Check for updates

Improving mental health in high school students shortly before their final exams — a pilot study of a stress management intervention

Timo Kortsch[1]*, Nico Wegener[2] and Manon Elisa Schwake[3]

[1]Department of Social Sciences, IU International University of Applied Sciences, Erfurt, Germany,
[2]Department of Work, Organizational and Social Psychology, Technical University of Braunschweig,
Braunschweig, Germany, [3]Department of Education and Psychology, Free University of Berlin, Berlin,
Germany

Stress - exacerbated by the COVID-19 pandemic - has become a major problem for students. Students who are about to graduate, are particularly affected, as they experience significant pressure from their final exams while simultaneously facing far-reaching decisions about their future. Stress management interventions can therefore be a valuable way to foster the development of more effective coping strategies. This study utilized a pre-post follow-up design to examine the effectiveness of the 2 days "Simply Less Stress" intervention - a structured program based on the Demands-Resources framework that encourages students to reflect on their individual stress emergence and equips them with practical stress management strategies - as a large group training in a group of high school graduates (N = 34). In addition, quasi-experimental effects on efficacy were examined in students who were undergoing parallel psychological supervision (or not). The results showed that the intervention significantly ($p < 0.05$) reduced burnout symptoms (dimension *reduced feeling of efficacy*: η^2partial = 0.523) and increased overall study engagement (η^2partial = 0.606). The exploratory analyses revealed that students currently receiving psychological support also benefited from the course, experiencing a significant increase in wellbeing. The results were supported by qualitative data from the questionnaires. This pilot study contributes to existing literature by providing preliminary evidence that a stress management intervention can achieve positive outcomes for students with and without parallel psychological support. The findings of this study emphasize the importance of implementing effective interventions, especially during particularly stressful episodes, to address stress among high school students and foster their wellbeing.

Introduction

The COVID-19 pandemic profoundly disrupted daily life and had a significant impact on mental health (Zacher and Rudolph, 2024). One group was particularly affected: children and adolescents. The psychological distress experienced by children and adolescents has been shown to have increased in the wake of the COVID-19 pandemic (Kaman et al., 2023; Ravens-Sieberer et al., 2021; Wolf and Schmitz, 2024) as well as students (Reiß et al., 2023). The interventions initiated during the early stages of the pandemic had a profound impact on individuals' lives. For instance, in Germany, schools were closed nationwide from mid-March to the end of April 2020, with most students transitioning to remote learning (Sonnenburg et al., 2022). Despite the gradual reopening of schools with safety measures, repeated closures occurred in response to rising infection rates throughout 2020 and early 2021 (Sonnenburg et al., 2022). School closures were especially impactful, with students having to adapt to distance learning (Sari et al., 2023) and expressing considerable stress due to the lack of social interaction with peers and leisure activities (KKH, 2024). A survey of university students across Germany's federal states revealed that 40%–60% experienced increased mental distress, feelings of loneliness, and fear of the future (Voltmer et al., 2021). For a considerable proportion of students, stress has become a constant companion, and an increasing number of students are experiencing anxiety about their future, as shown by various studies (KKH, 2024; Hansen et al., 2023).

For students nearing the end of high school, another challenge emerges that can lead to increased stress: Concerns regarding their own future and the accompanying uncertainty. Research suggests that academic stress is a significant factor for high school students, particularly during their final years, when they must balance school performance with long-term decisions about their careers or education paths (Jagiello et al., 2024). During the COVID-19 pandemic in 2021, 36% of students reported experiencing anxiety about graduating from high school, and 56% of parents surveyed reported particularly burdening experiences of anxiety (parents of 16–18 years olds; KKH, 2024). This concern among graduates is not surprising. According to the social clock model (Neugarten et al., 1965), young people attempt to orient their lives according to assumed age norms and, if necessary, adjust their goals (Heyer, 2022). For high school graduates, this typically entails pursuing a university degree or, alternatively, vocational training. However, due to the Corona pandemic, both were associated with uncertainties and employment opportunities available were limited (Heyer, 2022). Moreover, the option of taking a "gap year," which may have been an alternative in the past, has become more challenging due to the imposition of entry restrictions in countries like New Zealand or Australia. Consequently, the transition between school and the subsequent chapter was inherently more challenging, which can provoke feelings of anxiety and unease (Hansen et al., 2023; Heyer, 2022; Jagiello et al., 2024).

To better understand and address these stressors, recent research has shifted from merely focusing on demands to also recognizing available resources as a counterbalance. The Study-Demands-Resources (SD-R; Lesener et al., 2020; Bakker and Mostert, 2024) framework, an extension of the job demands resources (JD-R) model (Bakker and Demerouti, 2007), provides a balanced perspective: While study demands can contribute to burnout, study resources promote engagement and mitigate burnout. Therefore, resources, whether personal, social or institutional are crucial to buffer negative effects of academic stress and maintaining capacities during unexpected challenges (Bakker et al., 2015).

By applying the SD-R model, we can move beyond seeing stress as an inevitable burden and focus on strengthening the resources of students to ensure a smoother transition between their life chapters. Stress and resource management interventions aim to focus on these issues. While extensive research supports the effectiveness of stress management interventions in workplace settings (Bhui et al., 2012; Kröll et al., 2017; Richardson and Rothstein, 2008; Tetrick and Winslow, 2015) and higher education (Amanvermez et al., 2020; Yusufov et al., 2019), studies focusing on high school students—especially those about to graduate—remain scarce (van Loon et al., 2020). However, initial findings indicate that such interventions may be particularly effective in older adolescents (Juhász et al., 2024). Therefore, this study aims to investigate the efficacy of a stress management intervention within the high school setting, examining whether it reduces stress, mitigates burnout symptoms, and enhances study engagement within high school student populations.

Theoretical background

The following section provides an overview of studies reporting an increase in the prevalence of psychological distress during the pandemic period. Afterwards, the need for effective stress and resource management interventions that can empower students to cope better with challenges experienced during the COVID-19 pandemic is highlighted. Lastly, the SD-R framework (Lesener et al., 2020) is utilized as a theoretical approach to understand the connection between the coping of stressors promoted by interventions and the students' own resources.

Prevalence of stress and mental health problems among students in Germany before and during the pandemic

As shown in mixed samples, there has been an increase in the prevalence of psychological distress among young people in Germany, which has experienced yet another boost during the pandemic (Zacher and Rudolph, 2024; Reiß et al., 2023; KKH, 2024; Hansen et al., 2023; Ravens-Sieberer et al., 2021).

Even prior to the pandemic, approximately 18% of children and adolescents in Germany showed signs of mental health problems (Klasen et al., 2017). Following the beginning of the pandemic, two-thirds of children and adolescents reported being highly burdened by the overall circumstances caused by the pandemic (Ravens-Sieberer et al., 2021, 2022). Consequently, mental health problems have increased at early stages of the pandemic in comparison to pre-pandemic levels and have remained elevated, even after countermeasures were discontinued (Reiß et al., 2023; Ravens-Sieberer et al., 2021, 2022). This was especially evident among elementary school students, where the rate of mental health problems increased from 16.9% to 40% and high school students, where the rate rose from 8.9% to 21.1% (Reiß et al.,

2023). Jagiello et al. (2024) further emphasize that high school students, particularly those facing final exams, are at a heightened risk for stress-related issues, because they also approach high stakes assessments. At the secondary-school level, the worsening of mental health was especially characterized by emotional problems, such as feelings of unhappiness, depression and downheartedness compared to the pre-pandemic situation (Hansen et al., 2023). Furthermore, a three-wave longitudinal study on children and adolescents between the ages of 7 and 17 revealed a deterioration in mental health, as indicated by a decline in perceived quality of life (from 40% to 15%) and an increase in anxiety levels (from 15% to 24%; Ravens-Sieberer et al., 2021, 2022). Particularly affected were students from underprivileged families (Kaman et al., 2023) and students with exceptional learning needs (Nusser, 2021). Summarized, most of the studies mentioned, emphasize the necessity for easily accessible health promotion and stress prevention measures, especially tailored for young individuals (Reiß et al., 2023; Hansen et al., 2023; Ravens-Sieberer et al., 2021, 2022).

Effects of stress management interventions for high school students

Extensive research has demonstrated the effectiveness of stress management interventions in reducing stress. Several meta-analyses have shown the effectiveness of stress management interventions mainly focusing on occupational settings (Bhui et al., 2012; Kröll et al., 2017; Richardson and Rothstein, 2008; Tetrick and Winslow, 2015; Sakuraya et al., 2020), adult samples (Heber et al., 2017), or college students (Amanvermez et al., 2020; Yusufov et al., 2019). For instance, Amanvermez et al. (2020) reported a medium effect size (g = 0.54) for stress management interventions aimed at reducing stress. Notably, the effectiveness was not bound to the duration of the intervention; interventions lasting at least 8 weeks were not found to be more effective in reducing perceived stress compared to shorter interventions (Yusufov et al., 2019).

While evidence for adult and college student populations is well-documented, studies focusing on younger student samples remain limited but are growing (Juhász et al., 2024; van Loon et al., 2020; Vogelaar et al., 2024). A meta-analysis by van Loon et al. (2020) evaluated the effectiveness of school-based intervention programs in reducing psychological stress among adolescents. The study included 54 studies with 61 independent samples, encompassing a total of 16,475 individuals. The findings indicated that these intervention programs have a moderate overall effect on reducing psychological stress. However, significant effects were primarily observed in selected student samples, such as those who self-selected or were identified through screening processes for high stress levels. The study also found that interventions were particularly effective in reducing school-related stress rather than social stress. Despite some limitations, such as potential publication bias and the presence of outliers, the study underscores the potential of school-based interventions to mitigate psychological stress in adolescents, especially for those at higher risk.

A more recent meta-analysis by Juhász et al. (2024) focused specifically on school-based stress management and coping/resilience interventions in children and adolescents. By implementing rigorous inclusion criteria and exclusively analyzing randomized controlled trials, this study provided particularly robust findings. The results demonstrated small but significant effects on stress reduction (g = −0.15) and coping/resilience outcomes (g = 0.14), with the exclusion of outliers. Including outliers increased the effect sizes. Importantly, stress management interventions were more effective when delivered by mental health professionals or researchers, while coping and resilience interventions showed greater effects in older age groups, selective samples, and programs incorporating cognitive behavioral therapy.

