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'Grow For It!': School-based Intervention to reduce adolescents' school stress and increase learning and motivation

Lucija Andre[1], Joost Jansen in de Wal[2], Jaap A. Schuitema[3], Thijmen van Alphen[4] y Thea T. D. Peetsma[5]

[1] *Faculty of Psychology and Educational Sciences, Vrije Universiteit Brussels*

[1,2,3,4,5] *Research Institute of Child Development and Education, University of Amsterdam*

This study introduced and evaluated 'Grow for it!', a school-based multicomponent intervention designed to enhance adolescents' Future Time Perspective (FTP) and Growth Mindset (GM) to reduce school stress and improve learning and motivation. A total of 323 Dutch students were randomly assigned to the intervention or control group. The intervention group showed a significant decrease in test anxiety over time, and reported higher FTP, learning investment, GM, and intrinsic motivation at post-test. However, these effects did not persist longitudinally, limiting evidence of the intervention's overall effectiveness. Nevertheless, our study provided valuable insights into the combined potential of FTP and GM in influencing academic outcomes and highlighted the need for more research about the role of positive adaptive beliefs.

Keywords: future time perspective, growth mindset, school stress, motivation, school-based intervention.

¡A crecer! una intervención escolar para reducir el estrés escolar e incrementar el aprendizaje y la motivación em adolescentes

Este estudio presentó y evaluó ¡A crecer!: una intervención escolar multicomponente diseñada para mejorar la Perspectiva de Tiempo Futuro (PTF) y la Mentalidad de Crecimiento (MC) en adolescentes, con el objetivo de reducir el estrés escolar y mejorar el aprendizaje y la motivación. Un total de 323 estudiantes neerlandeses fueron asignados aleatoriamente a un grupo de intervención o control. El grupo de intervención mostró una disminución significativa de la ansiedad ante los exámenes a lo largo del tiempo y puntuaciones más altas en PTF, inversión en el aprendizaje, MC y motivación intrínseca en la prueba posterior.

Lucija Andre https://orcid.org/0000-0002-2125-3264
Joost Jansen in de Wal https://orcid.org/0000-0003-4969-750X
Jaap A. Schuitema https://orcid.org/0000-0002-0125-5537
Thijmen van Alphen https://orcid.org/0000-0003-3983-0370
Thea T. D. Peetsma https://orcid.org/0000-0003-3052-7236
All correspondence about this article must be addressed to Lucija Andre. Email: lucija.andre@vub.be

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Sin embargo, estos efectos no se mantuvieron a largo plazo, lo que limita la evidencia sobre la efectividad global de la intervención. A pesar de esto, los hallazgos proporcionaron valiosas ideas sobre el potencial combinado de la PTF y la MC para influir en los resultados académicos y subrayan la necesidad de más investigación sobre el papel de las creencias adaptativas positivas.
Palabras clave: perspectiva de tiempo futuro, mentalidad de crecimiento, estrés escolar, motivación, intervención escolar.

"Grow For It!": Intervenção baseada na escola para reduzir o estresse escolar dos adolescentes e aumentar o aprendizado e a motivação

Este estudo apresentou e avaliou a intervenção multicomponente baseada na escola 'Grow for it!', com o objetivo de aprimorar as crenças de Perspectiva de Tempo Futuro (PTF) e Mentalidade de Crescimento (MC) dos adolescentes para reduzir o estresse escolar e aumentar o investimento na aprendizagem e a motivação. Um total de 323 estudantes holandeses foram aleatoriamente designados para o grupo de intervenção ou controle. O grupo de intervenção mostrou uma diminuição significativa na ansiedade em relação às provas ao longo do tempo e pontuações mais altas em PTF, investimento na aprendizagem, MC e motivação intrínseca no pós-teste. Contudo, esses efeitos não foram sustentados ao longo do tempo, limitando as evidências sobre a eficácia geral da intervenção. Apesar disso, o estudo forneceu insights valiosos sobre o potencial combinado da PTF e da MC na influência dos resultados acadêmicos e destacou a necessidade de mais pesquisas sobre o papel das crenças adaptativas positivas.
Palavras-chave: perspectiva de tempo futuro, mentalidade de crescimento, estresse escolar, motivação, intervenção escolar.

Adolescents worldwide are experiencing increased level of school stress, such as feeling worried about a test, homework, and facing various daily school setbacks, which can harm their learning, achievement, and mental health (*American Psychological Association [APA]*, 2020; Cosma et al., 2020, 2023; Kleinjan et al., 2020; Pascoe et al., 2020; Salmela-Aro et al., 2008; Vogel & Schwabe, 2016). At the same time, it is well-known that during adolescence, students' self-regulated learning behaviors and motivation, such as investment in learning for school and intrinsic motivation (i.e., internally driven learning) substantially decrease (Gottfried et al., 2001; Peetsma et al., 2005; Vansteenkiste et al., 2009) altogether hampering adolescents' future prospects. Given the importance of reducing adolescents' stress levels and also supporting their learning and motivation, researchers and practitioners have urged for the development of school-based interventions (van Loon et al., 2020; World Health Organization [WHO], 2022).

A tree often manages to grow towards the sun despite the confronted obstacle, seen in a rock. Similarly, as students cannot eliminate all stressful school experiences, yet what they can do is to take a different perspective on the stressful situation and view it through the lens of learning and growth (*growth mindset; GM*) that they relate to their personally valued and positive future goals (*Future Time Perspective; FTP*). If students envision their positive future goal with a GM (when faced with school stress), instead of avoiding obstacles and feeling emotionally consumed by school stress, they might be able to use them as an opportunity to grow towards their valued future goal.

