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RESEARCH ARTICLE

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Learning under stress: The moderating role of future time perspective

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Abstract

We investigated the relationship between students' perceived stress and investment in learning and tested the role of future time perspective (FTP) as a moderator. We expected that FTP would serve as a protective factor in the association between students' perceived stress and investment in learning. Perceived stress was gauged by assessing students' mathematics anxiety related to class, learning, and tests, and investment in learning was gauged by measuring investment in learning with respect to mathematics. To measure FTP, we focused on the FTP in school and professional career. A total of $N = 349$ secondary school students from the Netherlands participated in this study. Results revealed negative associations between students' investment in learning and their anxiety in class, during learning, and while taking tests. The moderating effects of FTP were also found to be significant. Contrary to our expectations, higher levels of FTP were associated with a stronger negative relationship between anxiety and investment in learning. Moreover, we found negative associations between FTP and class anxiety and learning anxiety and a positive association between FTP and investment in learning. Overall, our results may suggest that FTP motivates students to learn, but students' anxiety weakens the motivating effect of FTP.

KEYWORDS
anxiety, future time perspective, investment in learning

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1 | INTRODUCTION

Students in secondary education must navigate many potential stressors such as homework, exams, and conflicting deadlines. The number of secondary school students who experience high levels of stress have increased, especially in recent years (Organisation for Economic Co-operation and Development [OECD], 2017). Experiencing too much stress related to school can impact students' learning behavior, lower their academic performance, and lead to maladaptive behaviors (Duchesne et al., 2008; Gadbois & Strugeon, 2011; Joels et al., 2006; Pascoe et al., 2020; Vogel & Schwabe, 2016). To prevent these negative effects, it is important to understand the impact of stress on students' learning behavior and to identify possible factors that may influence this relationship.

Stress is generally defined as an individual's response to an adverse stimulus in the environment (Folkman, 2013). This response can be characterized as physiological (e.g., increased heartbeat, blushing, sweating), cognitive (e.g., concentration problems, forgetfulness), or emotional (e.g., negative emotions such as anxiety, fear, and shame). In this study, we focused on one particular and common negative stress response: anxiety. Within the field of educational psychology, anxiety has been identified within a category of achievement emotions that are tied directly to achievement activities and outcomes (Pekrun, 2006). Also, research has shown that anxiety is the negative emotion most often reported by students, especially with respect to exams but also while doing homework or being in class (Pekrun et al., 2002).

A long research tradition about anxiety in education has confirmed that students differ in their levels of anxiety and that anxiety can have a detrimental impact on learning (Ahmed et al., 2012; Mandler & Sarason, 1952; Pekrun et al., 2002; Zeidner, 1998, 2014). However, the research has not always demonstrated a negative relationship between anxiety and learning behavior, making conclusions about the association between anxiety and learning uncertain. For example, studies have shown that anxiety may have an activating effect on learning (such as expending more effort in learning; Benjamin et al., 1981; Pekrun & Stephens, 2009; Strack et al., 2017). Some researchers have found weak (even nonsignificant) associations between anxiety and engagement and motivation for learning (e.g., Gillen-O'Neel et al., 2011; Martin, 2008). Indeed, we do not know why anxiety can demonstrate different effects on learning behavior.

Overall, the different relationships between anxiety and learning may suggest that anxiety does not have the same effect on all students and that there are other factors that are involved as possible moderators within the anxiety and learning relationship. Recent studies suggest that certain individual difference variables such as academic buoyancy and proactive personality moderate the relationship between anxiety and learning among students (e.g., Putwain et al., 2020; Zhu et al., 2017). Our study aims to contribute to this body of research.

To manage the potential negative effects of anxiety on learning behavior, students may require a certain attitude towards their future goals, which may help them to invest more effort in learning in the present. This individual attitude towards future goals and reflecting on the future consequences of one's present actions has been termed *future time perspective* (FTP; Andre et al., 2018; Husman & Lens, 1999; Peetsma, 1992). In general, studies have confirmed that individuals who scored high on FTP demonstrated maximized learning efforts, reduced anxiety, and more engagement in stress-coping strategies (Andre et at., 2018; Holman & Zimbardo, 1999; Kooij et al., 2018). Studies have also suggested that there is an interaction between negative emotions and long-term future goals (Turner et al., 2002). This interaction may result in students expending more effort in their learning because they attach high values and positive expectations to the future, which can empower students to recover from negative emotions and to pursue their education (Turner & Schallert, 2001; Turner et al., 2002). As far as we know, however, no research has tested FTP as a protective factor in the anxiety and investment-in-learning relationship among secondary school students. Studying FTP as a moderator in this relationship could help to better understand the mechanism that explains the relationship between anxiety and investment in learning among secondary school students. Furthermore, this line of inquiry could inform educational and psychological research and practice about how to enhance students' learning and to counter potential negative effects relating to anxiety.

