinholm, H., Olsen, M. H., Ørntoft, C., Larsen, M. N., et al. (2018). "FIFA 11 for health" for Europe in the Faroe Islands: effects on health markers and physical fitness in 10- to 12-year-old schoolchildren. *Scand. J. Med. Sci. Sports* 28, 8–17. doi: 10.1111/sms.13209

Smith, J. J., Beauchamp, M. R., Faulkner, G., Morgan, P. J., Kennedy, S. G., and Lubans, D. R. (2018). Intervention effects and mediators of well-being in a school-based physical activity program for adolescents: the "resistance training for teens' Cluster RCT. *Ment. Health Phys. Act* 15, 88–94. doi: 10.1016/j.mhpa.2018.08.002

Snyder, H. R., Young, J. F., and Hankin, B. L. (2019). Chronic stress exposure and generation are related to the p-factor and externalizing specific psychopathology in youth. *J. Clin. Child Adolesc. Psychol* 48, 306–315. doi: 10.1080/15374416.2017.1321002

Solmi, M., Radua, J., Olivola, M., Croce, E., Soardo, L., Salazar de Pablo, G., et al. (2022). Age at onset of mental disorders worldwide: large-scale meta-analysis of 192 epidemiological studies. *Mol. Psychiatry* 27, 281–295. doi: 10.1038/s41380-021-01161-7

Steare, T., Gutiérrez Muñoz, C., Sullivan, A., and Lewis, G. (2023). The association between academic pressure and adolescent mental health problems: a systematic review. *J. Affect. Disord* 339, 302–317. doi: 10.1016/j.jad.2023.07.028

Steinmayr, R., Crede, J., McElvany, N., and Wirthwein, L. (2016). Subjective well-being, test anxiety, academic achievement: testing for reciprocal effects. *Front. Psychol* 6, 1994. doi: 10.3389/fpsyg.2015.01994

Suldo, S. M., Savage, J. A., and Mercer, S. H. (2014). Increasing middle school students' life satisfaction: efficacy of a positive psychology group intervention. *J. Happiness Stud* 15, 19–42. doi: 10.1007/s10902-013-9414-2

Tejada-Gallardo, C., Blasco-Belled, A., Torrelles-Nadal, C., and Alsinet, C. (2020). Effects of school-based multicomponent positive psychology interventions on well-being and distress in adolescents: a systematic review and meta-analysis. *J. Youth Adolesc* 49, 1943–1960. doi: 10.1007/s10964-020-01289-9

Teuber, Z., Möer, J., Webel, L., and Seifert, A. (2020). Burnout und Engagement: eine Pilotstudie zum Transfer des Job-Demands-Resources-Modells in den deutschen Schulkontext [Burnout and engagement: a pilot study on the transfer of the job-demands-resources model to the German school context]. *Präv. Gesundheitsf* 15, 269–274. doi: 10.1007/s11553-019-00752-1

Tian, L., Jiang, S., and Huebner, E. S. (2019). The big two personality traits and adolescents' complete mental health: the mediation role of perceived school stress. *Sch. Psychol. Q* 34, 32–42. doi: 10.1037/spq0000257

Tian, L., Tian, Q., and Huebner, E. S. (2016). School-related social support and adolescents' school-related subjective well-being: the mediating role of basic psychological needs satisfaction at school. *Soc. Indic. Res* 128, 105–129. doi: 10.1007/s11205-015-1021-7

Tian, L., Yu, T., and Huebner, E. S. (2017). Achievement goal orientations and adolescents' subjective well-being in school: the mediating roles of academic social comparison directions. *Front. Psychol* 8, 37. doi: 10.3389/fpsyg.2017.00037

Tomás, J. M., Gutiérrez, M., Pastor, A. M., and Sancho, P. (2020). Perceived social support, school adaptation and adolescents' subjective well-being. *Child Indic. Res* 13, 1597–1617. doi: 10.1007/s12187-020-09717-9

