

Goal Clarification and Process Feedback Matter: Reducing Test Anxiety in Low-Stakes Testing


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Abstract: Test anxiety can undermine student achievement and self-esteem, even with low-stakes tests designed to support learning. While previous research mainly focused on individual factors, an important question was whether aspects of the social context – how teachers interact with students about tests – can also reduce test anxiety. Grounded in assessment for learning and self-determination theory, this study investigated if goal clarification and process feedback—core instructional strategies in low-stakes contexts—relate to lower test anxiety via need satisfaction and need frustration. A pretest-posttest field study was conducted with 237 secondary school students. Two to five days before their low-stakes test, a pre-questionnaire measured students' baseline test anxiety, need-based experiences, and perceptions of goal clarification and process feedback. The post-questionnaire, completed immediately after the test, assessed students' experienced test anxiety. Multilevel analyses revealed that students who perceived more goal clarification and process feedback reported lower test anxiety, after accounting for baseline test anxiety and gender. Greater need satisfaction, but not lower need frustration, mediated these student-level relations. Moreover, classroom-level process feedback predicted decreased test anxiety. These findings suggest that providing more clarity on learning goals and more process feedback can alleviate test anxiety in low-stakes contexts, offering insights for targeted interventions.

Keywords: clarity; feedback; self-determination theory; test anxiety; low-stakes testing

Introduction

Instructors typically monitor and evaluate student learning, both for accountability purposes and because assessments can motivate students to put more effort into learning (OECD, 2016, 2023). However, some students may experience feelings of anxiety during assessments (Pekrun et al., 2011). *Test anxiety* is a specific type of anxiety that students experience in evaluative contexts that are appraised as threatening, and is manifested in physiological, cognitive, behavioral (or affective) and motivational responses (Zeidner, 2007). When students experience test anxiety, they may feel their heart pounding and start sweating (i.e., physiological component), worry about getting good grades and the negative consequences of failure (i.e., cognitive), feel panicky or tense (i.e., behavioral-affective), or have an urge to escape the testing situation in order to avoid failure (i.e., motivational). While moderate test anxiety levels can extrinsically motivate students to put in more effort and achieve short-term success (Theobald et al., 2021; von der Embse et al., 2018), high levels of test anxiety often have detrimental effects. It can influence assessment validity (Zeidner, 2007), can contribute to lower self-esteem (Liu et al., 2024), and can impair students' self-regulated learning (Cassady, 2004), ultimately hindering students' achievement in the longer run (von der Embse et al., 2018).

Test anxiety is more pronounced in high-stakes assessments (e.g., end-of-term exams) because of the strong evaluative focus and major consequences of poor performance, such as not being admitted to the next year (C. L. Reeve et al., 2008). Yet, students may also experience anxiety during *low-stakes assessments* such as teacher-developed classroom tests (De Jonge et al., 2024). Although low-stakes assessments have little or no direct impact on students' final grade (Schüttpelz-Brauns et al., 2020), are designed to monitor and support student learning, and provide both students and

teachers with information about the learning process and areas of strength and improvement (Wiliam, 2011), they can still be perceived as stressful and threatening (Wenzel & Reinhard, 2021), hereby leading to test anxiety (De Jonge et al., 2024). Recently, it has been estimated that approximately 15–22% of secondary school students exhibit high test anxiety (Putwain & Daly, 2014; Thomas et al., 2018) and 55% of secondary school students indicate feeling very anxious for a low-stakes test even if they were well prepared (OECD, 2017). For low-stakes testing in secondary education in particular, 17–21% students report experiencing heightened feelings of anxiety (De Jonge et al., 2024). When students perceive low-stakes tests as stressful, they seek out less feedback on their learning progress in order to protect their self-worth from failure (Putwain, 2019; Zeidner & Matthews, 2005), thereby missing valuable learning opportunities. As low-stakes tests are the most commonly and frequently used assessments in secondary education (OECD, 2023) and are increasingly integrated into higher education to support and structure student learning (Schüttpelz-Brauns et al., 2020), identifying strategies to reduce anxiety on low-stakes tests is crucial. This is especially important in secondary education, where test anxiety tends to intensify with increasing age (Dan et al., 2014; von der Embse et al., 2018), highlighting the need for identification and intervention for test anxiety at this educational level.