In addition to these meta-analyses, individual studies underscore the potential of specific school-based interventions. For instance, Vogelaar et al. (2024) evaluated the impact of a brief universal psychoeducation program (*Stress Lessons*), aimed at increasing adolescents' knowledge about stress and their ability to cope with it. The cluster-randomized controlled trial, involving 1,613 students, revealed significant improvements in stress knowledge, particular among female participants and those academically oriented. However, no significant reduction in perceived stress was observed, suggesting that while psychoeducation can successfully enhance awareness and understanding of stress, additional components may be required to achieve measurable reductions in stress levels. Similarly, Tan and Martin (2015) investigated a mindfulness-based group intervention for adolescents with various mental health conditions. Their findings showed significant improvements, leading to the conclusion that mindfulness-based programs represent a promising complementary therapeutic approach for young people in clinical contexts. Furthermore, Lowe and Wuthrich (2021) conducted a randomized controlled trial to evaluate the effectiveness of a cognitive-behavioral therapy-based group intervention designed to reduce academic stress in 56 Australian final-year high school students. The intervention significantly reduced distress among participants in comparison to the control group. Participants in the intervention group showed heightened self-efficacy, which was sustained 3 months after the program. However, the study did not find significant effects for anxiety, depression, or teacher-reported emotional problems. In conclusion, these findings underscore the significance of structured, school-based stress management programs in promoting student wellbeing.

In addition to developing interventions specifically for the target group of high school students, it can also be valuable to adapt interventions that have already demonstrated effectiveness in similar contexts, such as with university students. One such example is the *"Simply Less Stress"* program (German original *"Einfach weniger Stress"*; Paulsen and Kortsch, 2020). This 2 days stress management program has been evaluated in various contexts, including workplace and student health management, and demonstrated effectiveness across multiple outcomes, such as increased knowledge of stressors and resources, reduced stress experience, enhanced job and study crafting, and improved stress management strategies (Kortsch et al., 2019; Fabian, 2019; Fasthoff et al., 2023). The program is theoretically grounded in the job demands-resources model (Demerouti et al., 2001; Bakker and Demerouti, 2007), which has been extended to the study demands-resources framework for application in academic settings.

The interplay between demands and resources

The SD-R framework (Lesener et al., 2020), which is widely used in higher education, was employed as a lens to understand

the interplay of high school students' demands and resources. It is an extension of the JD-R model and was developed to examine the specific demands and resources of studying. The SD-R framework consists of two pathways: the health-impairment pathway and the motivation pathway. The health-impairment path states that study demands are positively related to burnout, while the motivational path states that study resources are positively related to engagement and negatively related to burnout. There is extensive empirical support for the SD-R framework (Bakker et al., 2015; Bakker and Mostert, 2024; Gusy et al., 2016; Mokgele and Rothmann, 2014). In addition, the JD-R model/SD-R framework has been extended to include personal resources (Bakker et al., 2015; Bakker and Mostert, 2024) and personal demands (Barbier et al., 2013; Zeijen et al., 2021).

Study demands manifest at various levels—organizational, physical, social, or psychological—and require high levels of physical or mental effort and are therefore associated with physiological or psychological costs (Lesener et al., 2020). Among these demands, overload and time pressure stand out particularly (Lesener et al., 2020). The context of the pandemic exposed new challenges or acted as a magnifying glass on already existing challenges once again. During the 2021–2022 academic year, students experienced concerns about graduating from high school due to uncertainty about their future career plans, while parents, particularly those with older teenagers, shared similar worries about their children's future (KKH, 2024). Graduates faced increased uncertainty due to limited job opportunities and travel constraints, making conventional choices such as pursuing higher education or taking a gap year more challenging (Heyer, 2022).

Study resources can also be found at the organizational, physical, social or psychological level. These resources have the potential to contribute to the achievement of study goals, enhance personal growth, and lessen strain and pressure related to their study demands (Lesener et al., 2020). For instance, self-efficacy has been identified as an important resource and significant for resilience, defined as the ability to adapt to stressors (Reichel et al., 2023). Noteworthy among these study resources is social support (Mokgele and Rothmann, 2014; Schmiedl et al., 2022). Within the school system, peer support is especially important, besides assistance from instructors and parents, particularly during times of stress.

Students were affected by the pandemic in many ways. Among its significant impacts is the closure of schools, which drastically altered their lives (Lee, 2020). Social contacts that were strongly associated with school were abruptly eliminated. More than 50% of young people reported that their social contacts had broken down (Andresen et al., 2022). Notably, school is an essential hub for building social connections during adolescence, and its sudden closure led to the abrupt elimination of these connections. The school context is particularly essential for a sense of belonging during the school years. In addition to classmates, teachers can be an indispensable social resource in the school context. Meta-analytically, teachers have been identified as playing a central role in promoting a sense of belonging amongst students through positive relationships (Allen et al., 2018). However, teachers themselves have also reported finding the COVID-19 pandemic to be especially stressful (Klusmann et al., 2023). Even parents, as another important social resource, were highly stressed and less available during the pandemic due to their own additional

challenges, such as balancing childcare and work (Reiß et al., 2023; Seguin et al., 2021). During this period, they reported high levels of stress and consistently expressed need for support, ranging from over 50% to over 75% of adults (Reiß et al., 2023). This underlines their limited availability as a social resource for their children.

The present study

Stress management courses have proven to be a successful strategy for preventing work-related stress (Bhui et al., 2012; Kröll et al., 2017). However, the usage of these interventions has been limited within younger target groups within school settings, despite its high prevalence of psychological stress (Klasen et al., 2017; Jagiello et al., 2024; van Loon et al., 2020). The objective of this study is to evaluate the effectiveness of a stress and resource management intervention within the school context, specifically targeting high-school students in their final year. The intervention, originally developed for working adults but already successfully implemented with university students (Körner et al., 2024), aims to reduce students' stress levels, alleviate burnout symptoms, and enhance their study engagement over time. The JD-R model (Bakker and Demerouti, 2007) serves as the theoretical foundation, positing that stress, emotional exhaustion, and engagement arise from the balance—or imbalance—between demands and resources (Demerouti et al., 2001; Bakker and Demerouti, 2007).

This study has three primary objectives in assessing the efficacy of the intervention, particularly amidst the challenges posed by the COVID-19 pandemic.

- Firstly, the study aims to rigorously evaluate the intervention's effectiveness by examining its impact on various health-related and stress-related variables, while also analyzing changes in proactive and destructive behaviors to reaffirm its overall outcomes.
- Secondly, it investigates the intervention's adaptability to a younger demographic, exploring whether an intervention originally designed for working adults remains effective when applied to students experiencing comparable stressors. By doing so, the study seeks to determine the intervention's broader applicability to diverse target groups.
- Finally, the research aims to validate the intervention's alignment with the SD-R framework. Specifically, it examines whether the intervention successfully reduces stress levels, enhances health-related outcomes, and fosters proactive behaviors, ensuring consistency with the SD-R framework's core principles.

Research questions and hypotheses

In this intervention study, we pilot an established stress-management intervention for a new target group and investigate the extent to which the intervention has different effects on participants with different needs and resources (in this case social support). We therefore address the following research questions:

- RQ1: To what extent does the effect of the intervention differ for high school students with low vs. high levels of demands at the beginning of the intervention?

- RQ2: To what extent does the effect of the intervention differ for high school students with low vs. high levels of resources (in terms of social support) at the beginning of the intervention?
- RQ3: How suitable do the high school students feel the intervention is for their needs and what suggestions for change do they have?

Furthermore, we assume that relevant stress- and health-related variables will change in the short- (T2 vs. T1) and long term (T3 vs. T1), resulting in improved stress management competences among the target group. We therefore hypothesize the following for an effective intervention:

- H1: The participation in the intervention leads to a reduction in stress-related variables, including (a) perceived stress and (b) burnout symptoms
- H2: The participation in the intervention leads to an increase in health-related variables, including (a) knowledge (cognitive) and (b) wellbeing (affective).
- H3: The participation in the intervention leads to an increase in self-efficacy.
- H4: The participation in the intervention leads to an increase in study engagement.

Materials and methods

Intervention, study design and data collection

From January 19th to 20th, 2022, students at a German high school were given the opportunity to either participate in a 2 days stress and resource management intervention course (i.e., "Simply less stress," SLS, Paulsen and Kortsch, 2020) or choose an alternative exam preparation program (which was planned as a control group). The intervention took place in the context of a full return to face-tp-face schooling, which was implemented again starting in August 2021. Even though face-to-face classes, extracurricular activities, and school trips had resumed under health protocols and adjustments based on infection rates, daily school life was still characterized by uncertainty and restrictions for students in terms of future prospects, as universities had only partially returned to face-to-face teaching, and job offers from companies were low.

The SLS intervention is theoretically based on the assumptions of the transactional stress model (Lazarus and Folkman, 1987) and the job demands- resources model (Bakker and Demerouti, 2007). Its objectives are to promote functional stress management skills and to prevent work-related stress for individuals experiencing stress without mental illness (Paulsen and Kortsch, 2020). The EWS program, which is certified by the German Central Office for Prevention and Health Promotion (Zentrale Prüfstelle Prävention), consists of five main modules that build on each other: (1) understanding stress, (2) recognizing stressors, (3) awakening resources, (4) planning implementation, and (5) responding calmly (see Table 1 for detailed information on the intervention content per module).

An experimental design with a control group was originally planned. The study was designed with four measurement points (pre-post with two follow ups), but the fourth measurement point had to be omitted due to a high dropout rate at T3. Unfortunately, only two students who opted for the alternative offer during the intervention period took part in the evaluation. Therefore, the control group was not considered further in the study, which resulted in a pre-post-follow-up design without a control group. Finally, the evaluation study consisted of three online questionnaires that were sent to the intervention participants at their email addresses. The data was collected online using the survey software SoSci Survey (version 3.2.40; Leiner, 2021), a widely used and established survey platform in academic research in Germany. SoSci Survey is known for its accessible survey interface design and compliance with strict German data privacy regulations which was particularly important given the vulnerability of the student sample. Each survey took approximately 10 min to complete. The first questionnaire (T1) was completed prior to the start of the intervention and included both quantitative assessment of the students' demands and resources, as well as qualitative questions. Those were used to tailor the intervention to the students' needs. One example of a qualitative question in the T1 questionnaire is: "What is causing you stress at the moment?" The second questionnaire (T2) was provided immediately after the intervention, the third questionnaire (T3) 4 weeks after the intervention. A qualitative question from the T2 questionnaire was "What did you find particularly helpful about the "Simply Less Stress" course for high school graduates?"