We argue that students' FTP moderates the negative relationship between anxiety and investment in learning because individuals with a high FTP tend to think more positively about their academic future, attribute more value

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to achieving distant future goals, and see the usefulness of highly valued and positive future goals. These characteristics may strengthen students' resilience to stress and may help them to invest more in learning. Indeed, the expectations regarding students' future academic success and the perceived value of learning are likely to drive their persistence and achievement behaviors, while taking into account the negative emotional costs such as anxiety (Eccles & Wigfield, 2002). Within FTP theory, abilities to anticipate distant future goals and to attach value to these future goals are clearly tied to learners' FTP and are crucial with respect to learning behaviors such as investment in learning (de Volder & Lens, 1982; Husman & Shell, 2008; Peetsma, 2000). Furthermore, a study by Kooij et al. (2018) has suggested that FTP can inhibit anxiety. Consequently, it is possible that students' FTP interacts with anxiety in such a way that FTP plays a protective role by decreasing the negative relationship between anxiety and investment in learning.

1.1 | Anxiety and investment in learning

In this study, we regard anxiety based on the achievement emotions framework (Pekrun et al., 2002), which relates emotions to achievement activities and outcomes. We categorize anxiety as a negative emotion. Anxiety is seen as a negative activating emotion (e.g., evoking avoidance of threat, such as the *flight response*), particularly within the achievement emotions framework. Furthermore, anxiety is conceptualized as a set of interrelated psychological processes, including affective, cognitive, physiological, and motivational components (e.g., "feeling tense and uneasy, worrying, being activated physiologically, and wanting to escape in anxiety"; Pekrun et al., 2005, p. 2). This conceptualization mirrors the recognized and extensively researched component models of test anxiety (Zeidner, 1998).

Students may experience anxiety differently across situations or contexts. The three most important instances in which students experience anxiety are related to (a) attending class (e.g., worrying about not being sufficiently prepared), (b) learning in general (e.g., getting tense and nervous while studying and doing homework), and (c) taking tests and exams (e.g., feeling intensely nervous so as to seek to skip an exam; Pekrun et al., 2002, 2005). We focus on anxiety in each of these three situations.

Studies have suggested that students' anxiety should be measured domain specifically (Goetz et al., 2006; Pekrun, 2006) and that the relationships among anxiety and learning are stronger when emotions and achievement outcomes are measured in a specific domain (Goetz & Hall, 2013). Hence, we investigated the relationships among anxiety and investment in learning in the subject of mathematics. We chose mathematics because mathematics-related anxiety is a significant factor in students' decisions to avoid mathematics-related career tracks (Ashcraft, 2002). In general, students often experience anxiety in mathematics (OECD, 2013).

In research about anxiety and learning, different concepts have been used to measure students' learning behaviors, such as effort in learning, engagement, and learning time (e.g., Hill & Wigfield, 1984; Martin, 2008; Pekrun et al., 2002). In our study, we conceptualize students' learning behavior as a personal investment in school (Maehr & Braskamp, 1986). Based on this personal investment theory, students' investment in school comprises the direction (choice/preference in the course of action), intensity (activity level such as the number of tasks completed), persistence (time spent engaged in an activity), and quality (higher or lower levels of cognitive engagement) of learning behavior (Maehr & Meyer, 1997). Defined like this, school investment (or students' investment in learning) includes more than merely time or effort spent in learning. Moreover, investment in learning has been regarded as a constituent of students' self-regulated learning, which directly relates to student achievement (Peetsma & van der Veen, 2011).

Based on Boekaerts' (2011) theory on emotions and self-regulation of learning, it has been argued that situations that evoke strong negative emotions (e.g., anxiety) and a concern for well-being might require extra processing capacity from students to downplay this negative emotion and to return to their task. This could mean that when students focus on their well-being, they intentionally withhold effort from their learning task. Boekaerts

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(1999) found that favorable appraisals of tasks and opportunities for learning (e.g., feelings of efficacy) lead students to adopt mastery goals and activities, whereas feelings of stress lead students to focus on their well-being. Feeling anxious in mathematics can be one of the catalysts towards prioritizing well-being instead of putting effort into learning. Based on this theory, it is possible that when students are feeling anxious about mathematics in class, during learning, or while taking tests, they become more focused on maintaining their well-being and prioritizing emotional goals—rather than investing more in their learning.

Indeed, this detrimental effect of anxiety on learners' functioning has been extensively reported in the literature (Boekaerts & Pekrun, 2016; Pekrun, 1992, 2002; Pekrun & Linnenbink-Garcia, 2012). In a review study by Pekrun et al. (2002) about positive and negative emotions and their relationship among students' learning and achievement, anxiety was described to be negatively related to self-reported effort in learning over the course of 3 years in both university and school students. Also, based on the body of research conducted on test anxiety, students' test anxiety negatively influenced learning and achievement across different age groups and academic fields (Hembree, 1988). The overall negative relationship between anxiety and learning was further reinforced in the mathematics domain, but mainly with regard to student achievement (Pekrun et al., 2017). To support this, two meta-analyses found robust evidence that students' mathematics anxiety negatively related to their mathematics performance (see Ma, 1999; Zhang et al., 2019). Indeed, with regard to the relationship between test anxiety and students' learning behavior, test-anxious students were less persistent at difficult tasks and tended to invest less effort and time in their learning, (Hill & Wigfield 1984; Macher et al., 2012; Pekrun et al., 2002; Pintrich & DeGroot, 1990).