Having a positive attitude toward long-term future goals (FTP; Peetsma, 1992) and embracing the belief that individual abilities can grow through practice and hard work (GM; Dweck, 2000) together provide a promising foundation for this intervention. First, due to the malleable nature and motivational benefits of FTP and GM, both

theories have consistently proven effective in influencing adolescents' learning and motivation over time (Andre et al., 2018, 2019; Burnette et al., 2023; Peetsma et al., 2017). Second, according to the stress and coping theory (Lazarus & Folkman, 1984), both FTP and GM can be linked to coping with school-related stress through the cognitive appraisals and coping strategies they convey. Indeed, recent studies suggest that FTP and GM can lead to lower student stress levels and an enhanced ability to cope with stress (Aspinwall, 2005; Kooij et al., 2018; Montagna et al., 2021; Yeager et al., 2022). However, while there is growing evidence on the effects of GM interventions on stress (e.g., Burnette et al., 2020), the evidence regarding FTP's effects on stress remains largely correlational (Kooij et al., 2018), highlighting the need for experimental data.

Additionally, the growing evidence on the gains from FTP and GM interventions has so far emerged from two separate theoretical foundations, with more experimental evidence on their separate impact on learning and motivation than on school-related stress. However, these two attitudinal beliefs could complement each other in reducing adolescents' school stress while enhancing their learning and motivation. Indeed, in recent years, FTP and GM have been proposed as distinct yet mutually reinforcing constructs in the academic domain, which reciprocally supplement one another (Dweck & Yeager, 2018; Park et al., 2020). Specifically, while FTP can help reduce stress, actions that students take in the present to prepare for their future—such as studying for exams or completing homework on time—can sometimes be stressful and even increase stress levels (Holding et al., 2021). In this context, adopting a GM can complement FTP by allowing students to view stressful experiences as opportunities for learning and growth (Dweck, 2006), while FTP can provide a sense of purpose, meaning, and direction for students' growth, grounded in positive feelings. Lastly, while GM interventions on stress and learning have been criticized as costly, yielding small effects over short periods (around four months) and being most effective for disadvantaged and at-risk adolescents (Macnamara & Burgoyne, 2023; Sisk et al., 2018), FTP's

effects on motivation have been more generalizable across different student populations, with larger effect sizes that have endured for over two years (Andre et al., 2019; Peetsma et al., 2017). Taken together, the evidence suggests the potential for integrating FTP and GM theories into a single intervention. However, no experimental study has yet combined the two theories with the aim of reducing adolescents' school stress while increasing their investment in learning and intrinsic motivation. Furthermore, such an intervention has yet to be tested in a short and cost-effective format.

Theoretically-based multicomponent interventions (i.e., interventions consisting of two or more evidence-based components targeting multiple outcomes) have been recognized as beneficial for reducing adolescents' psychological distress and/or promoting learning (Putwain et al., 2018; Stattin & Kerr, 2009; Yeager et al., 2022). While limited in number and often lengthy or costly, these interventions have rarely addressed adolescents' school stress in a broad sense (i.e., the emotional-stress response across various school situations and the ability to cope with everyday school-related stress) in conjunction with learning investment and intrinsic motivation. The aim of this study is to address these research gaps by testing the effectiveness of a school-based multicomponent intervention 'Grow for it!' which integrates FTP and GM theory in a short, online format.

Dealing with School Stress: Stress and Coping Theory

In general, stress is understood as a response that occurs when individuals perceive the demands of a situation to exceed their personal, psychological, or social resources (Lazarus, 1966). In the school context, students may experience stress in various situations, such as taking a test or completing homework, which often manifests as negative emotions like anxiety. According to the stress and coping theory (Lazarus & Folkman, 1984), individuals engage in two primary cognitive appraisals when confronted with a stressful event: primary and secondary appraisals. Primary appraisal involves evaluating the

significance of the event and determining whether it represents a threat or a challenge. Secondary appraisal focuses on assessing one's coping resources and options for managing the event, such as future-oriented coping (i.e., reacting preventively and proactively to potential stressors) and meaning-focused coping (i.e., relying on personal beliefs, values, and goals to maintain well-being). When students encounter school-related stress (e.g., worrying about failing a test or making a mistake), both types of appraisals interact dynamically and iteratively, shaping their stress response.

In this study, we focus on adolescents' school stress by examining a specific and common stress response among students: anxiety. Within the achievement emotions framework (Pekrun, 2006), anxiety is classified as a negative activating emotion that evokes avoidance of threat and encompasses affective, cognitive, physiological, and motivational components. Thus, it represents a comprehensive reaction to school-related stress. Specifically, we investigate the anxiety experienced by adolescents in various school contexts (e.g., in class, during learning, and while taking tests), as these situations are commonly associated with anxiety and have been linked to educational outcomes (Andre et al., 2022; Pekrun et al., 2002).

Additionally, we examine adolescents' ability to cope with daily school stress by focusing on academic buoyancy—a measure of students' capacity to effectively manage minor setbacks in school, such as failures and mistakes (Martin & Marsh, 2009). Academic buoyancy is also considered important for understanding school stress (Putwain et al., 2023) and beneficial for learning (Martin & Marsh, 2007; 2009). Both anxiety and academic buoyancy have been found to be related to adaptive motivational beliefs, such as FTP and GM. Below, we discuss the FTP and GM theory and interventions, relating them (both separately and in synergy) to adolescents' school stress within the context of the stress and coping theory.

Future Time Perspective Theory and TIME Intervention

FTP theory, which stems from individuals' goal-setting and value beliefs (Nuttin & Lens, 1985), posits that adolescents' thoughts, feelings, and behaviors regarding the distant future and specific life domains (e.g., school or professional career) influence their present attitudes and behaviors (Andre et al., 2018; Peetsma, 1992). Accordingly, FTP is operationalized through three components that relate to an individual's future goals: cognition (i.e., ideas or expectations about the future), behavioral intention/behavioral component (i.e., targeted future behavior), and affect (i.e., positive feelings toward the future).