Participants

A total of 34 students from a German upper school (combines middle- and high-school) participated voluntarily in the intervention and the accompanying evaluation (64.71% female). Two students formed the control group and accepted an alternative offer. One student was excluded from further analysis because he did not complete the evaluation questionnaire at T1. However, as the same student provided qualitative answers at T2, he will still be included in the qualitative analysis. According to the teacher, all participants were over the age of 18 years, which was considered an inclusion factor. Due to the small sample size, the exact age was not asked to preserve the anonymity of the participants. There was a significant dropout of participants between the surveys. At T2, only 18 students participated (72.23% female; dropout rate: 47%), and at T3, only seven people participated in the evaluation (71.43% female; dropout rate: 79%).

The question in the pre-intervention survey (T1) regarding whether respondents were currently undergoing psychological treatment was originally intended as a control question. However, it was revealed that 16 participants (47.1%) were undergoing psychological treatment at the time of the evaluation. After consultation with the students' teachers, all participants were assessed as psychologically stable, and the teachers regarded the stress management training as a helpful resource given the high levels of stress. The proportion of participants undergoing psychological treatment roughly reflected what teachers observed in their everyday school experience. This unintentional division

TABLE 1 SLS intervention contents per module.

Module name	Learning objective	Content
Introduction	Participants understand what to expect in the course.	Welcome and introduction to the course and the SLS program Information on the modules and relevance of stress prevention
1. Understanding stress	Participants understand how stress arises and how it affects their thoughts and actions.	Theory/Input: Information on stress, the Transactional Stress Model and coping, the job demands-resources model, and biological consequences of stress Practice: Exercises on the individual stress process, reflecting on positive and negative stress, recovery strategies, stress symptoms, and constant availability
2. Recognizing stressors	Participants understand triggers of stress and the interaction of situations and personality.	Theory/Input: Information on typical (work-related) stressors and stress-promoting cognitions Practice: Exercises on classifying own stressors, recognizing own stress-promoting cognitions, developing alternative functional cognitions
3. Awakening resources	Participants activate their resources.	Theory/Input: Information on resources and techniques for resource activation Practice: Relaxation exercise, exercises on reflection of resources, and techniques for resource activation
4. Planning implementation	Participants develop strategies to master future stressful situations.	Theory/Input: Information on the Rubicon model and crafting strategies Practice: Exercises on planning the use of new resources and applying crafting strategies
5. Acting calmly	Participants remain calm even in stressful situations.	Theory/Input: Information on the WOOP technique (Oettingen and Reininger, 2016), mental access to experiences of serenity and establishment of new habits Practice: Exercises on developing strategies to overcome potential obstacles, reflecting on your own experiences of calmness, applying, and reflecting of the coffee bean method
Closure	Participants reflect on the course and reinforce learning.	Review of modules Reflections on the transfer of everyday life

Every primary module includes learning objectives, informative inputs, and practice exercises to apply the knowledge to one's own experience.

provided the study with an opportunity to compare the two groups—those undergoing psychological treatment and those not—in a quasi-experimental design, enabling the identification of group-specific effects in addition to the main effects of the intervention. Thus, an additional dropout-Analysis and comparison between the groups of psychological treatment vs. no psychological treatment is provided in the results section. Considering the difficulties faced by most of the target group, an additional counseling service was made available to participants on an ongoing basis, along with other low-level support services. These included a support hotline and local counseling centers, which were sent to their email address. Moreover, the psychologists leading the intervention raised this issue with the participants at the beginning of the intervention and offered additional support onsite.

Instruments

The questionnaire utilized included established instruments that were modified to fit the school context, if needed.

Study demands and resources

The study demands and resources were assessed using the Structural Study Conditions questionnaire (Schmidt et al., 2018). Three subscales were included. *Psychological demands* were measured with seven items (e.g., "My studies are hectic"; α = 0.745). *Social support from classmates* was measured using five items (e.g., "My classmates help with the lessons"; α = 0.835). *Social support from teachers* was measured using five items (e.g., "My teachers support me through good organization"; α = 0.826). The items were rated on a four-point Likert scale (1 = *does not apply*, 4 = *does apply*).

Perceived stress

Perceived stress was measured using the German version (Klein et al., 2016) of the Perceived Stress Scale (PSS-10) (Cohen et al., 1983). The instrument assesses the extent to which one's life is perceived as stressful and uncontrollable based on the frequency of ten thoughts or feelings within the last month (e.g., "How often have you felt nervous or "stressed" in the last month?") rated on a five-point Likert scale from 0 = *never* to 4 = *very ofte*n. The baseline data indicated good internal consistency for the PSS-10 score (α = 0.886).

Burnout

Burnout was measured using the short German version of the Maslach Burnout Inventory–Student Survey (Wörfel et al., 2015). The study assessed three burnout subscales: *exhaustion* (e.g., "School makes me feel drained"; α = 0.756), *loss of meanin*g (e.g., "I question the significance of my schooling"; α = 0.893), and *reduced feeling of efficacy* (e.g., "I don't feel like I can confidently handle demands from school"; α = 0.736). Each subscale was assessed with three items. The overall score had a Cronbach's alpha value

of α = 0.887. The items were rated on a seven-point Likert scale (1 = *never*, 7 = *always*).

Knowledge on stressors and resources

The study assessed the extent of participants' knowledge about their stressors (e.g., "I can recognize my stressors.") and knowledge about their resources (e.g., "I know what helps me in daily life to better deal with my stress."), using a five-point Likert scale to rate agreement on three statements for each construct (Paulsen and Kortsch, 2020). The internal consistency of the knowledge about stressors and knowledge about resources were α = 0.659 and α = 0.872, respectively.

Wellbeing

Wellbeing was measured using the WHO Well-Being Index (WHO-5) (World Health Organization, 1998), which consists of five items (e.g., "In the last 2 weeks I have felt calm and relaxed"; α = 0.880). The items were rated on a six-point Likert scale (1 = *never*, 6 = *always*).

Self-efficacy

Self-efficacy was measured using the General Self-Efficacy Scale (Schwarzer and Jerusalem, 1995), which consists of ten items (e.g., "In unexpected situations, I always know how to behave"; α = 0.854). The items were rated on a four-point Likert scale (1 = *does not apply*, 4 = *does apply*).

Study engagement

Engagement was measured with the Utrecht Work Engagement Scale–Student Form (Schaufeli et al., 2002). The scale includes three items each for *vigor* (e.g., "When I get up in the morning, I look forward to class"; α = 0.757), *dedication* (e.g., "I am enthusiastic about my school education"; α = 0.824), and *absorption* (e.g., "I am immersed in my learning"; α = 0.615). The study engagement overall score had a Cronbach's alpha value of α = 0.896. The items were rated on a seven-point Likert scale (1 = *never*, 7 = *always*).

Data analyses

Statistical analyses were conducted using SPSS Version 28.0 [IBM Corp. Released, (IBM Corp., 2021)] and JASP Version 0.17.3 (JASP Team, 2023). Reported *p*-values are two-sided and a significance level of 0.05 was applied. To examine the research questions, first a median split was made for the variables psychological demands (high vs. low) and teacher support (high vs. low) as well as peer support (high vs. low). The median for the T1 values was calculated in each case (*Mn* = 2.714 for psychological demands, *Mn* = 3.400 for teacher support, and *Mn* = 3.000 for peer support). The cases that were exactly at the median were excluded from these calculations (*n* = 4 for psychological demands, *n* = 6 for teacher support, *n* = 10 for peer support). Subsequently, repeated measurement ANOVA of variance were calculated in a 2 × 2 design, where time (depending on the variable t1 vs. t2 or t1 vs. t3) was the repeated measures factor.

To examine intervention effectiveness, repeated measurement ANOVAs were computed including each measurement point (T1 vs. T2 vs. T3). In case of significant main effects, *a priori*

TABLE 2 Qualitative questionnaire regarding stressors from *n* = 28 participants at baseline (T1) (multiple answers were possible).

Category	Examples of content	No. of mentions
Grading	The upcoming exam season	19
Schooling	Unorganized teachers, especially "School" as a catchword	16
Future	"Future" as well as the question what is happening after the exams	12
Relationships	really high expectations (from themselves and others) as well as relationship types were mentioned	5
Finances	Work alongside school	3
Crisis	COVID-19	3
Time management	Time pressure	2
Other	Getting more autonomous, bodyweight fluctuations	2

defined simple contrast analyses were conducted and partial η^2 were calculated in case of significant differences and interpreted according to the conventions of Cohen (1988).

Results

Baseline results regarding the content of student's stressors

Open questions: To gain an impression of the stress levels of the students studied at baseline (T1), several open questions were asked, the results of which are reported in the following. Most of the participants (*n* = 28) answered the question about stress triggers in the free text field in the T1 questionnaire. In total there were 62 answers given which could be categorized. The top three categories that emerged from the responses highlight significant areas of concern for the students and can be seen in Table 2. Notably, the first prominent category was stress, associated with the upcoming exam season as a prevalent theme, with 19 respondents expressing concerns about the pressure related to exams. Example factors contributing to this category are, for example, a lengthy commute to school, extended school hours until 5 pm and a high number of exams within a short timeframe.

The second prominent category centers around issues related to the school environment, with 16 respondents emphasizing the challenges associated with the overarching theme of "School" as a catchword. The third significant category revolves around future-oriented concerns, with 12 respondents expressing anxieties about what happens post-exams and uncertainties related to their future endeavors. Factors contributing to this category include expectations that may go unfulfilled, concerns about their unclear post-graduation future and considerations about post-graduation choices like career options, further education, or travel. Further results can be seen in the Supplementary Material (e.g., word cloud in Supplementary Figure 1).

Student's psychological demands and resources and how they affect the intervention (research question 1 and 2)

The values and correlations between the different variables at T1 are shown in Table 3. The most important correlations are briefly presented here. First, most of the students agreed to experiencing psychological demands at school, for instance having to work fast or not having much time for their tasks [$M = 2.731$; $SD = 0.078$; 95% CI (2.572, 2.891)]. The measures of psychological demands at school correlated significantly positive with perceived stress ($r = 0.469$; $p < 0.01$), exhaustion ($r = 0.389$; $p < 0.05$), a reduced sense of efficacy ($r = 0.393$; $p < 0.05$), but also negatively with knowledge of resources ($r = –0.427$; $p < 0.05$). Second, while social support from classmates did not correlate significantly with any other variable, social support from teachers was particularly associated with less loss of meaning ($r = –0.382$; $p < 0.05$). Furthermore, the frequency of burnout symptoms, especially exhaustion ($M = 4.762$; $SD = 1.462$) and loss of meaning ($M = 4.714$; $SD = 1.995$), was worrisome, but varied widely (As a reminder, a four on the response scale was defined as regularly). Meanwhile, perceived stress also fluctuated, with most students feeling stressed at least sometimes during the past month ($M = 3.371$; $SD = 0.804$).