Even though the evidence points to a negative relationship between anxiety and students' learning behavior, studies have suggested that anxiety may also have positive effects on students' learning and may spur them to expend more effort in their learning and achievements (Pekrun & Stephens, 2009; Pekrun et al., 2011; Strack et al., 2017). For example, a recent study found that feelings of anxiety were a motivating factor: Strack et al. (2017) found a general tendency for their participants to use anxiety for self-motivation (i.e., the use of anxiety as a source of information and energy) or anxiety motivation, which resulted in higher academic achievement among students. However, the confirmed overall negative and long-term effects of anxiety on overall learning behavior were still found to outweigh the positive and short-term learning benefits of anxiety (Loderer et al., 2018; Pekrun et al., 2011). Therefore, we drew upon the theoretical reasoning by Boekaerts (2011) and the described empirical work that found negative relationships between mathematic anxiety and learning behaviors, and we hypothesized that:

Hypothesis 1 – *class anxiety, learning anxiety, and test anxiety relate negatively to investment in learning.*

In the following section, we address FTP as a possible moderator of the anxiety and investment in learning relationship among students—based on the different effects of anxiety on learning that suggest an existence of a moderating variable.

1.2 | FTP as a moderator in the anxiety and investment in learning relationship

Many definitions and conceptualizations of FTP have been used in the literature over the years (Andre et al., 2018; Shipp et al., 2009). We used the definition by Peetsma (1992, 2000): FTP is an attitude towards a life domain in the distant future that motivates learners' actions in the present through the value, intentions, and positive feelings that learners attach to their future life domain. This attitude is conceptualized by three components that individuals have towards their distant future. *Cognitions* include expectations, future goals, beliefs, or ideas; *behavioral intentions/behaviors* include plans and actions; and *affects* include feelings towards the future that can be positive or negative and therefore can influence an individual's values and behaviors (Andre et al., 2018; Peetsma, 2000). Together, these three components encompass the FTP construct.

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In the literature, FTP has been regarded as a motivator in different life domains of students (Andre, 2018; Husman & Shell, 2008; Peetsma, 2000; Peetsma & van der Veen, 2011; Seginer, 2019). In our study, we focused on the FTP related to school and professional career because we were interested in exploring the relationship between anxiety and investment in learning in the academic domain. FTP was found to be positively related to various educational outcomes such as learning effort, engagement, achievement, and performance (Andre et al., 2018; Schuitema et al., 2014; Zhang et al., 2021). Particularly, studies have found that FTP in school and professional career positively related to secondary school students' investment in learning. These relationships also held longitudinally and across different student samples (Andre et al., 2019; Peetsma et al., 2017; Schuitema et al., 2014).

FTP was found to be negatively related to individuals' perceived anxiety (e.g., Papastamatelou et al., 2015; Zimbardo & Boyd, 1999). In addition, two recent meta-analyses found robust evidence that FTP and anxiety were negatively related constructs across different age groups and suggested a protective role of FTP (Diaconu-Gherasim et al., 2021; Kooij et al., 2018).

Having positive thoughts about obtaining a diploma in the future and attaching a high value to future goals in school and for a professional career may impact the relationship between anxiety and investment in learning. For example, Turner and Schallert (2001) found that students who felt ashamed (a negative emotion) after failing a test were able to overcome that shame and to improve their test scores if they saw the value in passing the course and linking that to their future goals. This also matches the expectancy-value model by Eccles and Wigfield (2002), which states that the expectation of future academic success and task values, such as the utility value (i.e., the usefulness of a task for the pursuit of other short- and long-term learning goals), drive students' achievement behaviors in class while also taking into account the negative emotional costs (e.g., feeling worried or anxious). This co-occurrence of heightened values with heightened negative costs has been also found for secondary students' motivation in mathematics (Conley, 2012), suggesting that the more students anticipate and value their distant future while feeling anxious, the more they might invest in learning mathematics. Furthermore, the protective role that future-related thoughts play in combating students' stress was also suggested in a study by Almeida (2005). In this study, future life goals were assumed to have a moderating influence on the relationship between stress and well-being by increasing individuals' resilience to stress that protected them from the negative stress experience (Almeida, 2005). In a similar vein, students who are more prone to anticipate their future school and professional career and who attach more value to the same can better cope with their anxiety and invest more in learning because attaching high value and positive thoughts to the future can make students more resilient to academic stress.

Following these theoretical and empirical reasonings, it is possible to expect that there is an interaction between anxiety as a negative emotion and FTP, which can predict students' investment in learning. As FTP increases, we would expect it to buffer against the detrimental impact of anxiety such that the negative relationship between anxiety and investment in learning would weaken, which leads to our second hypothesis:

Hypothesis 2 – *FTP attenuates the negative association between class anxiety, learning and test anxiety, and investment in learning.*

1.3 | The present study

The goal of this study was to explore the relationship between students' anxiety during class, as they learn, and while taking tests and their investment in learning. We also sought to test FTP as a moderator. We expected that class, learning, and test anxiety and investment in learning would have a negative association and that FTP would significantly moderate these relationships. Particularly, we expected that FTP would serve as a protective factor that would reduce the negative associations between students' anxiety (e.g., class, learning, and testing) and their investment in learning in the subject of mathematics.