Meta-analyses have consistently confirmed the motivational benefits of FTP, demonstrating positive relationships between adolescents' FTP and various educational outcomes, such as investment in and motivation for learning, with small to medium effect sizes (Andre et al., 2018; Kooij et al., 2018). Additionally, studies have examined FTP in relation to school stress, emphasizing the affective quality of FTP (in addition to the importance of setting a valued future goal) as beneficial for reducing anxiety (Kooij et al., 2018). This includes anxiety related to tests, classroom situations, and learning (Andre et al., 2022), as well as a positive relationship with academic buoyancy (Fong & Kim, 2018). Specifically, according to meta-analysis, the largest effect sizes were observed in the educational, career, and health domains, and across different samples, when FTP included affective, cognitive, and behavioral intention/behavior components (Andre et al., 2018; 2019).

The successful combination of the three FTP components is evident in the TIME intervention (Peetsma et al., 2017), which increased secondary school students' investment in learning even after two years and positively influenced their well-being (Peetsma et al., 2017; Peetsma & van der Veen, 2008). TIME is based on the assumption that FTP in the domains of school and professional career is an important motivator for students. This is because TIME connects present learning behavior with the fulfillment of future goals by creating a contingent path of meaningful, personally endorsed intermediate steps (Husman

& Lens, 1999; Raynor & Entin, 1983). During TIME, students participated in a guided interview where they were asked to contemplate their future goals in various life domains (e.g., school and professional career), identify steps needed to achieve these valued future goals, and complete a role-play assignment (see Peetsma et al., 2017). However, the TIME intervention has not yet been linked to school stress.

According to the appraisal and coping theory (Lazarus & Folkman, 1984), positive emotions provide relief from stress through the use of coping techniques during the stress process. For example, by attaching positive feelings to a valued goal related to school and career (the affective component of FTP), a student can reduce stress, which is reflected in motivated, meaning-focused coping. Indeed, recent studies have suggested that when adolescents have positive feelings toward the future, their psychological distress is reduced (Tejada-Gallardo et al., 2021), they effectively manage academic pressures (e.g., high-stakes assessments), and they persist in the face of academic difficulties (Putwain et al., 2018). Moreover, planning and anticipating a valued future goal (the cognitive and behavioral intention/behavior components of FTP) can provide students with a sense of purpose, meaning, and direction, which is seen as future-oriented and meaning-focused coping to manage stress (Aspinwall, 2010). For example, by attaching higher personal value to future distant goals (e.g., obtaining a degree and finding a job), FTP can add meaning to stress management, increase students' capacity to cope with everyday school stress—reflected in higher academic buoyancy—and reduce their negative emotional responses to stress, manifested as lower anxiety.

Given that the TIME intervention combines all three components, it incorporates both positive affectivity (e.g., enjoyment, hope, pride) and coping strategies, which can ultimately reduce adolescents' school stress while promoting learning and motivation.

Growth Mindset Theory and Interventions

According to Dweck (2006), 'the hallmark of human nature is each person's great capacity to adapt, to change, and to grow'. Rooted in the incremental theory of intelligence (Dweck, 2000), GM is seen as a motivational and adaptive belief that can provide students' an interpretative framework for active learning behavior. It emphasizes the development of abilities, ascribes positive beliefs about effort, and embraces setbacks as challenges and learning opportunities rather than as indications of incapability (Molden & Dweck, 2006).

Critically, research has suggested that mindsets are malleable and can be shaped by school interventions in ways that promote adolescents' learning behavior and motivation (Burnette et al., 2023). A growing body of research has shown that school-based mindset interventions can ameliorate declines in learning engagement and increase motivation (e.g., Blackwell et al. 2007; Burnette et al., 2013). Mindset interventions were generally delivered in a form of a workshop, a video, or a lecture that illustrated the brain's plasticity. For example, Blackwell et al. (2007) GM intervention showed that lessons about how intelligence grows similarly to muscles in the body helped adolescents achieve better grades compared to students in the control condition. Moreover, based on the PISA results, students with a GM were found to report greater motivation to master tasks, set more ambitious learning goals, attached greater importance to school, and were more likely to expect to complete a university degree (OECD, 2019).

Recently, nurturing a GM was also found negatively related to stress response and positively to (pro)active coping (Burnette et al., 2020; King et al., 2012; Yeager et al., 2022). Specifically, GM was found beneficial in reducing students' anxiety (King et al., 2012; Smith & Capuzzi, 2019). A study by King et al. (2019) has shown that students with a stronger GM were feeling less anxious at school. Furthermore, studies have shown that mindset was beneficial in increasing students' academic buoyancy (Dweck, 2000; 2015; Paunesku et al., 2015; Yeager

& Dweck, 2012). In a recent study, Montagna et al. (2021) found that GM interventions influenced students' cognitive stress appraisal, prompting further investigation into the effects of GM on students' academic emotions and coping abilities. Nevertheless, considering the recently identified limitations of the GM intervention (Macnamara & Burgoyne, 2023), there is a need for a more practical intervention that can address the needs of a diverse student population (e.g., varying in educational backgrounds and achievements) while offering improved effectiveness and cost-efficiency.

Approaching the FTP and GM Synergy from the Stress and Coping Theory

Within the stress and coping theory, stress response is contingent upon individual's perception-based (attitudinal) beliefs such are the FTP and GM. Despite the outlined benefits and complementary advantages of the FTP and GM theory (Park et al., 2020), to date very little, if any, focus in the literature has been given to considering the connection of FTP and GM; in particular, to what extent do these two motivational concepts together influence adolescents' school stress and learning and motivation. This line of inquiry, theoretically and conceptually, is innovative for its positive nature, reflecting the benefits of the TIME and GM intervention, their discussed research gaps and limitations, and their powerful synergetic effect on adolescents' school stress and learning and motivation

Accordingly, given that mindsets influence how students interpret and evaluate achievement and learning situations (Dweck & Yeager, 2019), we argue that GM can complement students' FTP by encouraging students to see school stress as a challenge versus a threat, while FTP can add a sense of purpose, direction, and affective tone seen in the use of positive future-oriented and meaning-focused coping strategies (Aspinwall, 2010), ultimately helping students to reduce school stress and increase investment in learning and intrinsic motivation.