The interaction effects and the main effects of the group are particularly interesting for the research questions, as they indicate differential effects of the intervention for the participants with different initial levels of psychological demands and support at T1. For this reason, the focus of the report is on these results. The repeated measurement ANOVAs showed for the psychological demands (high vs. low) a main effect of the factor time [$F(1,13) = 11.738$, $p = 0.005$, partial $\eta^2 = 0.474$] and an interaction effect time*group [$F(1,13) = 6.350$, $p = 0.026$, partial $\eta^2 = 0.328$] was found for knowledge of resources. Bonferroni adjusted post-hoc tests revealed that the increase in knowledge of resources was due to the significant increase in people with high demands at T1 ($\Delta M = 1.250$, $t = 4.352$, $df = 1$, $p$bonf = 0.005).

Regarding the groups of high vs. low teacher support there was a main effect of the group factor for study engagement [$F(1,7) = 9.713$, $p = 0.017$, partial $\eta^2 = 0.581$]. Bonferroni adjusted post-hoc tests revealed that only the high teacher support group had a significant higher level of study engagement ($\Delta M = 1.106$, $t = 3.117$, $df = 1$, $p$bonf = 0.017).

Regarding the groups of high vs. low peer support, there were several significant effects. First, there was a significant time [$F(1,12) = 9.621$, $p = 0.009$, partial $\eta^2 = 0.445$] and interaction effect [$F(1,12) = 5.366$, $p = 0.017$, partial $\eta^2 = 0.309$] for perceived stress. Bonferroni adjusted post-hoc tests revealed that the significant interaction effect was due to a significant decrease in perceived stress only in the high peer support group ($\Delta M = 0.460$, $t = 3.379$, $df = 1$, $p$bonf = 0.033). Second, there was a significant group effect for wellbeing [$F(1,11) = 6.210$, $p = 0.030$, partial $\eta^2 = 0.361$] which was due to a significant higher level of wellbeing in the high peer support group ($\Delta M = 0.970$). Third, there was a significant time [$F(1,11) = 9.060$, $p = 0.012$, partial $\eta^2 = 0.452$] and interaction effect [$F(1,11) = 5.739$, $p = 0.036$, partial $\eta^2 = 0.343$] for the dependent variable study engagement. Bonferroni adjusted post-hoc tests revealed that the significant interaction effect was due to

a significant increase in study engagement only in the high peer support group ($\Delta M = 0.978$, $t = 3.445$, $df = 1$, $p$bonf = 0.033).

The main results of the quantitative analysis regarding the effectiveness of the intervention, are displayed in Table 4. To test the first hypothesis that stress-related variables would decrease as a result of the SLS program perceived stress was assessed prior to the course (T1), immediately following the course (T2), and 4 weeks after the course (T3). Burnout symptoms were only measured at T1 and T3 due to the necessary time period required for the variable to potentially change. The statistical analyses revealed no significant differences in perceived stress [$F(1.116,6.694) = 4.567$, $p = 0.069$] or overall burnout symptoms [$F(1,6) = 5.367$, $p = 0.060$]. Further analyses were conducted to examine whether there were any changes in the subdimensions of Burnout. Although there were no significant differences in exhaustion [$F(1,6) = 2.005$, $p = 0.207$] or loss of meaning [$F(1,6) = 4.571$, $p = 0.089$], a notable difference in reduced experience of efficacy was observed between T1 and T3 [$F(1,6) = 6.568$, $p = 0.043$, η^2partial = 0.523]. Thus, students reported less reduction/more efficacy 4 weeks after the intervention ($M = 2.542$; $SD = 1.034$) compared to before the course ($M = 3.333$; $SD = 1.536$; see Figure 1a).

Second, an increase in health-related variables was hypothesized for cognitive (knowledge) and affective (wellbeing) aspects. We evaluated these factors by investigating individuals' knowledge of stressors and resources, as well as their overall wellbeing. No significant differences in wellbeing were found [$F(2,12) = 0.494$, $p = 0.622$]. However, significant changes were observed for knowledge about stressors [$F(2,10) = 11.563$, $p = 0.003$, η^2partial = 0.698] and resources [$F(1.296,7.778) = 6.063$, $p = 0.034$, η^2partial = 0.503; see Figures 1b, c]. Contrast analyses of knowledge about stressors revealed significant differences between T1 and T2 [$F(1,5) = 20.862$, $p = 0.006 < 0.025$, η^2partial = 0.807] as well as T1 and T3 [$F(1,5) = 21.739$, $p = 0.006 < 0.025$, η^2partial = 0.813]. Students had more knowledge about their individual stressors at school right after the course ($M = 4.167$; $SD = 0.789$) and also 4 weeks later ($M = 4.056$, $SD = 0.772$) compared to prior to the course ($M = 2.944$, $SD = 0,905$). While a priori contrasts between the measurement points of knowledge about resources did not reach significance due to being non-orthogonal and requiring a corrected alpha-level of.025, when T3 was excluded, a significant difference emerged between T1 and T2 [$F(1,15) = 15.769$, $p = 0.001$, η^2partial = 0.512]. More specifically, student's knowledge about resources increased between the start of the course ($M = 2.833$, $SD = 0.873$) and its completion ($M = 3.611$; $SD = 0,752$).

Third, an increase in student's self-efficacy was expected. However, self-efficacy didn't change notably over the course of the study [$F(2,12) = 1.092$, $p = 0.367$].

Lastly, the fourth hypothesis postulated an increase in study engagement. The analysis revealed a significant difference in overall study engagement across measures [$F(2,12) = 9.223$, $p = 0.004$, η^2partial = 0.606]. This effect is supported by a marginal contrast between T1 and T2 [$F(1,6) = 8.605$, $p = 0.026 > 0.025$] and a distinct contrast between T1 and T3 [$F(1,6) = 30.834$, $p = 0.001 < 0.025$, η^2partial = 0.837]. As illustrated in Figure 1d, students' pre-course engagement in studying ($M = 2.603$; $SD = 0.991$) increased immediately after the course ($M = 3.318$, $SD = 1.061$) and raised further 4 weeks later to a notable extent ($M = 3.587$, $SD = 0.944$). Further analysis of the subdimensions in study engagement revealed that the overall increase could not be explained by a

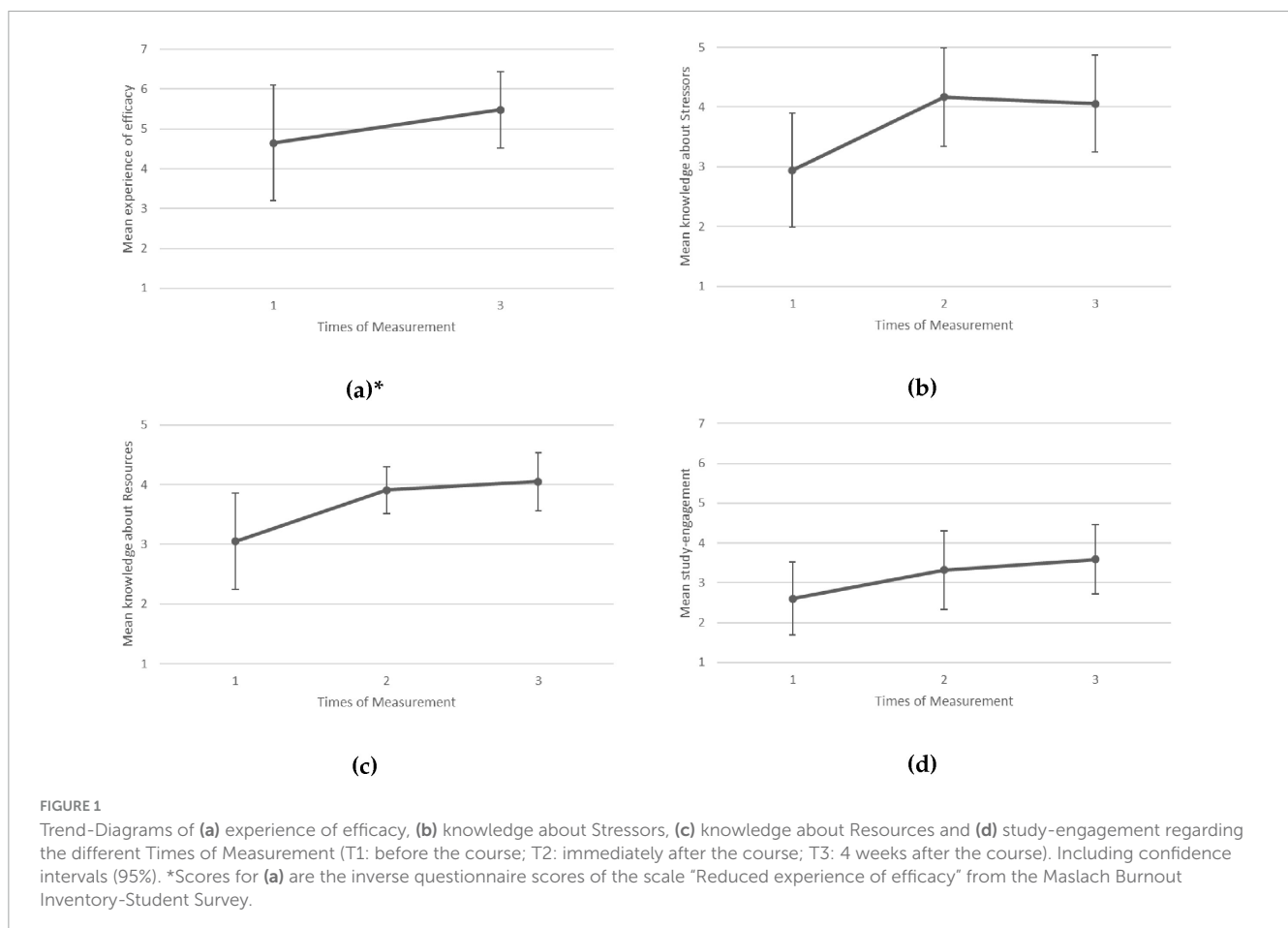**TABLE 3** Descriptive statistics of the included variables at T1.