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Our study is the first to contribute to the stress and time perspective research on the relationship between anxiety and investment in learning and on the moderating role of FTP in the subject of mathematics. Our study also has practical relevance. Knowing the relationship between students' mathematics anxiety in different situations and their investment in learning (and the role of FTP in this relationship) can generate useful evidence for researchers and school practitioners. This evidence can help to develop interventions to reduce the negative effect of anxiety and to increase students' investment in learning. If FTP plays a protective role that can help students to overcome their anxiety and to invest more in their learning, then this may result in motivated and successful students and may guide the development of stress management interventions and coaching strategies. Ideally, these strategies and interventions could help students to put more effort in their learning—even if they feel anxious during class, while learning, or while sitting for a test in mathematics.

2 | METHOD

2.1 | Participants and procedure

Participants in this study were $N = 349$ Dutch students (128 men, 190 women, and 31 students who did not report their gender) from a large secondary school in the western part of the Netherlands. This school included three educational levels (lower general secondary education, higher general secondary education, and preuniversity education), which are indicative of the vocational or theoretical orientation. The majority of the students (97%) were from the higher general and preuniversity education, which offer more theoretical education and prepare students for university. The average age of the students was $M = 15.4$ years (SD = 2.66).

Most of the students (86.8%) had a Dutch background, 6.3% were from a non-Western ethnic minority group (mainly Moroccan, Turkish, or Surinamese), and 6.9% students labeled their origin as from another country (mainly Western). Ethnic background was based on the mother's country of birth. Students' socioeconomic background was assessed through their parents' education. The majority of the students' parents had a higher education or university education background (45.7%) or a higher general secondary education or preuniversity education background (37.5); 16.8% of the students' parents completed prevocational or lower general education. Before the data collection, we contacted a school from our network via a phone call and sent a letter describing our study. Once the approval to participate was obtained by the school principals, we recruited a convenience sample of students. Participation was preceded by an informed-consent procedure that required active consent from both students and parents. In March 2020, an online questionnaire was introduced by the researchers and administered during the mentor class. Students could access the questionnaire by clicking on the link or by scanning the QR code with their phones. It took about 20 min to complete the questionnaire.

2.2 | Measures

2.2.1 | Anxiety

Anxiety was measured using the mathematics anxiety scale from the Achievement Emotions Questionnaire-Mathematics (AEQ-M; Pekrun et al., 2005). The AEQ-M is a questionnaire in which students report their negative achievement emotions related to mathematics and encompasses affective, cognitive, physiological, and motivational components. The anxiety scale included three subscales that measured different types of students' anxiety in mathematics: 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 am so afraid of mathematics that I would rather not go to class," and learning anxiety, "When I am studying for

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mathematics, I feel tense and nervous"). The subscale for test anxiety consisted of seven items (e.g., "During a mathematics test I am worried I will receive a bad grade"). These items were rated on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). The validity of the AEQ-M questionnaire was confirmed in a cross-cultural study (e.g., Frenzel et al., 2007), and each subscale had a good reliability in the current study (class anxiety: $\alpha = .86$; learning anxiety: $\alpha = .85$, and test anxiety: $\alpha = .93$).

2.2.2 | Investment in learning

Students' investment in learning was measured using the investment in learning in class subscale of the School Investment Questionnaire developed by Roede (1989). This questionnaire has been widely used in educational research in the Netherlands. This scale was based on the theory of Maehr and Braskamp (1986) and includes the onset/direction of students' behavior, the degree of intensity in learning, and perseverance in learning. The subscale consisted of five items with a 5-point Likert scale ranging from 1 (*totally agree*) to 5 (*totally disagree*) through which students reported about their investment in learning for mathematics. The questionnaire included items like, "During mathematics class, I work hard." The validity of this questionnaire has been confirmed in previous studies on different samples and also longitudinally (Andre et al., 2019; Peetsma, 2000; Peetsma et al., 2005; Roede, 1989). Also, in the current study this scale had a good reliability that was similar to previous work ($\alpha = .86$).

2.2.3 | FTP

FTP was measured using the Future Scale of the Time Perspective Questionnaire on school and professional career, which was developed by Peetsma (1992). With this scale, students reported their long-term future thoughts and feelings related to school and professional career. This scale assessed students' cognition, affect, and behavioral intention towards the future while specifying the context of future thinking (i.e., school and professional career). The questionnaire included seven items rated on a 5-point Likert scale ranging from 1 (*totally agree*) to 5 (*totally disagree*). An item example included, "I enjoy thinking about my future studies or work." The validity of this scale has been confirmed in previous studies and cross-culturally (Andre et al., 2019; Peetsma, 1993; Peetsma et al., 2005; Stouthard & Peetsma, 1999). The questionnaire had a good reliability in the current study that was similar to previous work (Cronbach's $\alpha = .71$).

2.3 | Data analysis

We analyzed the data in three steps. First, as part of the preliminary analyses, missing data were checked and the main assumptions relevant for the analyses were tested. Second, bivariate Pearson correlation analyses were conducted to test the relationships between class, learning, and test anxiety with investment in learning. Third, to test the FTP as a moderator in the relationship between anxiety and investment in learning, three moderator analyses were conducted that included class, learning, and test anxiety in relation to investment in learning. These analyses were conducted using the PROCESS macro for SPSS, version 3.5 (Hayes, 2017), which is a regression-based analysis software. We analyzed the interaction effect of FTP and anxiety on investment in learning and used the pick-a-point technique to probe the effect. The pick-a-point technique allowed us to ascertain whether students' class, learning, and test anxiety related to investment in learning when students' FTP scores were low (1 SD below the mean), medium (mean), and high (1 SD above the mean).