The present study

The aim of this study was to develop the school-based multicomponent intervention 'Grow for it!' and test its effectiveness by manipulating students' FTP and GM beliefs. Specifically, the intervention sought to: a) reduce anxiety (i.e., class anxiety, learning anxiety, and test anxiety), b) increase academic buoyancy, and c) increase learning investment for school (investment for learning and investment in homework) and intrinsic motivation by integrating the FTP and GM theory. To this end, we used a clustered Randomized Controlled Trial (RCT; Woods, 2004) with three measurement moments.

First, as part of the manipulation check, we expected that FTP and GM levels would be higher in the intervention group compared to the control group (*Hypothesis 1*). Second, we hypothesized that students who participated in the 'Grow for it!' intervention would experience lower anxiety levels over time (i.e., anxiety related to class, learning, and tests; *Hypothesis 2*). Third, we anticipated that students in the intervention group would develop higher academic buoyancy over time (*Hypothesis 3*). Fourth, we expected that students who received the 'Grow for it!' intervention would invest more in their learning and homework over time, compared to those in the control group (*Hypothesis 4*). Fifth, we hypothesized that intrinsic motivation would increase for students who completed the 'Grow for it!' (*Hypothesis 5*). Finally, drawing on recent research (e.g., Peetsma et al., 2017; Torrano et al., 2020), we explored the role of gender in the intervention's effects.

Method

Participants and procedure

A convenience sample of four secondary schools in the Netherlands participated in the study. In total, 323 students (50,5% male) from 15 classes, aged M = 15.86; SD = 0.96, were randomly assigned to either the 'Grow for it!' intervention group (177 students from nine classes) or the control group (146 students from six classes). Just over half of the students (58.5%) were enrolled in higher educational levels, while the remaining students were in lower educational levels, as defined by the Dutch educational system (see UNESCO-UNEVOC, 2012). The majority of participants were born and raised in the Netherlands, with over half of their parents (approximately 63%) having a Dutch background, while the others had a background from another Western country (e.g., Germany, France) or a non-Western country (e.g., Turkey, Suriname).

The study was approved by the Ethical Review Board of the University of Amsterdam. The inclusion criteria required that students are in the pre-final classes of secondary education, as they are more susceptible to school-related stress and often experience lower motivation for learning. The exclusion criteria involved severe and acute mental health issues. Three weeks before the study began, parents and caregivers received an information letter detailing the research and a passive consent form. Meanwhile, students were informed about the study and asked for their active consent on the first day of the research. Students were told that the study aimed to help them better manage school difficulties and improve their learning. Both the 'Grow for it!' intervention and the control condition were matched in duration (20 minutes), and students were blinded to their assigned condition.

Questionnaire assessments were conducted at three time points: pre-test (within two weeks prior to the intervention), post-test (within two weeks after the intervention), and follow-up (5-6 months after the intervention). Additionally, following recommendations for the

inclusion of booster sessions to reinforce long-term intervention effects (Gearing et al., 2013), a booster session was held three months after the intervention for students in the intervention group. The same questionnaires were administered at all three time points as during the pre-test assessment. Students completed the questionnaires on a phone or computer, guided by a trained research assistant and the first author in a quiet classroom with their class mentor present. Data collection took place from November 2022 to June 2023. To thank students for their participation, they were entered into a lottery for a chance to win a 10- or 20-euro voucher or a tablet, and mentors received a small gift for their assistance during the study.

'Grow for it!' condition

'Grow for it!' is a brief online intervention designed to reduce adolescents' school stress and increase their learning and motivation. It is based on the TIME intervention (Peetsma et al., 2017) and the GM intervention (Dweck, 2000). Specifically, the intervention encourages adolescents to develop FTP and GM beliefs by guiding them to connect with a personally valued future goal, explicitly highlighting the cognitive, behavioral, and affective aspects of FTP. It also stimulates their GM in relation to a specific and potential school-stress experience. 'Grow for it!' is grounded in persuasion research, utilizing the saying-is-believing effect (Lee et al., 2022) to enhance the internalization of the intervention content. For instance, students are asked to write down their future goals, describing the positive feelings associated with these goals and the necessary steps to achieve them. Later, they engage in a role-play assignment where they express the belief that intelligence is malleable. The underlying assumption is that explicitly endorsing an opinion can influence the speaker's (the student's) own beliefs in line with the publicly stated position. Additionally, the intervention employs a technique of positive reappraisal, encouraging students to view negative thoughts as opportunities for learning and growth.

Accordingly, the two theories are integrated into five successive steps within the intervention (Figure 1). Throughout these steps, students read brief texts, completed interactive assignments, watched a short, animated video illustrating the theories (2 minutes), and participated in a role-play assignment to internalize the content. The intervention kept students engaged by incorporating various activities and providing immediate rewards (e.g., 'thumbs-up' emoticons). Students were guided through the process by a trusted, gender-neutral avatar named 'Sasha'. To personalize the experience and address individual needs, students had the option to choose an academic domain in which they were facing challenges (e.g., life sciences, social sciences, language, and arts).

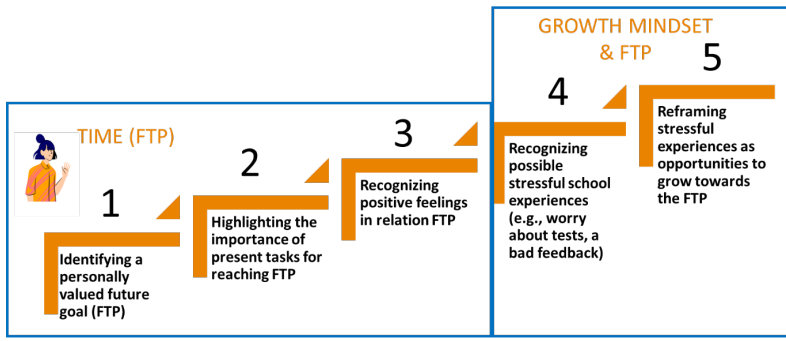

Figure 1. Grow for it!' steps

Active control condition

Similarly, to the study by Montagna et al. (2021), students in the active control condition read a short text about brain anatomy and the regions activated during future thinking. To further align this condition with the intervention group, we asked students to answer a few brief questions based on the text.