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Psychological demands	2.731	0.078	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2. Task variety	2.559	0.091	−0.315	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3. Freedom in decision-making	2.317	0.132	−0.321	0.633**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
4. Social support of classmates	3.329	0.090	−0.204	0.165	−0.054	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5. Social support of teachers	2.888	0.082	−0.420*	0.363*	0.261	0.525**	–	–	–	–	–	–	–	–	–	–	–	–	–
6. Perceived stress	3.371	0.804	0.469**	−0.315	−0.315	−0.212	−0.130	–	–	–	–	–	–	–	–	–	–	–	–
7. Burnout symptoms - overall	4.270	1.450	0.322	−0.319	−0.433**	−0.101	−0.327	0.578**	–	–	–	–	–	–	–	–	–	–	–
8. BS - exhaustion	4.762	1.462	0.389*	−0.273	−0.418*	−0.246	−0.278	0.636**	0.890**	–	–	–	–	–	–	–	–	–	–
9. BS - loss of meaning	4.714	1.995	0.109	−0.333	−0.455**	−0.003	−0.382*	0.322	0.850**	0.578**	–	–	–	–	–	–	–	–	–
10. BS - red. feeling of efficacy	3.333	1.563	0.393*	−0.213	−0.238	−0.032	−0.170	0.604**	0.888**	0.802**	0.582**	–	–	–	–	–	–	–	–
11. Knowledge stressors	2.944	0.905	−0.218	0.513**	0.258	0.224	0.007	−0.423*	−0.167	−0.239	−0.035	−0.192	–	–	–	–	–	–	–
12. Knowledge resources	3.048	0.870	−0.427*	0.543**	0.244	0.235	0.296	−0.424*	−0.192	−0.263	−0.077	−0.184	0.580**	–	–	–	–	–	–
13. Wellbeing	3.343	1.081	−0.237	0.532**	0.309	0.296	0.128	−0.689**	−0.439**	−0.550**	−0.216	−0.427*	0.425*	0.430*	–	–	–	–	–
14. Self-efficacy	2.757	0.496	−0.292	0.433*	0.231	0.236	0.264	−0.706**	−0.398*	−0.515**	−0.122	−0.464**	0.418*	0.335	0.628**	–	–	–	–
15. Study engagement - overall	2.603	0.991	−0.200	0.392*	0.404*	0.086	0.148	−0.469**	−0.685**	−0.592**	−0.673**	−0.508**	0.222	0.046	0.516**	0.211	–	–	–
16. SE - vigor	2.517	1.117	−0.249	0.387*	0.442**	0.207	0.110	−0.569**	−0.651**	−0.629**	−0.550**	−0.530**	0.376*	0.123	0.639**	0.360*	0.863**	–	–
17. SE - dedication	2.762	1.182	−0.244	0.379*	0.379*	0.065	0.208	−0.403*	−0.649**	−0.534**	−0.668**	−0.472**	0.100	0.016	0.444**	0.153	0.976**	0.781**	–
18. SE - absorption	2.476	0.879	−0.062	0.322	0.300	−0.027	0.085	−0.336*	−0.594**	−0.482**	−0.635**	−0.407*	0.158	−0.004	0.357*	0.082	0.919**	0.620**	0.904**

BS, burnout symptoms; SE, study engagement; Red, reduced; *$p < 0.05$ (two-tailed), ** $p < 0.01$ (two-tailed) effectiveness of the intervention.

TABLE 4   Main results of the quantitative analysis.

Variable	T1		T2		T3		F	P	Partial η²ᵃ
	M	SD	M	SD	M	SD			
Perceived stress	**3.371**	**0.804**	3.014	0.897	2.586	0.598	4.567	0.069	–
Burnout symptoms (overall)	4.270	1.450	n. m.	n. m.	3.365	1.014	5.367	0.060	–
Burnout - exhaustion	4.762	1.462	n. m.	n. m.	4.000	1.072	2.005	0.207	–
Burnout - loss of meaning	4.714	1.995	n. m.	n. m.	3.517	1.548	4.571	0.089	–
Burnout - reduced experience of efficacy	3.333	1.563	n. m.	n. m.	2.524	1.034	6.568	**0.043**	0.523
Knowledge stressors	2.944	0.905	4.167	0.782	4.056	0.772	11.563	**0.003**	0.698
Knowledge resources	3.048	0.870	3.905	0.418	4.048	0.525	6.063	**0.034**	0.503
Wellbeing	3.343	1.081	3.514	0.729	3.686	0.729	0.494	0.622	–
Self-efficacy	2.757	0.496	2.743	0.621	2.900	0.560	1.092	0.367	–
Study engagement (overall)	2.603	0.991	3.318	1.061	3.587	0.944	9.223	**0.004**	0.606
Study engagement - vigor	2.517	1.117	2.905	1.013	3.333	0.981	2.528	0.121	–
Study engagement - dedication	2.762	1.182	3.429	1.584	3.714	1.393	4.764	**0.030**	0.443
Study engagement - absorption	2.476	0.879	3.619	1.113	3.714	0.705	12.155	**0.001**	0.670

ᵃThe partial η2 was reported only in case of significance. The significance level was set at $p = 0.05$ (two-tailed). Significant results are highlighted in bold. n. m., not measured.

FIGURE 1
Trend-Diagrams of **(a)** experience of efficacy, **(b)** knowledge about Stressors, **(c)** knowledge about Resources and **(d)** study-engagement regarding the different Times of Measurement (T1: before the course; T2: immediately after the course; T3: 4 weeks after the course). Including confidence intervals (95%). *Scores for **(a)** are the inverse questionnaire scores of the scale "Reduced experience of efficacy" from the Maslach Burnout Inventory-Student Survey.

change in vigor [$F(2,12) = 2.528$, $p = 0.121$], but by a development in dedication [$F(2,12) = 4.764$, $p = 0.03$, η^2partial $= 0.443$] and absorption [$F(2,12) = 12.155$, $p = 0.001$, η^2partial $= 0.670$]. More specifically, the same pattern of effect emerged in both subdimensions. Students didn't immediately feel more dedicated comparing T1 ($M = 2.762$, $SD = 1.182$) to T2 ($M = 3.429$, $SD = 1.584$; [$F(1,6) = 2.897$, $p = 0.14$], but did so compared to T3 ($M = 3.714$; $SD = 1.393$; [$F(1,6) = 12.766$, $p = 0.012 < 0.025$,

TABLE 5 Results of the dropout-analysis.

Variable	T1 only (n = 15)		T1 and T2 (n = 11)		All measures (n = 7)		F (df = 2,30)	P
	M	SD	M	SD	M	SD		
Perceived stress	3.147	0.579	3.500	0.615	3.371	0.804	0.964	0.393
Burnout symptoms (overall)	3.741	1.071	3.974	1.200	4.270	1.450	0.475	0.627
Burnout - reduced experience of efficacy	3.244	1.144	3.515	1.196	3.333	1.563	0.149	0.863
Knowledge stressors	3.133	0.754	3.000	0.632	2.905	0.833	0.257	0.775
Knowledge resources	2.667	0.816	2.848	0.993	3.048	0.870	0.455	0.639
Study engagement (overall)	3.356	0.852	2.646	0.663	2.603	0.991	3.170	**0.056**
Study engagement - Vigor	2.978	0.904	2.485	0.524	2.517	1.117	1.216	0.311
Study engagement - dedication	3.489	0.999	2.667	0.856	2.764	1.182	2.569	**0.093**
Study engagement - absorption	3.600	0.969	2.788	0.734	2.476	0.879	4.880	**0.015**

The significance level was set at $p = 0.20$ (two-tailed) for a conservative approach. Significant results are highlighted in bold.

η^2partial = 0.680]. Moreover, students perceived a significant increase in absorption [$F(1,6) = 13.091$, $p = 0.011 < 0.025$, η^2partial = 0.686] comparing T1 ($M = 2.476$; $SD = 0.879$) and T2 ($M = 3.619$; $SD = 1.113$), which persisted ($M = 3.714$; $SD = 0.705$) throughout the next 4 weeks [$F(1,6) = 50.700$, $p > 0.001$, η^2partial = 0.894].

Additional analyses

Additionally, we performed a dropout analysis and an analysis regarding possible differences between students with and without psychological treatment. The results are reported in the following part.

Dropout-analysis

In the previous section, the results of the study on the impact of the intervention on various psychological variables were described. However, high dropout rates emerged as a further issue to address, due to their potential influence on the study's outcomes. To examine, whether dropout influenced the observed changes, participants were categorized into three distinct groups based on their level of participation: Group 1 (completed T1 only; $n = 15$), Group 2 (completed only T1 and T2; $n = 11$), and Group 3 (completed all three surveys; $n = 7$). The results of the Dropout-Analysis are presented in Table 5. ANOVAs were conducted using the initial data to investigate if the groups differed in the characteristics in question before the intervention (T1). Because homogeneity between groups was the intended outcome, the alpha level for these tests was increased to .20 for a conservative approach. Following this principle, only study engagement [$F(2,30) = 3.17$; $p = 0.056$] seemed to be influenced by dropout effects. More specifically, in the subdimensions dedication [$F(2,30) = 2.569$; $p = 0.093$] and absorption [$F(2,30) = 4.88$; $p = 0.015$], but not vigor [$F(2,30) = 1.216$; $p = 0.311$] the .20 limit was exceeded. Further post hoc analyses revealed that participants who completed only T1 had greater overall study engagement ($M = 3.356$, $SD = 0.852$) compared to those who completed both T1 and T2 ($M = 2.646$, $SD = 0.663$; $t = 2.164$; $p = 0.109 < 0.20$) and those who completed all measures ($M = 2.603$, $SD = 0.991$; $t = 1.991$; $p = 0.155 < 0.20$). Additionally, a significant difference in

dedication was observed between participants who completed T1 exclusively ($M = 3.489$, $SD = 0.999$) and those who completed both T1 and T2 ($M = 2.667$, $SD = 0.856$) in a similar manner ($t = 2.082$; $p = 0.129 < 0.20$). Lastly, participants who only filled out the T1 measure ($M = 3.6$, $SD = 0.969$) also demonstrated greater levels of absorption compared to those who completed both T1 and T2 ($M = 2.788$, $SD = 0.734$; $t = 2.327$; $p = 0.077 < 0.20$) and those who completed all measures ($M = 2.476$, $SD = 0.879$; $t = 2.793$; $p = 0.026 < 0.20$).