While the majority of previous test anxiety research has focused on individual factors to reduce test anxiety (e.g., teaching students test-taking skills, relaxation and breathing techniques or coping strategies; Soares & Woods, 2020), an important question posed in the current study is whether aspects of students' social context may also help to reduce test anxiety. According to the transactional model of coping and stress (Lazarus & Folkman, 1984; Zeidner, 2007), test anxiety develops, and can be mitigated, through a dynamic interplay between individual (e.g., students' levels of trait

anxiety, perfectionism or cognitive working memory capacity) and contextual (e.g., parental expectations, classroom climate, test environment) factors. How students respond to assessment situations is influenced not only by individual factors, but also by the context in which the student is functioning. Environmental factors can thus either mitigate or exacerbate students' test anxiety.

Recent evidence has pointed towards a promising contextual pathway through which test anxiety might be reduced: that is addressing students' need-based experiences (i.e., need satisfaction and need frustration), as derived from Self-Determination Theory (SDT; Ryan & Deci, 2017). According to SDT, students will thrive in environments that fulfill their basic psychological needs for autonomy (i.e., sense of volition and control), competence (i.e., feelings of mastery and effectiveness), and relatedness (i.e., experiences of warmth and care). Contrastingly, when these needs are thwarted, which is the case when students feel pressured (i.e., autonomy frustration), experience failure (i.e., competence frustration), or feel alienated (i.e., relatedness frustration), they are more likely to experience ill-being (Vansteenkiste & Ryan, 2013). Indeed, one earlier study demonstrated that, particularly in low-stakes assessment contexts, secondary school students experience higher test anxiety when they perceive to have experienced more need frustration (De Jonge et al., 2024). Other research has similarly found that high need satisfaction relates to lower test anxiety, although the stakes of the assessment contexts were not specified (Maralani et al., 2016, 2018; Spadafora et al., 2020). In the current study, we specifically examine this link in a low-stakes context.

In low-stakes assessment contexts, tests are often used as formative assessments (FA) to provide ongoing feedback and allow students to practice and make mistakes without significant consequences for their final evaluation (Black & Wiliam, 2009).

Essentially, formative assessments are tools for monitoring progress and informing students on the next steps for learning. The use of formative assessments is closely aligned with the principles of assessment for learning (AFL; Broadfoot et al., 2002; Wiliam, 2011), that is, “the *process* of seeking and interpreting evidence for use by learners and their teachers to decide where they are in their learning, where they need to go to and how best to get there” (Broadfoot et al., 2002, pp. 2-3). In line with the intended function of formative assessments, the AFL concept emphasizes that assessments should be used to actively support learning, rather than merely measure achievement, which is the intended function of summative assessments (Dixson & Worrell, 2016). Hence, all formative assessments are part of assessment for learning, but assessment for learning includes more than just formative assessments. It includes how teachers and students use feedback and set goals. There are a number of strategies that are essential to effective FA and AFL (Wiliam, 2011). Two promising strategies are clarifying learning intentions or goals (i.e., goal clarification) and providing feedback that moves learning forward (i.e., process feedback), both of which have been linked with need satisfaction and need frustration (Krijgsman et al., 2019; Leenknecht et al., 2020).