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3 | RESULTS

3.1 | Preliminary analyses

Because only 5% of the data had missing values, missing values were estimated using the SPSS Expectation Maximization (EM) procedure (Graham, 2009). All scales met the assumptions of normal distribution or slight nonnormality (Lei & Lomax, 2005). Based on the variance inflation factor, there were no concerns about multicollinearity among variables, allowing us to proceed with the analyses.

3.2 | Relationships among anxiety, investment in learning, and FTP

Correlations among class, learning, and text anxiety, investment in learning, and FTP are reported in Table 1. As shown, anxiety was negatively related to investment in learning. That is, the class anxiety, learning anxiety, and test anxiety experienced by students in mathematics all showed a significant negative correlation of medium effect size with their investment in learning for mathematics—as we hypothesized. In addition, the relationships between FTP and class and learning anxiety were negative and of a moderate effect size (Keith, 2006). However, the correlation between FTP and test anxiety was not significant. Indeed, these results indicate that class anxiety, learning anxiety, and test anxiety are all negatively related to students' investment in learning as predicted by our first hypothesis. Moderation analyses are presented below.

Moderation analyses were carried out for each type of anxiety. The interaction effect of FTP and class anxiety on investment in learning was significant and the largest, $B = -0.20$, SE = 0.08, $p < .05$, 95% CI [−0.346, −0.050]. Contrary to our expectations, however, the interaction effect was found to be negative instead of positive. This means that the relationship between anxiety and investment in learning was more negative for higher levels of FTP than for lower levels of FTP. The interaction effect of FTP and learning anxiety on investment in learning was significant as well—again in the negative direction, $B = -0.16$, SE = 0.074, $p < .05$, 95% CI [−0.307, −0.017]. Both these effect sizes can be considered as medium sized (Keith, 2006). Finally, the moderation of FTP and test anxiety on investment in learning was marginally significant and also negative, $B = -0.11$, SE = 0.064, $p = .08$, 95% CI [−0.23, 0.01].

A visual representation of the results is provided in Figure 1. As shown in Figure 1a, the relationship between investment in learning and class anxiety was very large for individuals with a high FTP, $B = -0.40$, SE = 0.07, $p < .001$, 95% CI [−0.55, −0.25]; large for individuals with moderate FTP, $B = -0.27$, SE = 0.05, $p < .001$, 95% CI [−0.37, −0.17]; and moderate for individuals with a low FTP, $B = -0.14$, SE = 0.06, $p < .05$, 95% CI [−0.27, −0.01]. In Figure 1b, it is shown that the relationship between investment in learning and learning anxiety is large for individuals with a high FTP, $B = -0.35$, SE = 0.07, $p < .001$, 95% CI [−0.49, −0.20]; moderate for individuals with moderate FTP, $B = -0.24$,

TABLE 1 Descriptive statistics and correlations of all study variables

Variables	1	2	3	4	5	*M*	SD
Class anxiety	-	.81**	.71**	-.30**	-.15*	1.86	.90
Learning anxiety		-	.79**	-.28**	-.15*	1.92	.95
Test anxiety			-	-.22**	-.05	2.51	1.11
Investment in learning				-	.37**	3.07	.90
FTP					-	3.78	.65

*$p < .01$; **$p < .001$.

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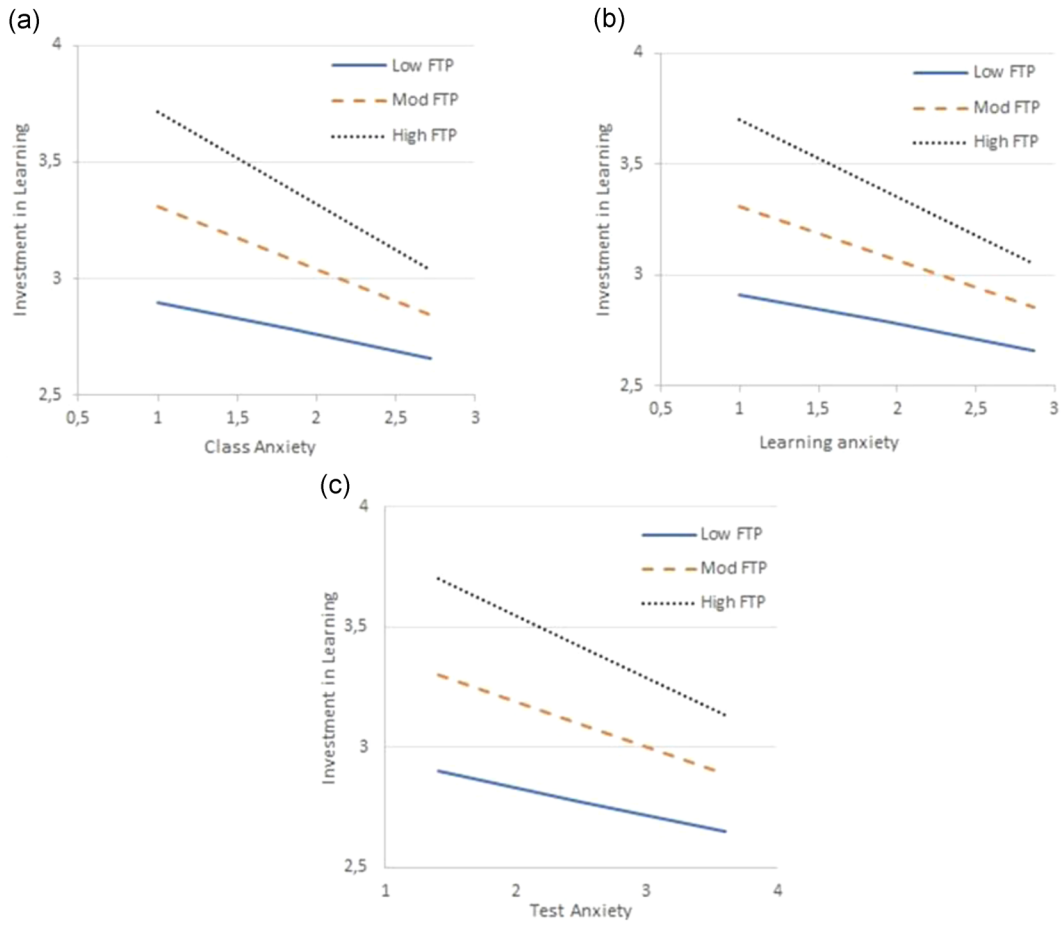