Measures

The reliabilities for each variable and across the three measurement points are shown in Table 1.

Anxiety

Anxiety was measured using the shortened version of the anxiety scale from the Achievement Emotions Questionnaire (AEQ-S; Bieleke et al., 2021) originally developed by Pekrun et al. (2006). The AEQ is a well-established instrument in educational research in which students report their negative achievement emotions in different school contexts. Accordingly, the anxiety scale included three subscales that measured different types of students' anxiety: class anxiety, learning anxiety, and test anxiety. The subscales on class anxiety and learning anxiety consisted of four items each (e.g., class anxiety, "I get tense in class"," and learning anxiety, "Worry about not completing the material makes me sweat"). The subscale for test anxiety consisted of five items (e.g., "At the beginning of the test, my heart starts pounding"). These items were rated on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). The psychometric properties of the AEQ-S questionnaire were confirmed in recent studies (e.g., Bieleke et al., 2021; Graf et al., 2024) and each subscale had a good reliability in the current study.

Academic buoyancy

Academic buoyancy was measured using the four-item *Academic Buoyancy Scale* (ABS; Martin & Marsh, 2007). Students responded to items (e.g., "I don't let study stress get on top of me") on a seven-point Likert scale 1 (*strongly disagree*) to 7 (*strongly agree*). Numerous studies have provided a strong support for the scale's single factor structure, internal consistency and its' predictive validity (Martin & Marsh, 2007; Putwain et al., 2023) along with the predictive validity for different academic emotions and beliefs (Hirvonen et al., 2020; Martin & Marsh, 2007). The internal consistency of the ABS scale in the present study was good and similar to previous work.

Investment in learning and investment in homework

To assess adolescents' investment in learning and homework, we used an abridged version of the two subscales of the Investment in School (i.e. investment for learning and investment for homework) questionnaire, developed by Roede (1989). Each scale includes three behavioral aspects (onset of behavior or direction, intensity, and persistence). The total scores of the three behavioral aspects are calculated for the investment in learning and the investment in homework scales, respectively. Consequently, six items per scale that most dominantly describe the three aspects of behavioral investment were included. This scale has been widely used in educational research and in research on adolescents' FTP, and is found to show sound construct and external validities and longitudinal invariance (Andre et al., 2018; Schuitema et al. 2014). Students rated their behavior on a 5-point Likert- scale ranging from 1 (*hardly ever/never*) to 5 (*almost always/always*). An item example for investment in learning and investment in homework respectively is: "I work hard at school", and "I carefully do my homework". In the current study, both subscales had a good reliability that was similar to previous work.

Intrinsic motivation

Students' intrinsic motivation was measured by the Vansteenkiste et al. (2009) short version of the intrinsic motivation subscale from the Academic Self-Regulation Questionnaire by Ryan and Connell (1989). This scale measured students' internally driven reasons for engaging in learning (i.e., enjoyment, curiosity) and it has been successfully used in previous work (Vansteenkiste et al., 2005). The scale included four items rated on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). An item example included, "I am learning because it is interesting". Internal consistency was very good, and similar to previous studies (e.g., Vansteenkiste et al., 2009).

Future time perspective

FTP was measured using the Future Scale of the Time Perspective Questionnaire developed by Peetsma (1992). Students reported their long-term future thoughts and feelings related to school and professional career. This scale was developed by using a facet design in which the three components (cognition, affect, and behavioral intention/behavior) relevant for the life domain were systematically altered (Peetsma, 1992; Stouthard & Peetsma, 1999). Consequently, a common and recommended approach in the literature was to use a composite FTP score. The questionnaire included six items rated on a 5-point Likert scale ranging from 1 (*totally disagree)* to 5 (*totally agree*). An item example included, "I enjoy thinking about my future studies or work." The psychometric properties of this scale have been confirmed in previous studies and cross-culturally (Andre et al., 2019; Schuitema et al., 2014). The questionnaire had a good reliability in the current study and is similar to previous work.

Growth mindset

Students' GM was assessed through the implicit theories scale by Dweck et al. (1995). This scale has already been repeatedly successfully evaluated across different student samples and in relation to students' stress (e.g., Montagna et al., 2021). The scale consists of three negative-worded items that indicate a growth mindset (e.g., "I possess a certain amount of intelligence, and there is not much I can do about it"). Participants indicated how much they agreed with the presented statements through a 6-point Likert scale 1 (*I completely disagree*) to 6 (*I completely agree*)". The present reliabilities were good.

Table 1

Scale reliabilities

Variable	Internal consistency			
	n items	Pre-test	Post-test	Follow-up
Class anxiety	4	.87	.90	.84
Learning anxiety	4	.85	.88	.85
Test anxiety	5	.90	.90	.89
Academic buoyancy	4	.86	.89	.86
Investment for learning	6	.77	.74	.71
Investment for homework	6	.77	.77	.81
Intrinsic motivation	4	.90	.91	.89
GM	3	.78	.79	.79
FTP	6	.63	.64	.62

Statistical analyses

First, as part of the randomization check, we assessed potential differences in background variables and outcome variables at the pre-test between the two groups by performing MANOVA and chi-square tests. Second, we used Multilevel Modelling (MLM) for longitudinal data in SPSS with the mixed-effects (MIXED) program (Heck et al., 2013) to examine intervention effects on nine outcome variables: FTP, GM, investment in learning, investment in homework, intrinsic motivation, class anxiety, learning anxiety, test anxiety, and academic buoyancy. Nine MLMs with three levels were estimated to account for the nested structure of the data. The three measurement occasions (pre-test, post-test, and follow-up) were treated as Level 1 variables nested within 323 students (Level 2), and students were nested within 15 classrooms (Level 3). The multilevel models included a random intercept representing individual differences at the first measurement occasion (pre-test). Two dummy variables were added to model the growth (or decline) at the post-test (Time 2) and follow-up (Time 3)

compared to the pre-test. There are several advantages to MLM compared to other analyses, such as not requiring complete data across all time points, and allowing models to be simultaneously adjusted for the effects of numerous factors (Heck et al., 2013). Accordingly, analyses were conducted to evaluate main effects, including interactions between condition, time, and gender.