Tomba, E., Belaise, C., Ottolini, F., Ruini, C., Bravi, A., Albieri, E., et al. (2010). Differential effects of well-being promoting and anxiety-management strategies in a non-clinical school setting. *J. Anxiety Disord* 24, 326–333. doi: 10.1016/j.janxdis.2010.01.005

Torppa, M., Aro, T., Eklund, K. M., Parrila, R., Eloranta, A.-K., and Ahonen, T. (2024). Adolescent Reading and math skills and self-concept beliefs as predictors of age 20 emotional well-being. *Read. Writ* 37, 2075–2099. doi: 10.1007/s11145-023-10461-z

Tracey, D., Gray, T., Truong, S., and Ward, K. (2018). Combining acceptance and commitment therapy with adventure therapy to promote psychological well-being for children at-risk. *Front. Psychol* 9, 1565. doi: 10.3389/fpsyg.2018.01565

Tulis, M. (2013). Error management behavior in classrooms: teachers' responses to student mistakes. *Teach. Teach. Educ* 33, 56–68. doi: 10.1016/j.tate.2013.02.003

Twenge, J. M., Haidt, J., Blake, A. B., McAllister, C., Lemon, H., and Le Roy, A. (2021). Worldwide increases in adolescent loneliness. *J. Adolesc* 93, 257–269. doi: 10.1016/j.adolescence.2021.06.006

Uvhagen, L., Söderqvist, F., and Gustafsson, J. (2026). Doing the right thing and doing things right: secondary school students' perspectives on a school-based intervention to promote mental well-being. *Front. Educ* 11, 1778047. doi: 10.3389/feduc.2026.1778047

VanderWeele, T. J., Johnson, B. R., Bialowolski, P. T., Bonhag, R., Bradshaw, M., Breedlove, T., et al. (2025). The global flourishing study: study profile and initial results on flourishing. *Nat. Ment. Health* 3, 636–653. doi: 10.1038/s44220-025-00423-5

van Loon, A. W. G., Creemers, H. E., Okorn, A., Vogelaar, S., Miers, A. C., Saab, N., et al. (2022). The effects of school-based interventions on physiological stress in adolescents: a meta-analysis. *Stress Health* 38, 187–209. doi: 10.1002/smi.3081

Van Vliet, H., and Andrews, G. (2009). Internet-based course for the management of stress for junior high schools. *Aust. N. Z. J. Psychiatry* 43, 305–309. doi: 10.1080/00048670902721145

Vasalampi, K., Salmela-Aro, K., and Nurmi, J.-E. (2009). Adolescents' self-concordance, school engagement, and burnout predict their educational trajectories. *Eur. Psychol* 14, 332–341. doi: 10.1027/1016-9040.14.4.332

Virtanen, T. E., Lerkkanen, M.-K., Poikkeus, A.-M., and Kuorelahti, M. (2018). Student engagement and school burnout in Finnish lower-secondary schools: latent profile analysis. Scand. *J. Educ. Res* 62, 519–537. doi: 10.1080/00313831.2016.1258669

Volanen, S.-M., Lassander, M., Hankonen, N., Santalahti, P., Hintsanen, M., Simonsen, N., et al. (2020). Healthy learning mind—effectiveness of a mindfulness program on mental health compared to a relaxation program and teaching as usual in schools: a cluster-randomised controlled trial. *J. Affect. Disord* 260, 660–669. doi: 10.1016/j.jad.2019.08.087

Wang, C.-H., Hong, F.-Y., and Hsu, T.-Y. (2025). Examining the relationship between daily academic hassles, academic buoyancy, flourishing, and mental and physical health issues among Taiwanese high school students. *Psychol. Sch* 62, 1283–1293. doi: 10.1002/pits.23395

Wang, M.-T., Scanlon, C. L., McKellar, S. E., and Ye, F. (2024). A multi-informant study on teachers' mindset, classroom practices, and student well-being. *Learn. Instr* 91, 101875. doi: 10.1016/j.learninstruc.2024.101875

Weeks, C., Hill, V., and Owen, C. (2017). Changing thoughts, changing practice: examining the delivery of a group CBT-based intervention in a school setting. *Educ. Psychol. Pract* 33, 1–15. doi: 10.1080/02667363.2016.1217400

Weissberg, R. P., Durlak, J. A., Domitrovich, C. E., and Gullotta, T. P. (2015). "Social and emotional learning: past, present, and future," in *Handbook of Social and Emotional Learning: Research and Practice*, eds. J. A. Durlak, C. E. Domitrovich, R. P. Weissberg, and T. P. Gullotta (New York: Guilford Press), 3–19.