FIGURE 1 The interactions of future time perspective (FTP) and different types of anxiety on investment in learning. (a) class anxiety, (b) learning anxiety, and (c) test anxiety

SE = 0.048, $p < .001$, 95% CI [−0.34, −0.15]; and also moderate for individuals with a low FTP, $B = -0.14$, SE = 0.063, $p < .05$, 95% CI [−0.26, −0.01]. Finally, Figure 1c shows that the relationship between investment in learning and test anxiety (albeit marginally significant) is large for individuals with a high FTP, $B = -0.26$, SE = 0.061, $p < .001$, 95% CI [−0.38, −0.14]; moderate for individuals with moderate FTP, $B = -0.19$, SE = 0.041, $p < .001$, 95% CI [−0.27, −0.11]; and moderate for individuals with a low FTP, $B = -0.11$, SE = 0.056, $p < .05$, 95% CI [−0.22, −0.005].

From the moderation analyses results, it becomes apparent that our second hypothesis was not accepted. Although FTP was a significant moderator in the relationship between class, learning, and test anxiety and investment in learning, the effect of FTP was opposite to the anticipated direction. For students with higher scores on FTP, the relationship between anxiety and investment in learning was more negative than for students with lower scores on FTP. Explanations for these results are proposed in the discussion.

4 | DISCUSSION

Our aim was to investigate the relationship between students' stress (that manifests as anxiety) and their investment in learning and to test FTP as a moderator. Particularly, we explored the experience of anxiety during class, while learning, and while taking tests because these are the most common emotional reactions to stress of

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secondary school students and are found to significantly influence students' performance (Pekrun et al., 2002). Also, we focused on the subject of mathematics because mathematics is compulsory for most students, and the anxiety experienced in mathematics is a common problem among the majority of students (OECD, 2013).

4.1 | Anxiety and investment in learning

We hypothesized that students' anxiety would be negatively associated with their investment in learning. Specifically, we expected that students' class, learning, and test anxiety would each have a negative relationship with their investment in learning. As expected, our study revealed that when students experienced more anxiety related to class, learning, and taking a test, they were less invested in their learning. For example, students put less effort in learning and were not persistent as they learned for a class. Also, we found that the negative relationship between anxiety and learning was the strongest when students experienced anxiety during classes and while learning and moderate when students experienced anxiety during tests. Overall, these findings show that students' anxiety can be detrimental to their investment in learning. Thus, our findings support Boekaerts' dual processing self-regulation model (2011) and corroborate previous research by Pekrun et al. (2002) and Ahmed et al. (2012). Our study also advances research on the relationship between anxiety and learning. On a more specific and contextual level, we found that three types of anxiety were negatively related to students' investment in learning in the subject of mathematics. On a more general level, our findings provide evidence about the role of students' perceived stress that manifests as anxiety and to underscore how negative emotions (such as anxiety) harm students' learning, which has also been highlighted by previous research about emotions in academic settings and learning relationships (Boekaerts & Pekrun, 2016; Pekrun & Linnenbink-Garcia, 2012).

4.2 | FTP as a moderator in the anxiety and investment in learning relationship

In this study, we used FTP as a moderator according to the expectancy-value theory by Eccles and Wigfield (2002) and to empirical work that suggests that expectancies of future success and value drive students' learning behaviors, while taking into account the negative emotional costs (Conley, 2012; Turner & Schallert, 2001; Turner et al., 2002). In addition, we relied on research that highlighted the protective and motivational role that FTP plays in the educational domain and with regard to anxiety (Andre et al., 2018; Diaconu-Gherasim et al., 2021; Kooij et al., 2018). Consequently, we proposed that FTP would moderate the negative association between students' anxiety and investment in learning. Particularly, we expected that FTP would serve as a protective factor that would reduce the negative role of class anxiety, learning anxiety, and test anxiety on students' investment in learning in the subject of mathematics.