Both goal clarification and process feedback might have the potential to lower test anxiety because they have been, theoretically and empirically, associated with student motivation, and in particular with students’ need-based experiences (Jang et al., 2010; Krijgsman et al., 2019; Pat-El et al., 2024). They may help students feel in control of their own behavior, feel effective, capable and improve their self-confidence, and feel connected and valued by their teacher and peers. Thus, one likely mechanism by which goal clarification and process feedback can reduce test anxiety in low-stakes settings is via students’ experienced need satisfaction and need frustration. Although goal

clarification and process feedback have been found to reduce anxiety on high-stakes tests (Daniels & Gierl, 2017; Panadero & Jonsson, 2013), the mechanism for these effects has not been tested. This is particularly important in the context of low-stakes assessments, where goal clarification and process feedback are important instructional strategies to create a safe and predictable learning environment, yet test anxiety remains prevalent and high (De Jonge et al., 2024). No studies so far have investigated whether these strategies reduce test anxiety in *low-stakes* tests through their effects on *need satisfaction* and *need frustration*, despite reasons to believe that these mechanisms play an important role. To address these gaps, this study combines SDT, FA and AFL literature using a pretest-posttest survey design.

Goal Clarification and Process Feedback in Low-Stakes Testing

Goal clarification refers to communicating specific and clear *learning* objectives and success criteria (Black & Wiliam, 2009; Hattie, 2009). Goals serve as a compass during students' learning process (Biggs, 1996), providing them with direction on 'where to go' and where to focus their efforts, while also establishing a standard for what competent functioning looks like (Mouratidis et al., 2008). As goal clarification shows what is expected from the students, this can help support students' feelings of competence and mastery, making it a core element within the framework of SDT (Aelterman et al., 2019). Often, teachers clarify learning goals at the beginning of the lesson to the entire class (J. Reeve, 2006). In low-stakes testing situations, teachers explain more explicitly what students need to be able to do and know for the upcoming test, highlighting key aspects of the topic that require attention (Leber et al., 2018). When students understand the learning objectives and test expectations, they demonstrate greater self-regulation in their learning (Vansteenkiste et al., 2012;

Zimmerman, 2008), have higher academic performance (Locke & Latham, 2019; Moeller et al., 2012), and are more autonomously motivated and less amotivated (Haerens et al., 2019).

Process feedback involves offering students the necessary information and suggestions to help them achieve their learning goals and consequently improve their learning (Hattie & Timperley, 2007; J. Reeve, 2015). Process feedback focuses on ways to approach learning tasks, and encourages students to reflect on how they self-regulate their learning in order to improve (Pat-El et al., 2013; Winston & Carless, 2020). Process feedback can foster students' sense of competence by showing how to succeed and how to improve, underscoring the importance of process feedback as a competence-supportive strategy in the self-determination theory (Aelterman et al., 2019). Teachers who provide process feedback inform their students about 'how they are doing' towards meeting the learning goals (i.e., monitor) and guide them step-by-step through their learning trajectory (i.e., scaffold). It allows students to further develop their skills, bridge the gap between current and desired performance, and increase their sense of competence (Sadler, 1989; Shute, 2008). Teachers typically provide process feedback to individual students during the learning activities (Hattie & Timperley, 2007; J. Reeve, 2006). In low-stakes testing, the feedback is tailored to the exercises that will be covered on the upcoming test to improve test performance (Hattie, 2009). Process feedback is an important determinant of student achievement (Hattie, 2009) that is positively related to self-regulated learning (Butler & Winne, 1995), classroom engagement (Jang et al., 2010), and intrinsic motivation (Mouratidis et al., 2008).

Goal clarification and process feedback have been shown to help alleviate students' feelings of anxiety following a high-stakes assessment (Daniels & Gierl, 2017; Panadero & Jonsson, 2013; Pekrun et al., 2014). However, whether goal clarification

and process feedback may help to reduce test anxiety in *low-stakes* testing contexts remains unclear. To address this question, the current study examines the effects of goal clarification and process feedback on test anxiety in a low-stakes setting. In line with Daniels and Gierl (2017), this study measures test anxiety at two time points. However, whereas these authors measured test anxiety twice after the test to control for baseline test anxiety and compared a control group with no process feedback to an experimental group receiving process feedback, the current study uses a pretest-posttest design by measuring test anxiety both before and after the test. This pretest-posttest study design is necessary to enable a clearer understanding of the causal relations between goal clarification, process feedback, and test anxiety, as it allows us to examine the effect of both strategies on students' actual experienced test anxiety, while simultaneously accounting for baseline test anxiety levels and individual differences that may affect students' test anxiety (e.g., gender).