Wentzel, K. R. (2022). Does anybody care? Conceptualization and measurement within the contexts of teacher-student and peer relationships. *Educ. Psychol. Rev* 34, 1919–1954. doi: 10.1007/s10648-022-09702-4

Wentzel, K. R. (2024). Student well-being: in search of definitions, measures, and research designs. *Learn. Instr* 94, 101990. doi: 10.1016/j.learninstruc.2024.101990

Wettstein, A., Schneider, I., Jenni, G., and Lupien, S. J. (2026). ATLAS—a psychobiological model of teacher stress in classroom interactions. *Front. Psychol* 17, 1869744. doi: 10.3389/fpsyg.2026.1869744

Wolf, K., and Schmitz, J. (2024). Scoping review: longitudinal effects of the COVID-19 pandemic on child and adolescent mental health. *Eur. Child Adolesc. Psychiatry* 33, 1257–1312. doi: 10.1007/s00787-023-02206-8

World Health Organization (2005). *Promoting Mental Health: Concepts, Emerging Evidence, Practice*. Geneva: World Health Organization.

Wright, L. B., Gregoski, M. J., Tingen, M. S., Barnes, V. A., and Treiber, F. A. (2011). Impact of stress reduction interventions on hostility and ambulatory systolic blood pressure in African American adolescents. *J. Black Psychol* 37, 210–233. doi: 10.1177/0095798410380203

Wu, H., Guo, Y., Yang, Y., Zhao, L., and Guo, C. (2021). A meta-analysis of the longitudinal relationship between academic self-concept and academic achievement. *Educ. Psychol. Rev* 33, 1749–1778. doi: 10.1007/s10648-021-09600-1

Wubbels, T. (2017). "A knowledge base for teachers on teacher-student relationships," in *Teacher Education for the Changing Demographics of Schooling*, eds. L. Florian, and N. Pantić (Cham: Springer International Publishing), 67–82.

Yatkin, E., Aral, N., Gunes, L. C., and Tosun, S. (2023). Mental well-being and test anxiety among students preparing for the university admission exam during the pandemic. *Front. Psychol* 14, 1184788. doi: 10.3389/fpsyg.2023.1184788

Yu, C., Li, X., Wang, S., and Zhang, W. (2016). Teacher autonomy support reduces adolescent anxiety and depression: an 18-month longitudinal study. *J. Adolesc* 49, 115–123. doi: 10.1016/j.adolescence.2016.03.001

Yu, J., Kreijkes, P., and Salmela-Aro, K. (2022). Students' growth mindset: relation to teacher beliefs, teaching practices, and school climate. *Learn. Instr* 80, 101616. doi: 10.1016/j.learninstruc.2022.101616

Zammuner, V. L. (2019). Adolescents' coping strategies influence their psychosocial well-being. *Curr. J. Appl. Sci. Technol* 36, 1–17. doi: 10.9734/cjast/2019/v36i330232

Zhou, P., Yan, S., and Hou, L. (2025). The role of perceived social-emotional competence in adolescents' mental health: the longitudinal mediating effect of peer relationship and teacher-student relationship. *Psychol. Res. Behav. Manag* 18, 1585–1593. doi: 10.2147/PRBM.S531612

Zhu, A., Xue, D., Yang, H., and Ren, Y. (2025). Personality traits and psychological distress in Chinese adolescents: the mediating roles of anxiety and depression. *Front. Psychol* 16, 1748370. doi: 10.3389/fpsyg.2025.1748370