Our study revealed a significant interaction effect of FTP and class and learning anxiety, and a marginally significant interaction effect of FTP and test anxiety on investment in learning. This finding indicates that FTP moderates the effect of students' anxiety on their investment in learning. Yet, the interaction effect of FTP with anxiety was the opposite of what we expected. In particular, the results showed that for students with a high FTP score, anxiety had a stronger negative relationship with their investment in learning. In this way, our assumption about the protective role of FTP does not seem correct. The value and positive thoughts that students had about their future did not help anxious students to invest more effort in their learning. Furthermore, contrary to empirical work that has suggested that FTP plays a protective role in the educational and health domain (e.g., Kooij et al., 2018), we found that FTP did not protect students from the detrimental negative effects of anxiety. That is, even when students thought more about their future school and professional career and felt more positive about this future and attached values to these contemplations, their feelings of anxiety would harm learning. It might even be that FTP increases the negative effect of anxiety on investment in learning for mathematics because people's

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future thoughts when confronted with anxiety may inhibit motivation (Zaleski, 1996). Nevertheless, students higher in FTP still reported higher investment in learning (without taking anxiety into account), which was evident by the positive relationship between FTP and investment in learning. This corroborates previous research that has suggested a motivational role for FTP in education (Andre et al., 2018, 2019; Husman & Shell, 2008; Peetsma et al., 2017; Schuitema et al., 2014; Zhang et al., 2021).

Because this study was correlational in design, we cannot draw conclusions about the causality of the effects. We can, however, offer interpretations of these results. The interaction may be the other way around: The positive relationship between FTP and investment in learning may be lower among students who experience high amounts of anxiety. That is, it could be that anxiety decreases the positive effect of FTP on learning. In fact, it seems plausible that when stress is in the way, FTP cannot perform its motivating role because stress makes individuals focus on the present (Duggan, 2007; Rappaport, 1991; Sirois, 2014). Thus, the moderation results can be explained based on the emotion-regulation literature in an academic setting. As Boekaerts and Corno (2005) stated, once the (negative) emotions are activated, students' emotions tend to override future goals and actions (even considerations of appropriateness or long-term consequences), which our study suggested using the construct of FTP. These results draw attention to how these warning signs of anxiety interrupt ongoing activities related to investment in learning, even when students considered their future school and professional career. In this way, our study contributes to the time perspective and emotional-regulation literature. Even though FTP related positively to investment in learning and negatively to anxiety, the interplay between FTP and anxiety did not help students to invest more effort in their learning.

Finally, perhaps there are more variables acting as moderators, confounders, or mediators in the relationship between anxiety and investment in learning. For example, meta-emotions, or the feelings individuals have about their feelings, might contribute to the influence that anxiety has on how people invest in learning. As Pekrun et al. (2002) stated, the role of meta-emotions has been confirmed in coping with anxiety. A feeling of anger about one's anxiety can be a motivator to find constructive coping techniques that lower anxiety. Perhaps the measurement of meta-emotions could be valuable in future studies to elucidate the relationship between anxiety and learning behaviors. Moreover, mathematics self-concept is known to be negatively related to mathematics anxiety (Ahmed et al., 2012); hence, it is likely to lower the impact of anxiety on investment in learning. Mathematics self-concept is defined as an individual's self-appraisal of their mathematics skills. If students have trust in their mathematics skills, they are less likely to experience mathematics-related anxiety. Mathematics self-concept would be an interesting control variable or study variable to include in future studies about the anxiety and learning relationship. Indeed, it would also be interesting to explore this relationship across different school subjects.

4.3 | Practical implications

Our research provides implications for practice, particularly within the secondary school context. First, students who experience academic stress that manifests as anxiety in mathematics will expend less effort and be less persistent in their learning. In this respect, mathematics teachers should be aware of students who are experiencing anxiety and, together with the school and parents, should aim to establish an appropriate learning environment and to develop a support system for students who are confronted with anxiety. More emphasis should be placed on identifying students who are feeling anxious about learning, classes, and tests in mathematics; consequently, we may then apply appropriate interventions and coaching strategies to deal with their anxiety and to improve overall learning in mathematics. Some promising interventions to reduce anxiety in mathematics were proposed in previous studies (e.g., Brooks, 2014; Ramirez et al., 2018). For example, one intervention would be to reframe mathematics anxiety as an excitement rather than a threat by applying simple positive self-statements ("I am excited") and to develop an opportunity mindset to contrast the threatening mindset, which has been a successful way to reduce anxiety and to increase performance (Brooks, 2014).