Differences between students with and without psychological treatment

While the primary focus of the study was on the planned intervention, this section however, delves into the circumstance of closely half of the participants (47.1%) undergoing psychological treatment in any form. This non-intentional division provided the study with the opportunity to compare effectiveness between the two groups of psychological treatment vs. no psychological treatment in the sense of a quasi-experimental design. To investigate whether attendance at psychological treatment influenced the effectiveness of the intervention course, two-way-mixed ANOVAs were conducted to assess the effects within-subjects factor time (T1 and T2) and the between-subjects factor group (psychological treatment yes vs. no) on the measured variables. Measurement point T3 was not included in the analysis due to the high dropout. Furthermore, an interaction effect was observed in the domain of wellbeing [$F(1,12) = 5.12$, $p = 0.043$], as well as a main effect over time indicating a significant change of wellbeing between T1 and T2 [$F(1,12) = 6.916$, $p = 0.022$]. Participants, who were undergoing a psychological treatment, displayed a higher increase in wellbeing between T1 ($M = 2.667$, $SD = 0.847$) and T2 ($M = 3.667$, $SD = 0.764$) than students without treatment at T1 ($M = 3.325$, $SD = 0.847$) and T2 ($M = 3.400$, $SD = 0.764$). Additionally, to assess potential disparities at the study's outset, t-tests were conducted to examine whether there were significant differences at T1 between participants receiving psychological treatment and those without such treatment. Notably, the analysis revealed no significant differences in any of the measured variables at T1 ($p > 0.05$), indicating that participants from both groups exhibited comparable characteristics before the intervention commenced. An examination of dropout

patterns among participants in terms of psychological treatment status revealed that, while a similar number of participants from both groups participated at T1, a descriptive dropout analysis, conducted through cross-table examination, unveiled variations in dropout rates. Specifically, more participants undergoing psychological treatment ($n = 8$) chose to discontinue their participation in the study.

Qualitative results on the application of the intervention to the target group of high school students (research question 3)

In the T2 questionnaire, the participants were given the opportunity to provide detailed feedback on the intervention in a free text field. The participating students were asked to evaluate the adapted intervention, particularly because it was implemented for this target group for the first time. Nineteen participants responded to the evaluation questionnaire at T2 and provided personal feedback in various categories. To protect their privacy, the statements were anonymized, analyzed, and categorized. We tried to put a focus on potential differences between participants that are currently seeking therapy or counseling ($n = 9$) and those that don't ($n = 10$).

Regarding the first question, "What did you find particularly helpful about the "Simply Less Stress" course for high school graduates?" participants across both groups highlighted the importance of identifying stressors and employing relaxation techniques, such as "dream journeys" or meditation, to escape stressors. Students primarily cited increased knowledge of resources and stressors, methods for dealing with stress, and the possibility of social comparison with other peers. For example, the creation of a mental image of calmness was prevalent in the strategies discussed. The use of resources, both in recognizing and remembering them, emerged as a crucial element. Examples of qualitative feedback categorized as "stress management techniques" are "A diverse array of techniques to reduce stress." or "I learned methods to avoid or balance my stress. The journey to my place of rest, to which I can return again and again, was particularly helpful." An example of the category "Knowledge increase" is "Learning about my resources, knowing what stress actually is and what triggers it." An example of the category "social aspects" is "How my classmates feel about stress." People that were getting psychological support at that moment mentioned social aspects slightly more than the other group, but there weren't any more striking differences.

We also asked our participants what they would appreciate to better adapt our program to the target group of students: Even though the feedback is subjective and varies individually, they summarily agreed, that the amount of theoretical content should be reduced. Additionally, the timing of the course should be adjusted to a time frame where the stress level is not lower than at other times (e.g., not after holidays). One student asked for more examples outside of the school context. While those, that aren't seeking any counseling or therapy put a focus on more practical exercises, people that did seek support of any kind mentioned future concerns. Future concerns, as indicated by a word cloud

(see Supplementary Figure 1) and the questionnaire at T1, should be more of a focus. The differences were small and there weren't systematic differences. Notably, one student mentioned: "I think you've done a good job of adapting (the intervention) to our age group. Especially the digital aspect, where everyone could vote anonymously or express their thoughts, was suitable, because from (my) personal experience not everyone likes to talk openly about their feelings/thoughts."

Discussion

To address stress effectively, it is increasingly important to develop preventive measures tailored to the needs of different target groups. Given the rise in mental health problems, students represent a particularly important target group for stress management and resource-focused interventions (Reiß et al., 2023; KKH, 2024; Hansen et al., 2023). The primary objective of this pilot study was to evaluate the effectiveness of a stress management intervention – previously shown to be effective in adult and university student groups (Paulsen and Kortsch, 2020; Fasthoff et al., 2023; Körner et al., 2024)—within the context of graduating students. A range of measurement tools was used to assess changes in stress-related variables, health indicators, study engagement, and proactive behaviors.

The findings of the study provide valuable insights, both confirming and challenging initial expectations. The first aim was to examine the role of initial psychological demands and social resources (teachers and peers) in determining the intervention's effectiveness. The results showed that students with high initial demands particularly benefited from learning about their resources, while perceived teacher and peer support positively influenced study engagement. High peer support also contributed to stress reduction and overall wellbeing, underscoring the importance of integrating social resources into such interventions, particularly for highly stressed students.

Regarding the first hypothesis, while immediate reductions in perceived stress and burnout symptoms were not observed, the intervention led to a significant increase in participants' perceived ability to manage demands. This suggests that the intervention may not have provided immediate relief but instead strengthened coping efficacy, potentially buffering against future increases in stress or burnout—an effect that warrants further investigation. Prior research suggests that such long-term benefits may emerge over time (Tan and Martin, 2015).

The second hypothesis predicted improvements in affective wellbeing and cognitive aspects. Although the intervention's impact on affective wellbeing was limited, it significantly enhanced students' understanding of their stressors and available coping resources. This effect was most pronounced in students with high initial demands, highlighting the intervention's effectiveness in raising cognitive awareness and supporting essential coping mechanisms (Heber et al., 2017; Amanvermez et al., 2020; Yusufov et al., 2019). These findings align with the results of Vogelaar et al. (2024), who demonstrated that brief psychoeducational programs, such as the *Stress Lessons*, effectively increased students' knowledge about stress, even though no immediate reductions in experienced stress were observed. Similar to the current study, Vogelaar et al.

(2024) found that knowledge gains were particularly evident for specific subgroups, such as academically oriented students. This suggests that enhancing cognitive understanding of stress and resources is an important and achievable goal of school-based interventions, even if affective outcomes require additional intervention components or longer-term evaluations.

Contrary to the third hypothesis, no significant changes in proactive academic behavior or self-efficacy were observed. However, the intervention appeared to serve as a stabilizing factor, as students maintained their academic proactivity despite increasing exam pressures. This suggests that the intervention may help sustain academic engagement rather than actively boost proactive behaviors during particularly stressful periods.

Supporting the fourth hypothesis, the intervention significantly improved study engagement, particularly in the dimensions of dedication and absorption. This effect was further amplified by social support, aligning with previous findings (Körner et al., 2024) that emphasize the role of immersion and focused attention on academic tasks following stress management interventions.

Overall, this pilot study demonstrates the transferability of the SD-R framework (Lesener et al., 2020) and its extensions (Bakker and Mostert, 2024) to the school context. While previous research has shown the effectiveness of SD-R-based interventions in university settings (Körner et al., 2024), this study extends its applicability to graduating students. The findings indicate that such interventions can improve perceived stress management abilities and cognitive awareness, particularly during high-stress phases like exam preparation. However, the limited impact on stress-related variables and proactive behaviors highlights areas for further refinement. This aligns with findings from Juhász et al. (2024), who reported small but significant effects for school-based stress management interventions. Their observation that targeted interventions tend to yield larger effects suggests the need for further adaptation to meet the specific needs of graduating students.

Qualitative analysis of student's stressors and intervention effectiveness

The qualitative analysis provided deeper insights into the stressors faced by students and the perceived effectiveness of the intervention. Participants reported a range of stressors, including school-related pressures from graduation preparation, perspective-related uncertainties, and global stressors, such as the war in Ukraine. These findings align well with existing literature on pandemic-related stress, because of uncertainty about the future in schools in Germany (Reiß et al., 2023; KKH, 2024; Hansen et al., 2023) and heightened risk for stress-related issues, because they also approach high stakes assessments (Jagiello et al., 2024). This highlights the need for interventions that address the various and complex challenges that high-school students encounter daily.

Furthermore, students emphasized the importance of practical stress management strategies and relaxation techniques tailored to their needs. Feedback highlighted the value of aligning interventions with peak stress periods and incorporating relatable examples beyond the academic context. Customizing interventions to students' lived experiences and timing could

enhance their effectiveness in promoting stress management and overall wellbeing.

Exploratory analysis of dropout

The analysis of dropout patterns revealed connections between academic engagement and study participation. Interestingly, students who completed only the initial survey showed higher academic engagement, likely prioritizing exam preparation over continued participation. Conversely, those who completed all surveys may have been motivated by a desire to enhance their study engagement. Notably, the observed increase in engagement from T1 to T3 suggests that the evaluation process itself encouraged students to reflect on their academic involvement. This highlights a dynamic relationship between evaluation and academic engagement, suggesting that integrating reflective elements into future interventions could enhance their impact.

Exploratory analysis of psychological treatment

A surprisingly high proportion of students reported receiving concurrent psychological treatment, an exclusion variable in previous implementations of the intervention (Paulsen and Kortsch, 2020). Comparisons between treated and untreated groups revealed no significant baseline differences, and students undergoing treatment benefited equally from the intervention. Interestingly, participants in psychological treatment demonstrated greater improvements in wellbeing despite starting with lower initial levels, suggesting a higher potential for stress-related growth in this group (Waters et al., 2021). Qualitative feedback revealed that sharing experiences of stress and concerns with classmates provided valuable peer support. This realization can be particularly supportive for students undergoing psychological treatment, as they have people around them who face similar challenges, thus getting access to important social support by their peers (Mokgele and Rothmann, 2014; Schmiedl et al., 2022). Additionally, participants who received therapy showed a higher tendency toward avoidance strategies which can be detrimental when facing unavoidable situations like exams and should be addressed when talking about coping strategies (Lazarus and Folkman, 1987). However, the higher dropout rate in this group suggests that additional incentives may be needed to maintain participation among students receiving psychological treatment, especially during periods of high pressure.

Learnings from the pilot study, limitations and future directions

As a pilot study, this research has several limitations, but it also offers important insights for future interventions. First, integrating stress management training into the exam preparation phase for graduating students presents a major opportunity. Both the school and the students explicitly called for such initiatives, indicating a clear demand for tailored support during this critical period.