Effect sizes for the intervention effects (Time × Condition) were determined using Cohen's d. To calculate this, the unstandardized beta—representing the difference in change between conditions over time—was divided by the pooled standard deviation of the raw outcome variable. Effect sizes were interpreted according to standard benchmarks: small (.20), medium (.50), and large (.80) (Cohen, 1988).

Missing data

The rate of missing data at each measurement point was as follows: 12 students (3.7%) for the pre-test, 55 students (17%) for the post-test, and 77 students (23.8%) for the follow-up. The attrition at the post-test was primarily due to students missing class because of illness, while the slightly higher attrition at the follow-up was mainly a result of last-minute changes in the school schedule. Consequently, three classes were unable to complete the final measurement point. Overall, this attrition rate is relatively small and typical for student samples in longitudinal studies, which often range from about 10% to 20% (Enders, 2003). All students who participated in at least one measurement and were present during the intervention ($N = 323$) were included in the analyses. Missing data from one or two measurement occasions were addressed using Full-Information Maximum Likelihood (FIML). FIML assumes that the data are missing at random (MAR), meaning that the missing values can be predicted based on the available data (Little & Rubin, 2002).

Results

Randomization check

MANOVA tests were conducted for the continuous variables (class anxiety, learning anxiety, test anxiety, academic buoyancy, investment in learning, investment in homework, intrinsic motivation, FTP, GM, and students' age), while chi-square tests were used for the categorical variables (gender, school) to assess whether the intervention and control condition differed at the pre-test. No significant group differences were found across all variables, indicating successful randomization.

Descriptive data

Table 2 presents the means and standard deviations for the intervention and control condition on the three measurement occasions.

Table 2

Means and standard deviations across measurement points and per condition (N = 323 students)

Outcome variable	Condition	Pre-test		Post-test		Follow-up	
		M	*SD*	*M*	*SD*	*M*	*SD*
Class anxiety	Intervention	1.89	0.77	2.00	0.08	1.94	0.07
	Control	2.00	0.85	2.05	0.09	2.02	0.08
Learning anxiety	Intervention	2.19	0.78	2.22	0.08	2.29	0.81
	Control	2.23	0.09	2.26	0.09	2.29	0.09
Test anxiety	Intervention	2.91	0.87	2.67	0.88	2.76	0.08
	Control	2.86	0.96	2.83	0.09	2.69	0.97
Academic buoyancy	Intervention	4.25	0.12	4.34	0.12	4.15	0.12
	Control	3.97	0.13	4.14	0.13	4.11	0.13
Investment in learning	Intervention	3.22	0.53	3.21	0.50	3.09	0.52
	Control	3.07	0.58	2.99	0.56	2.99	0.59
Investment in homework	Intervention	3.16	0.57	3.14	0.58	3.01	0.64
	Control	3.13	0.63	2.99	0.65	3.03	0.07

Intrinsic motivation	Intervention	2.67	0.77	2.76	0.08	2.70	0.82
	Control	2.52	0.83	2.50	0.09	2.51	0.92
FTP	Intervention	3.55	0.05	3.47	0.05	3.51	0.06
	Control	3.51	0.06	3.48	0.06	3.39	0.06
Growth mindset	Intervention	3.80	0.10	3.87	0.10	3.84	0.99
	Control	3.56	0.11	3.61	0.11	3.62	0.11

Intervention effectiveness

Table 3 and Figure 2 display the main results of the 'Grow for it!' intervention effects. Contrary to our expectations, we did not find significant interaction effect of time and condition on FTP and GM as anticipated by the manipulation check. However, we did find a significant interaction effect of condition and gender on adolescents' FTP. Females in the intervention group scored significantly higher on FTP than females in the control group, $F(1, 300.979) = 7.382$, $p = .007$, $M_{dif} = .25$. Also, there was a significant main effect of condition on students' GM, with the intervention group scoring significantly higher on GM versus the control group, $F(1, 301.095) = 4.944$, $p = .027$, with the largest difference on the post-test, $M_{dif} = .26$.

In relation to the effectiveness of the 'Grow for it!' on school stress outcomes, in line with our hypothesis, we found a significant interaction effect of time and condition on adolescents' test anxiety (Table 3). Students who completed the 'Grow for it!' scored significantly lower on test anxiety from pre-test to post-test in comparison to the control group (see Figure 2). The negative slope, $\beta = -.208$, 95% CI [-.389, -.026], indicates that the 'Grow for it!' intervention resulted in .208 points less test anxiety from pre-test to post-test, than the control condition. This is a small effect size ($d = .20$). Moreover, we found a significant main effect of time on students' text anxiety, $F(2, 260.869) = 6.056$, $p = .003$, and a significant interaction effect of gender and condition, $F(1, 299.522) = 4.444$, $p = .036$. Females in the intervention group scored significantly lower on test anxiety than females in the control group, $M_{dif} = .25$.

As for the learning and motivation outcomes, contrary to our expectations, we did not find any significant time × condition effects. However, there was a significant main effect of condition on investment in learning, $F(1, 315.787) = 5.762$, $p = .017$. The mean difference between the groups on the post-test was the largest, with the intervention group scoring slightly higher than the control group ($M_{dif} = .21$). Additionally, there was a significant effect of condition on intrinsic motivation, $F(1, 310.628) = 4.197$, $p = .014$. The intervention group scored significantly higher than the control group on the post-test ($M_{dif} = .27$). However, since these results were not significant over time, they do not support the effectiveness of the intervention on learning and motivation outcomes. Finally, contrary to our hypotheses there were no significant main or interaction effects of time, condition, and gender on adolescents' class and learning anxiety, academic buoyancy, and investment in homework.