How Goal Clarification and Process Feedback Relate to Test Anxiety via Students' Need-Based Experiences

From an SDT perspective (Ryan & Deci, 2017), need-based experiences will explain if and why goal clarification and process feedback reduce test anxiety. First, when teachers clearly communicate the learning objectives and provide feedback on students' progress, students can evaluate their position in their learning trajectory, making them feel more in charge of their learning, thereby fostering their need for autonomy (Jang et al., 2010; Moeller et al., 2012). Thus, these strategies can reduce uncertainty and foster a sense of control. Second, students will know better what is expected of them on the upcoming test, areas for improvement are identified, and students get more opportunities to expand their capabilities, which enhances their sense of competence

(Aelterman et al., 2019; Skinner et al., 1998; Skinner & Belmont, 1993). Third, when teachers clarify goals and provide process feedback, students may feel that their teacher cares about them and wants them to do well on the test, hereby supporting their need for relatedness (Furrer & Skinner, 2003).

Several empirical studies in the educational domain have confirmed the positive association of goal clarification with students' need-based experiences. For example, in the study of Payne and Brown (2011), although need satisfaction was not explicitly measured, higher education students in focus groups expressed more control over their preparation for the exam (i.e., autonomy), and felt better prepared for the exam and more confident in taking exams (i.e., competence) when the learning goals and assessment criteria were made explicit. Similarly, when secondary school physical education students perceived they got to know the criteria for the upcoming test, they reported higher levels of need satisfaction (Haerens et al., 2019). In lessons in which physical education students in secondary education perceived their teacher communicated the learning goals for the low-stakes test (Krijgsman et al., 2019), they reported higher autonomy, competence, and relatedness satisfaction. Additionally, Leenknecht et al. (2020) found that clarifying success criteria was positively related to higher education students' autonomy and competence satisfaction, yet not to relatedness satisfaction.

Providing students with feedback on their learning process has also been shown to enhance secondary and higher education students' overall need satisfaction (Krijgsman et al., 2019), as well as their autonomy (Kierner et al., 2015; Krijgsman et al., 2019; Leenknecht et al., 2020), competence (Kierner et al., 2015; Leenknecht et al., 2020; Wollenschläger et al., 2016) and relatedness satisfaction (Krijgsman et al., 2019) uniquely. For instance, in the cross-sectional study of Leenknecht et al. (2020),

feedback on higher education students' learning progress was found to positively relate to their autonomy satisfaction and competence satisfaction, but not to relatedness satisfaction. Also, in the experimental study of Kiemer et al. (2015), secondary school students reported higher experienced autonomy and competence when their teacher provided constructive, process-oriented feedback compared to general feedback (such as "good job").

Moreover, recent empirical studies that have investigated the link with need frustration mainly showed no or negative associations between goal clarification, or process feedback, and the frustration of the three psychological needs (Haerens et al., 2019; Krijgsman et al., 2019; Leenknecht et al., 2020). For example, Haerens et al. (2019) found no significant effect of goal clarification on secondary education physical education students' experiences of need frustration, while Leenknecht et al. (2020) showed a unique, negative association between goal clarification and autonomy, competence, and relatedness frustration. Secondary school students who perceived more process feedback did not report higher autonomy and competence frustration (Krijgsman et al., 2019). Yet, Leenknecht et al. (2020) found no significant associations between teacher feedback and the frustration of the three psychological needs of higher education students.