However, a challenge in this study was the short preparation time and the limitations of the study design. Although a control group was originally planned, this proved impractical, as potential participants were involved in exam preparation and therefore unwilling to participate. This resulted in a high dropout rate, which affected the generalizability of the study. Future studies should explore alternative designs, such as matched control groups or longitudinal approaches, to ensure both feasibility and scientific rigor (Lowe and Wuthrich, 2021). Targeted stress management interventions during exam periods could address early signs of distress and problem behaviors, potentially preventing burnout-related issues (KKH, 2024; Voltmer et al., 2021; Hansen et al., 2023).

Second, the observed high dropout rate in this study was likely due to competing priorities during the final exam preparation phase. Time constraints and competing demands may have led to lower participation rates as students focused on their exams. Although this limits the generalizability of the findings, the dropout analysis confirmed that systematic biases were not present. Other research has shown that stress management interventions can be particularly beneficial during highly stressful phases (Körner et al., 2024), further underscoring the importance of targeted support. Future studies could implement adaptive intervention designs (e.g., shorter measurement time points) and strategic engagement approaches (e.g., embedded incentives such as vouchers, prize draws, or personalized feedback) to increase student retention and reduce dropout.

Third, reflecting on the study design, the use of a quasi-experimental approach with a self-selected sample was pragmatic but not ideal. While this method allowed for seamless integration into the school context without major disruptions, it also introduced potential biases and lacked the robustness of a randomized controlled trial. To improve validity, future research should aim to implement experimental designs with randomization or waiting-list control groups, where feasible. This would help reduce confounding variables and control for effects such as mere-measurement biases (Morwitz et al., 1993). Given the practical constraints in educational settings, alternative methods such as propensity score matching (e.g., Schneider et al., 2010) or within-subject designs may offer viable solutions for increasing internal validity without disrupting school routines. However, implementing such designs requires significant adaptability from both schools, students, and trainer.

Finally, this study highlights the potential for behavioral stress management interventions not only in primary and secondary prevention but also in tertiary prevention, particularly for students undergoing psychological treatment. The findings suggest positive effects on stress-related outcomes even in combination with ongoing therapy, although further research is needed to explore the nature and severity of the treatments involved. Differentiating between various psychological conditions, such as test anxiety, diagnosed depression, or other challenges, would provide deeper insights into the specific benefits of stress management interventions in educational settings.

Conclusion

This pilot study highlights the promising potential of stress management interventions tailored to graduating students facing the challenges of exams and uncertainties about their future, particularly within the context of the COVID-19 pandemic. Using both quantitative and qualitative analyses, the study evaluated the intervention's effectiveness and explored the stressors affecting students during this critical period. Quantitatively, while no immediate reductions in stress-related variables were observed, the intervention led to significant improvements in students' perceived ability to manage demands and their cognitive awareness of stressors and coping resources. Although proactive academic behavior remained largely unchanged, notable increases in overall study engagement, particularly in dedication and absorption—suggest that the intervention promoted deeper immersion in academic tasks. Qualitatively, students identified a variety of stressors, including exam pressures, school-related challenges, and uncertainties about post-graduation life. Feedback on the intervention emphasized the importance of practical stress management strategies, flexible timing, and content relevance to students' broader life contexts. These findings suggest that interventions should prioritize practical techniques, align with peak stress periods, and address students' real-world experiences beyond the academic setting. Overall, this study demonstrates the transferability of stress management programs to the school context and provides initial evidence for their effectiveness. While the intervention showed clear benefits in specific domains, further refinements are needed to achieve consistent reductions in stress and foster proactive academic behaviors. Future research should focus on long-term evaluations, including the sustainability of intervention effects during transitions into university or the workforce, and explore strategies to enhance engagement, particularly in highly demanding phases such as exam preparation.

Data availability statement

The datasets presented in this article are not readily available due to a small and vulnerable sample. Requests to access the datasets should be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Ethik-Kommission der IU International University of Applied Sciences. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

TK: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review and editing. NW: Conceptualization, Data curation,

Formal Analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review and editing. MS: Visualization, Writing – original draft, Writing – review and editing, Formal Analysis.

Funding

Conflict of interest

TK is the developer of the stress management intervention "Einfach weniger Stress" and profits from the sales of the face-to-face training and the online course. However, he acts according to the Ethical Principles of Psychologists and Code of Conduct from the Federation of German Psychologist Associations (DGPs).

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

Generative AI statement

The author(s) verify and take full responsibility for the use of generative AI in the preparation of this manuscript. Generative AI was used to improve the manuscript language. All suggested changes by the AI were carefully reviewed.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2025. 1548425/full#supplementary-material

References

Allen, K., 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

Amanvermez, Y., Rahmadiana, M., Karyotaki, E., de Wit, L., Ebert, D. D., Kessler, R. C., et al. (2020). Stress management interventions for college students: A systematic review and meta-analysis. *Clin. Psychol. Sci. Pract.* 30, 423–444. doi: 10.1111/cpsp. 12342

Andresen, S., Lips, A., Rusack, T., Schröer, W., Thomas, S., and Wilmes, J. (2022). *Verpasst? Verschoben? Verunsichert? Junge Menschen Gestalten ihre Jugend in der Pandemie. [Missed it? Postponed? Insecure? Young People are Shaping Their Youth During The Pandemic.].* Germany: Universitätsverlag Hildesheim, doi: 10.1844 2/205

Bakker, A. B., and Demerouti, E. (2007). The job demands-resources model: State of the art. *J. Manag. Psychol.* 22, 309–328. doi: 10.1108/02683940710733115

Bakker, A. B., and Mostert, K. (2024). Study demands–resources theory: Understanding student well-being in higher education. *Educ. Psychol. Rev.* 36:92. doi: 10.1007/s10648-024-09940-8

Bakker, A. B., Sanz Vergel, A. I., and Kuntze, J. (2015). Student engagement and performance: A weekly diary study on the role of openness. *Motiv. Emot.* 39, 49–62. doi: 10.1007/s11031-014-9422-5

Barbier, M., Hansez, I., Chmiel, N., and Demerouti, E. (2013). Performance expectations, personal resources, and job resources: How do they predict work engagement? *Eur. J. Work Organ. Psychol.* 22, 750–762. doi: 10.1080/1359432X.2012. 704675

Bhui, K. S., Dinos, S., Stansfeld, S. A., and White, P. D. (2012). A synthesis of the evidence for managing stress at work: A review of the reviews reporting on anxiety, depression, and absenteeism. *J. Environ. Public Health.* 2012:515874. doi: 10.1155/ 2012/515874

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*, 2nd Edn. New York: Taylor & Francis Group.

Cohen, S., Kamarck, T., and Mermelstein, R. (1983). *Perceived Stress Scale.* Washington, DC: APA, doi: 10.1037/t02889-000

Demerouti, E., Bakker, A. B., Nachreiner, F., and Schaufeli, W. B. (2001). The job demands-resources model of burnout. *J. Appl. Psychol.* 86, 499–512. doi: 10.1037/ 0021-9010.86.3.499

Fabian, A. (2019). *Evaluation der Effekte von zwei Stresspräventions-Interventionen auf Stresserleben und -Bewältigung. [Evaluation of the effects of Two Stress Prevention Interventions on Stress Experience and coping].* Unpublished master's thesis. Braunschweig: Technische Universität Braunschweig.

Fasthoff, R. M., Nolte, L., and Kortsch, T. (2023). Effectiveness of digital and analog stress management interventions within occupational health management in the public sector. *Merits* 3, 615–639. doi: 10.3390/merits3040037

Gusy, B., Wörfel, F., and Lohmann, K. (2016). Erschöpfung und engagement im studium. [exhaustion and engagement in university students.]. *Zeitschrift für Gesundheitspsychol.* 24, 41–53. doi: 10.1026/0943-8149/a000153

Hansen, J., Galimov, A., Unger, J. B., Sussman, S. Y., and Hanewinkel, R. (2023). Mental health and physical complaints of german children and adolescents before and during the COVID-19 pandemic: A repeated cross-sectional study. *Int. J. Environ. Health Res.* 20:4478. doi: 10.3390/ijerph20054478

Heber, E., Ebert, D. D., Lehr, D., Cuijpers, P., Berking, M., Nobis, S., et al. (2017). The benefit of web- and computer-based interventions for stress: A systematic review and meta-analysis. *J. Med. Internet Res.* 19:5774. doi: 10.2196/jmir.5774

Heyer, L. (2022). Zeit-bezogene perspektiven auf Jugend und Erfahrungen von Jugendlichen in der Corona-Pandemie. [Time-related perspectives on youth and the experiences of young people during times of COVID-19]. *Gr Interakt Org.* 53, 73–81. doi: 10.1007/s11612-022-00623-y

IBM Corp. (2021). *IBM SPSS Statistics for Windows, Version 28.0.* Armonk, NY: IBM Corp.

Jagiello, T., Belcher, J., Neelakandan, A., Boyd, K., and Wuthrich, V. M. (2024). Academic stress interventions in high schools: A systematic literature review. *Child Psychiatry Hum. Dev.* 1–34. doi: 10.1007/s10578-024-01667-5

JASP Team. (2023). *JASP (Version 0.17.3) [Computer software].* Amsterdam: JASP Team.

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. Schl. Psychol.* 106:101352. doi: 10.1016/j.jsp.2024.101352

Kaman, A., Erhart, M., Devine, J., Reiß, F., Napp, A.-K., Simon, A. M., et al. (2023). Two years of pandemic: The mental health and quality of life of children and adolescents—Findings of the COPSY longitudinal study. *Dtsch. Arztebl. Int.* 120, 269–270. doi: 10.3238/arztebl.m2023.0001

KKH (2024). *Corona Stresst 77 Prozent der Schüler. [Corona Stresses 77 Per Cent of Students].* Available online at: https://www.kkh.de/presse/pressemeldungen/ schuelerstress (accessed on 28 April 2024).

Klasen, F., Meyrose, A. K., Otto, C., Reiss, F., and Ravens-Sieberer, U. (2017). Psychische Auffälligkeiten von Kindern und Jugendlichen in Deutschland: Ergebnisse der BELLA-Studie (Leitthema) [Mental disorders in children and adolescents in Germany: Results of the BELLA study]. *Monatsschrift Kinderheilkunde*, 165, 402–407.