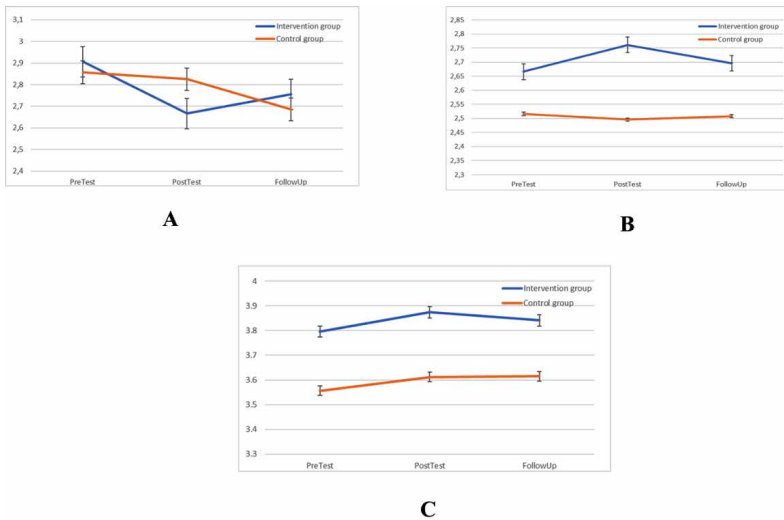

Figure 2. 'Grow for it!' effects on test anxiety from the pre-test to post-test (A); condition effect on intrinsic motivation (B); and condition effect on GM (C)

Table 3

Linear mixed-model outcomes

Fixed effects	Time		Condition		Time x Condition		Gender x Condition		Time x Condition x Gender	
	F(df)	*p*	*F(df)*	*p*	*F(df)*	*p*	*F(df)*	*p*	*F(df)*	*p*
FTP	2.29 (258.015)	.104	0.54 (313.707)	.464	1.40 (258.015)	.247	7.38 (300,979)	**.007**	0.097 (246.456)	.908
GM	0.310 (258.689)	.734	4.94 (201.085)	**.027**	0.024 (259.689)	.976	0.137 (286.705)	.711	0.416 (248.356)	.660
Class anxiety	1.572 (249.136)	.210	1.052 (302.071)	.306	0.449 (249.136)	.639	1.201 (302.071)	.274	0.234 (249.136)	.791
Learning anxiety	0.993 (249.924)	.372	0.630 (301.259)	.428	0.407 (249.924)	.666	0.767 (301.259)	.382	2.392 (249.924)	.094
Test anxiety	7.968 (244.184)	**<.001**	0.494 (299.522)	.483	3.217 (244.184)	**.042**	4.444 (299.522)	**.036**	2.097 (244.184)	.125
Academic buoyancy	1.885 (242.705)	.154	3.068 (299.325)	.081	0.691 (242.705)	.502	0.000 (242.705)	.987	0.069 (242.705)	.933
Investment in learning	2.551 (250.406)	.080	6.459 (301.616)	**.012**	1.306 (250.406)	.273	1.679 (301.616)	.196	0.222 (250.406)	.801
Investment in homework	2.871 (251.058)	.059	0.329 (307.653)	.567	0.237 (251.058)	.281	0.116 (307.653)	.734	0.597 (251.058)	.551
Intrinsic motivation	0.345 (252.535)	.709	4.688 (296.934)	**.031**	.772 (252.535)	.463	3.059 (296.934)	.081	0.584 (252.535)	.559

Note. Significant results are highlighted in bold.

Discussion

In this study, we investigated the effect of the 'Grow for it!' intervention to reduce adolescents' school stress and increase their learning investment and intrinsic motivation. To the best of the authors' knowledge, no studies with a similar design and theoretical framework targeting adolescents' school stress and learning and motivation were found. In general, the findings of this study were in favor of the effectiveness of the theory-based multicomponent intervention in reducing adolescents' test anxiety. Additionally, we found promising group differences in adolescents' GM and investment in learning, and intrinsic motivation due to the condition effect, as well as differences in FTP and test anxiety resulting from the interaction effects of condition and gender. However, despite these significant differences observed at the post-test, the lack of significant time × condition effects suggests that these improvements did not persist or change over time. In other words, while the intervention group performed better than the control group immediately after the intervention, the absence of over time effects means that we cannot definitively conclude that the intervention was effective in fostering sustained learning and motivation outcomes. These results pave the way for further studies.

The main finding from our RCT with 323 Dutch adolescents is the significant reduction of test anxiety levels from pre-test to post-test (after two weeks), with a small effect size. This result confirms our expectation about the effectiveness of the 'Grow for it!' intervention over time in reducing adolescents' test anxiety and corroborates recent research on the protective role of FTP and GM in alleviating test anxiety (e.g., Andre et al., 2022; King et al., 2012). In particular, our findings provide the first evidence of the combined potential of students' positive future thoughts, feelings, and behaviors, along with their growth beliefs, in significantly decreasing their negative emotions related to tests. Our study contributes to future research and theory by suggesting the emotion-regulation benefits of integrating FTP and GM theories in reducing anxiety in the specific context of tests and within

the stress and coping theory (Lazarus & Folkman, 1984). Furthermore, our study suggests the positive role of future-oriented and motivational meaning-focused coping appraisals, embedded in the FTP and GM constructs, in managing school stress.