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Second, previous studies have focused on exploring protective mechanisms in the stress and learning relationships among students (e.g., Putwain et al., 2020; Zhu et al., 2017), yet the protective role of students' FTP has not been studied in this respect—particularly with regard to their investment in learning. Our study provides evidence that even when students focused more positively on their future thoughts, feelings, and behavioral intentions in school and in their professional career, this did not help to reduce the negative impact of anxiety on their investment in learning for mathematics. Indeed, the detrimental effect of anxiety on investment in learning could even be stronger. Nevertheless, when the interplay of anxiety and FTP was ignored, students with higher levels of FTP still experienced less anxiety related to learning and during their mathematics class and invested more in their learning—even when they were not feeling anxious. This finding suggests that fostering FTP in school and in professional career is still very important for students' learning, but (as previously discussed) more factors should be taken into account. Consequently, school-based interventions that focus on developing students' FTP would be helpful to encourage students to invest more in their learning, and possibly even reduce (future) anxiety. A short teacher-training intervention has been implemented to develop FTP to enhance students' investment in learning and other learning behaviors (Peetsma et al., 2017; Schuitema et al., 2014). Peetsma et al. (2015, 2017) developed and tested this person-centered intervention TIME (Time perspective Intervention of Motivation Enhancement), which proved to have a significant impact on secondary school students' investment in learning, specifically in the subject of mathematics. Evidence of this intervention suggests that the demonstrated significant increase in investment in learning levels remained stable even after 2 years (Peetsma and Van der Veen 2015). Mathematics teachers could be trained to implement this motivational intervention. School counselors and psychologists may apply the TIME intervention in a counseling format.

Third, our findings have wide-ranging implications. Teachers seeking development, school curriculum designers, and parents should be aware of the warning signs of students' stress on their learning behavior and that certain individual factors may play a significant role. We suggest that during teacher education programs, teachers should learn motivational skills about how to create more stimulating and less stressful learning environments so as to help students to reduce their anxiety and to invest more in their learning. Our results directly relate to anxiety and investment in learning in the subject of mathematics. We posit that any mathematics curricula could be personalized and that schools could offer a tailor-made program for students who are feeling anxious in mathematics. However, these interventions could be tailored to other school subjects. To begin, students should communicate with school psychologists, teachers, and parents to be assigned to a personized curricula to help them cope with mathematics anxiety and to help them invest more in their learning.

4.4 | Limitations and future recommendations

Although our study adds to the theory, research, and practice about students' perceived stress, FTP, and investment in learning, there are some limitations that warrant consideration.

First, because we applied a cross-sectional design, it is not possible to assume causal relationships. To do so, future studies might use a longitudinal or experimental design when exploring the relationship between anxiety and investment in learning to test the influence of FTP in their relationship. Second, this study relied on self-report measures, which may be seen as a limitation. To have a more objective view of certain emotions and behaviors of individuals, observations could be included in addition to the self-reports. This especially applies to the construct of anxiety. Although it is more difficult to observe anxiety, researchers could measure the salivary cortisol levels to obtain evidence of students' anxiety levels (see Cipra & Müller-Hilke, 2019). To be clear, anxiety is an emotion, and we were interested in how students experience negative emotions about mathematics. In this regard, we believe that the self-report anxiety measure used in our study provided a valuable measure of students' anxiety in mathematics. Furthermore, measuring FTP using self-reports is a dominant approach in FTP research and also matches the psychological nature of the construct (Paulhus & Vazire, 2007). Thus, we believe that measuring FTP with a self-report was the right approach.

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Third, we measured students' anxiety as a trait. A relevant recommendation would be to make use of state-emotion data to complement trait-emotion data as was also recommended by the developer of the AEQ (Pekrun, 2006). This could be achieved by using a diary type of data collection rather than a questionnaire administered at set time points. The advantage of measuring state emotions over trait is that they may more accurately represent an individual's anxiety levels. When filling in a questionnaire about test anxiety, a respondent must think back about their last mathematics test, which may have been some time ago. The self-report of past emotions is probably less accurate or more generalized than a measurement taken on the day the emotion was experienced. Of course, trait emotions can still be situation specific as Pekrun (2006) stated. Therefore, our data collection for anxiety is still a relevant approximation of anxiety experienced in mathematics class, while learning, and while taking tests.

A final limitation could be that the moderation results revealed in our study are only applicable in this cultural context and for the subject of mathematics. Perhaps FTP plays a protective role in students' anxiety related to other cultural contexts and in other school subjects because the motivational role of FTP on learning is dependent upon students' culture and life domain (Andre et al., 2018, 2019; Peetsma & van der Veen, 2011; Seginer, 2009). Future studies could explore our core hypotheses in different cultural contexts and in other areas of study.

5 | CONCLUSION

Our study has revealed some relevant evidence to explain the relationships between students' anxiety and investment in learning and the moderating role of FTP in this relationship. When students felt anxious about learning for mathematics, classes, or tests, they invested less in their learning for mathematics. FTP played a negative role in the relationship between students' anxiety and their investment in learning for mathematics. Taken together, our study suggests that FTP might play a less positive role in learning for students who are experiencing high levels of anxiety in mathematics. In addition, we found that when students thought more about their futures regarding school and professional career, they felt less anxious in mathematics and invested more time and effort in their learning. That is, when we disregarded the interaction effect of FTP and anxiety, FTP tended to have a positive effect in decreasing students' class and learning anxiety in mathematics and in increasing their learning. Since virtually no prior research has investigated how FTP moderates the relationship between anxiety and investment in learning, it is our hope that our research, despite its correlational characteristics, will stimulate future researchers to study the relationship between students' anxiety and their learning behaviors.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available upon reasonable request from the corresponding author, Lucija Andre. The data are not publicly available due to data containing information that could compromise the privacy/consent of research participants.

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