Klein, E. M., Brähler, E., Dreier, M., Reinecke, L., Müller, K. W., Schmutzer, G., et al. (2016). The German version of the perceived stress scale - Psychometric characteristics in a representative German community sample. *BMC Psychiatry* 16:159. doi: 10.1186/s12888-016-0875-9

Klusmann, U., Aldrup, K., Roloff-Bruchmann, J., Carstensen, B., Wartenberg, G., Hansen, J., et al. (2023). Teachers' emotional exhaustion during the Covid-19 pandemic: Levels, changes, and relations to pandemic-specific demands. *Teach. Teach. Educ.* 121:103908. doi: 10.1016/j.tate.2022.103908

Körner, L., Kortsch, T., Rieder, K., and Rigotti, T. (2024). Evaluation of two study demands-resources-based interventions: A randomized controlled trial. *Front. Psychol.* 15:1368267. doi: 10.3389/fpsyg.2024.1368267

Kortsch, T., Paulsen, H., and Fabian, A. (2019). "Training or app? Comparison of two stress prevention interventions for the digitalized world of work. Presented at the European health psychology, Dubrovnic, Croatia, September 2019," in *Proceedings of the 33rd Annual Conference*, (ACM).

Kröll, C., Doebler, P., and Nüesch, S. (2017). Meta-analytic evidence of the effectiveness of stress management at work. *Eur. J. Work Organ. Psychol.* 26, 677–693. doi: 10.1080/1359432X.2017.1347157

Lazarus, R. S., and Folkman, S. (1987). Transactional theory and research on emotions and coping. *Eur. J. Pers.* 1, 141–169. doi: 10.1002/per.2410010304

Lee, J. (2020). Mental health effects of school closures during COVID-19. *Lancet Child Adolesc. Health* 4:421. doi: 10.1016/S2352-4642(20)30109-7

Leiner, D. J. (2021). *SoSci Survey Version 3.2.40 [Computer software]*.

Lesener, T., Pleiss, L. S., Gusy, B., and Wolter, C. (2020). The study demands-resources framework: An empirical introduction. *Int. J. Environ. Health Res.* 17:5183. doi: 10.3390/ijerph17145183

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

Mokgele, K. R. F., and Rothmann, S. (2014). A structural model of student well-being. *S. Afr. J. Psychol.* 44, 514–527. doi: 10.1177/0081246314541589

Morwitz, V. G., Johnson, E., and Schmittlein, D. (1993). Does measuring intent change behavior? *J. Consum. Res.* 20, 46–61. doi: 10.1086/209332

Neugarten, B. L., Moore, J. W., and Lowe, J. C. (1965). Age norms, age constraints, and adult socialization. *Am. J. Sociol.* 70, 710–717. doi: 10.1086/223965

Nusser, L. (2021). Learning at home during COVID-19 school closures–How do German students with and without special educational needs manage? *Eur. J. Spec. Needs Educ.* 36, 51–64. doi: 10.1080/08856257.2021.1872845

Oettingen, G., and Reininger, K. M. (2016). The power of prospection: Mental contrasting and behavior change. *Soc. Personal. Psychol.* 10, 591–604. doi: 10.1111/spc3.12271

Paulsen, H., and Kortsch, T. (2020). *Stressprävention in Modernen Arbeitswelten: Das "Einfach weniger Stress"-Manual [Stress Prevention in Modern Working Environments: The Simply Less Stress Manual]*, 1st Edn. Göttingen: Hogrefe.

Ravens-Sieberer, U., Erhart, M., Devine, J., Gilbert, M., Reiss, F., Barkmann, C., et al. (2022). Child and adolescent mental health during the COVID-19 pandemic: Results of the three-wave longitudinal COPSY study. *J. Adolesc. Health.* 71, 570–578. doi: 10.1016/j.jadohealth.2022.06.022

Ravens-Sieberer, U., Kaman, A., Erhart, M., Otto, C., Devine, J., Löffler, C., et al. (2021). Quality of life and mental health in children and adolescents during the first year of the COVID-19 pandemic: Results of a two-wave nationwide population-based study. *Eur. Child Adolesc. Psychiatry* 32, 575–588. doi: 10.1007/s00787-021-01889-1

Reichel, J. L., Dietz, P., Mülder, L. M., Werner, A. M., Heller, S., Schäfer, M., et al. (2023). Predictors of resilience of university students to educational stressors during the COVID-19 pandemic: A longitudinal study in Germany. *Int. J. Stress Manag.* 30, 172–183. doi: 10.1037/str0000289

Reiß, F., Napp, A.-K., Erhart, M., Devine, J., Dadaczynski, K., Kaman, A., et al. (2023). Prevention perspective: Mental health of schoolchildren in Germany. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 66, 391–401. doi: 10.1007/s00103-023-03674-8

Richardson, K. M., and Rothstein, H. R. (2008). Effects of occupational stress management intervention programs: A meta-analysis. *J. Occup. Health Psychol.* 13, 69–93. doi: 10.1037/1076-8998.13.1.69

Sakuraya, A., Imamura, K., Watanabe, K., Asai, Y., Ando, E., Eguchi, H., et al. (2020). What kind of intervention is effective for improving subjective well-being among workers? A systematic review and meta-analysis of randomized controlled trials. *Front. Psychol.* 11:528656. doi: 10.3389/fpsyg.2020.528656

Sari, E., Bittmann, F., and Homuth, C. (2023). Explaining inequalities of homeschooling in germany during the first COVID-19 lockdown. *Front. Educ.* 8:1154389. doi: 10.3389/feduc.2023.1154389

Schaufeli, W. B., Martinez, I. M., Marques Pinto, A., Salanova, M., and Bakker, A. B. (2002). Burnout and engagement in university students. *J. Cross. Cult. Psychol.* 33, 464–481. doi: 10.1177/0022022102033005003

Schmidt, L. I., Scheiter, F., Neubauer, A., and Sieverding, M. (2018). Anforderungen, entscheidungs-freiräume und stress im studium. [demands, decision latitude, and stress among university students.]. *Diagnostica* 65, 63–74. doi: 10.1026/0012-1924/a000213

Schmiedl, A., Schulte, E., and Kauffeld, S. (2022). The demands-buffering role of perceived and received social support for perceived stress and cortisol levels. *Eur. J. Health Psychol.* 29, 175–186. doi: 10.1027/2512-8442/a000110

Schneider, B., McDonald, S. K., Peterson, P., Baker, E., and McGaw, B. (2010). "Methods for approximating random assignment," in *International Encyclopedia of Education*, 3rd Edn, (Amsterdam: Elsevier), 97–103. doi: 10.1016/B978-0-08-044894-7.01689-4

Schwarzer, R., and Jerusalem, M. (1995). "Generalized self-efficacy scale (GSES)," in *Measures in Health Psychology: A User's Portfolio. Causal and Control Beliefs*, eds J. Weinman, S. Wright, and M. Johnston (Windsor: NFER-NELSON), 35–37.

Seguin, D., Kuenzel, E., Morton, J. B., and Duerden, E. G. (2021). School's out: Parenting stress and screen time use in school-age children during the COVID-19 pandemic. *J. Affect. Disord. Rep.* 6:100217. doi: 10.1016/j.jadr.2021.100217

Sonnenburg, N., Buddeberg, M., and Hornberg, S. (2022). The German school system in the COVID-19 pandemic era. *Tertium Comp.* 28, 332–355. doi: 10.25656/01:25330

Tan, L., and Martin, G. (2015). Taming the adolescent mind: A randomised controlled trial examining clinical efficacy of an adolescent mindfulness-based group programme. *J. Child Adolesc. Ment. Health* 20, 49–55. doi: 10.1111/camh.12057

Tetrick, L. E., and Winslow, C. J. (2015). Workplace stress management interventions and health promotion. *Annu. Rev. Organ. Psychol. Organ. Behav.* 2, 583–603. doi: 10.1146/annurev-orgpsych-032414-111341

van Loon, A. W. G., Creemers, H. E., Beumer, W. Y., Okorn, A., Vogelaar, S., Saab, N., et al. (2020). Can schools reduce adolescent psychological stress? A multilevel meta-analysis of the effectiveness of school-based intervention programs. *J. Youth Adolesc.* 49, 1127–1145. doi: 10.1007/s10964-020-01201-5

Vogelaar, S., Miers, A. C., Saab, N., Dusseldorp, E., van Loon, A. W., Creemers, H. E., et al. (2024). Teaching adolescents about stress using a universal school-based psychoeducation program: A cluster randomised controlled trial. *Schl. Mental Health* 16, 467–482. doi: 10.1007/s12310-024-09651-z

Voltmer, E., Köslich-Strumann, S., Walther, A., Kasem, M., Obst, K., and Kötter, T. (2021). The impact of the COVID-19 pandemic on stress, mental health and coping behavior in German University students–A longitudinal study before and after the onset of the pandemic. *BMC Public Health* 21:1385. doi: 10.1186/s12889-021-11295-6

Waters, L., Allen, K. A., and Arslan, G. (2021). Stress-related growth in adolescents returning to school after COVID-19 school closure. *Front. Psychol.* 12:643443. doi: 10.3389/fpsyg.2021.643443

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

Wörfel, F., Gusy, B., Lohman, K., and Kleiber, D. (2015). Validierung der deutschen Kurzversion des Maslach-Burnout-Inventars für Studierende (MBI-SS KV). [Validation of the german short version of the maslach-burnout-inventory for Students (MBI-SS KV)]. *Zeitschrift für Gesundheitspsychol.* 23, 191–196. doi: 10.1026/0943-8149/a000146

World Health Organization. (1998). *Wellbeing Measures in Primary Health Care/the DepCare PROJECT: Report on a WHO Meeting: Stockholm, Sweden, 12–13 February 1998*. Geneva: WHO

Yusufov, M., Nicoloro-SantaBarbara, J., Grey, N. E., Moyer, A., and Lobel, M. (2019). Meta-analytic evaluation of stress reduction interventions for undergraduate and graduate students. *Int. J. Stress Manag.* 26, 132–145. doi: 10.1037/str0000099

Zacher, H., and Rudolph, C. W. (2024). Subjective wellbeing during the COVID-19 pandemic: A 3-Year, 35-wave longitudinal study. *J. Posit. Psychol.* 19, 442–456. doi: 10.1080/17439760.2023.2224757

Zeijen, M. E. L., Brenninkmeijer, V., Peeters, M. C. W., and Mastenbroek, E. K. J. M. (2021). Exploring the role of personal demands in the health-impairment process of the job demands-resources model: A study among master students. *Int. J. Environ. Res. Public Health* 18:632. doi: 10.3390/ijerph18020632