While an effect size of 0.20 may appear small, it is relatively common in the context of universal promotion or prevention motivational randomized controlled trials (RCTs) and can still carry meaningful practical implications (Lazowski & Hulleman, 2016). Moreover, in educational research, new benchmarks for interpreting effect sizes have been proposed, taking into account specific study characteristics such as sample features, study design, and the common difficulty of inducing certain educational outcomes (Kraft, 2020). These factors together contribute to the perceived success of our intervention. Furthermore, the lack of effectiveness observed at the five-month follow-up indicates that more frequent implementation of the intervention may be necessary to achieve long-lasting positive effects.

The 'Grow for it!' intervention did not have a direct effect on adolescents' FTP and GM. This suggests that both FTP and GM (especially when combined) are distal predictors of outcomes, with various attributes, contexts, and processes mediating and moderating the relationships between FTP and GM and outcomes, as confirmed in other interventions (Schuitema et al., 2014). Specifically, it is possible that the 'Grow for it!' might work indirectly through personality constructs such as persistence (i.e., the personal tendency to endure through hardships to achieve goals; Howard & Crayne, 2019), and/or via emotional regulation strategy, such as positive cognitive reappraisal (i.e., a meaning-based coping strategy, by which the person copes with a stressful life event by searching for positive meaning among the negativity; Folkman & Moskowitz, 2000), which is also deeply rooted in the 'Grow for it!'. The capacity of our intervention may lie in its function to strengthen, and even reverse, the connection between adolescents' feelings of worry about tests and their future growth goals. By creating concrete steps in the present, the intervention seems to boost a sense of agency and induce cognitive reappraisal of worries into growth opportunities.

Interestingly, what we did find was an interaction effect of condition and gender on adolescents' FTP and test anxiety with a favorable positive group difference for girls on the post-test. While we cannot entirely attribute this effect to the 'Grow for it!' because the condition × gender did not include a three-way interaction effect with time, it may demonstrate that girls are more susceptible to motivational interventions, such as FTP and GM, confirmed by previous work (Peetsma & Van der Veen, 2008). Likewise, girls can be more prone to interventions that target anxiety, particularly due to their generally higher anxiety levels (Torrano et al., 2020) and high motivation for learning (Peetsma et al., 2005). Furthermore, a significant difference on the post-test caused by the condition effect of adolescents' GM, suggests that our intervention seem to contribute to certain changes in adolescent's GM beliefs.

Finally, our results revealed a significant positive condition effect on adolescents' increased investment in learning and intrinsic motivation, with the intervention group scoring higher on the post-test. These findings clearly point to promising group differences for the intervention group in investment in learning and intrinsic motivation after participating in the 'Grow for it!' intervention. However, we speculate that the intervention effects on self-regulated learning outcomes might have been significant if we had measured investment in learning and intrinsic motivation specifically in the domain of mathematics, as has been previously conducted (Peetsma, 2017; Montagna et al., 2021), rather than in a general domain. Future studies could build up on our work in this respect.

Strengths, Limitations, and Future Directions

This study has several strengths and limitations. Strengths include the involvement of various parties —such as researchers, teachers, adolescents, illustrators, clinical psychologists, and web developers—in the intervention development process. The study also featured successful randomization, demonstrated cost-effectiveness and scalability, and embraced inclusiveness. However, there are several limitations that

merit attention. First, as 'Grow for it!' is a multicomponent intervention, it remains unclear which specific components are more, or less, effective. This is a common challenge for multicomponent interventions (e.g., Putwain et al., 2018). Future research should explore potential mediators to understand the relative contributions of FTP and GM to the intervention's outcomes. Additionally, since the study departed from stress and coping theory (Lazarus & Folkman, 1984), it would be valuable to investigate the intervention mechanism by directly assessing adolescents' coping appraisals, such as future-oriented and meaning-focused coping strategies.

Similarly, another lingering question pertains to whether the observed effect is predominantly influenced by the affective component of FTP or by the behavioral intention and action component. Our scale included only a limited number of items for each component, which limits our ability to thoroughly explore this question. At the same time, this idea underlies the richness of the FTP construct; it captures different dimensions that are important for motivated action (Andre et al., 2018; Kooij et al., 2018).

Second, future research is needed to determine how beliefs about the malleability of abilities beyond intelligence relate to FTP, and importantly, how they influence adolescents' school stress, learning, and motivation. While beliefs about intelligence are particularly relevant to identity (Dweck, 2000), a GM about intelligence does not necessarily translate to a GM in other domains (Hughes, 2015). In this study, GM pertains specifically to intelligence, whereas FTP concerns goals in the domains of school and professional career. These domain-specific differences in measurement may explain the small effect sizes and non-significant findings observed in the current study. Strengthening the effects might be possible if GM and FTP measures were assessed with the same level of specificity.

Third, despite using a valid and commonly applied measure of academic buoyancy, this scale does not account for actual exposure to daily school stress. Instead, it relies on a self-report questionnaire administered possibly before any minor school stress has occurred.

Surprisingly, much of the academic buoyancy research also neglects to include measures of actual daily school stress, opting instead for questionnaires conducted before encountering any school setbacks or difficulties (e.g., Fong & Kim, 2018). When assessing academic buoyancy as an outcome—specifically, the ability to maintain mental health despite exposure to daily stressors—incorporating measures of daily school stress becomes crucial, as highlighted in a recent study (Janssen & van Atteveldt, 2023).

Lastly, our intervention focused solely on the role of adolescents in its application. A valuable addition for future interventions would be the involvement of parents or peers. For instance, in a study by Destin and Svoboda (2017), parents who participated in observing a parent panel subsequently expressed intentions to engage in earlier discussions with their adolescents about future opportunities and to respond more positively to academic challenges compared to parents in a control group. This proactive parental involvement contributed to improved educational outcomes, highlighting the potential benefits of experimental research that integrates other groups from adolescents' immediate context to positively influence their academic success.

To conclude, supporting adaptive motivational beliefs, such are FTP and GM, seems important for reducing adolescents' school stress, and potentially enhancing their self-regulated learning behaviors and motivation. With more interventions focusing on the role of positive beliefs, adolescents could grow towards their future goals even when confronted with stress.

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