Importantly, research has established that students' experienced need satisfaction positively relates to test anxiety (Maralani et al., 2016, 2018), while need frustration relates negatively (De Jonge et al., 2024; Spadafora et al., 2020). When students may choose when the test takes place or when they perceive the test as personally relevant (i.e., autonomy satisfaction), when they perceive the test as an opportunity to learn (i.e., competence satisfaction), or when they feel that their teacher supports them (i.e., relatedness satisfaction), they are less likely to experience test

anxiety. Indeed, in the cross-sectional studies of Maralani et al., 2016, 2018, secondary school students' perceived need satisfaction was negatively associated with test anxiety, with high autonomy satisfaction being related to lower test anxiety (Maralani et al., 2018). By contrast, if students feel pressured to perform well (i.e., autonomy frustration), if they perceive the test as a threat to their competence (i.e., competence frustration), or when they are more sensitive to the judgement of others in testing situations (i.e., relatedness frustration), they may experience greater test anxiety. For instance, the longitudinal study of Spadafora et al. (2020) showed that higher education students who perceived their needs to be frustrated at the beginning of the semester experienced increased test anxiety levels at the end of the semester. In a three-wave design, De Jonge et al. (2024) showed that during weeks in which secondary school students felt that their need for competence was highly frustrated, they also reported higher test anxiety levels in those weeks.

Hence, both mechanisms of need satisfaction and need frustration are important in explaining test anxiety. However, research has not yet examined if goal clarification and process feedback relate to test anxiety with low-stakes tests and whether this relation is explained through need satisfaction and need frustration. Therefore, this study aims to address this gap.

The Present Study

This study investigates whether students' perceptions of goal clarification and process feedback—two core instructional strategies of assessment for learning and contextual factors—relate to reduced test anxiety of secondary school students on *low-stakes assessments* via need satisfaction and need frustration. Hence, the following research questions are addressed:

- (1) Do goal clarification and process feedback relate to decreased test anxiety levels?
- (2) Do the satisfaction and frustration of the basic psychological needs mediate the relation between goal clarification and test anxiety, and between process feedback and test anxiety?

We chose to conduct the study in a low-stakes testing situation in secondary education and in a core theoretical course (i.e., economics course for students majoring in economics), because we expect teachers to clarify goals explicitly and provide more process feedback due to the high frequency of low-stakes (knowledge) tests in this setting. Based on the literature, we hypothesize that goal clarification (Hypothesis 1a) and process feedback (Hypothesis 1b) will be negatively related to test anxiety, after accounting for baseline test anxiety levels and gender, and that these negative relations will be mediated by overall need satisfaction (Hypothesis 2a) and overall need frustration (Hypothesis 2b).

This study contributes to the current line of research on assessment for learning, self-determination theory, and test anxiety in three ways. *First*, this study investigates both need satisfaction and need frustration as the mechanisms by which goal clarification and process feedback may reduce test anxiety on low-stakes tests in a pretest-posttest study design. While previous studies examined these elements separately, this study advances existing theories by integrating insights from assessment for learning, self-determination theory, and test anxiety into one unified model, hereby offering a more comprehensive understanding of the drivers of test anxiety and the role of instructional practices in shaping students' emotional responses during assessments. Importantly, no manipulations were made to the lessons which strengthens the ecological validity.

Second, in contrast to the majority of test anxiety research, this study focuses on test anxiety in *low-stakes testing* among *secondary school students*, a context that has been neglected despite the frequent and widespread use of low-stakes testing at the secondary level. Especially in a secondary education, where test anxiety tends to intensify with increasing age (e.g., Dan et al., 2014; von der Embse et al., 2018), studying this topic in this setting is important.

Third, this study acknowledges the dynamic nature of test anxiety with a specific focus on the environmental influences of test anxiety. Contextual factors shape how students perceive and experience assessments. While previous studies have mostly focused on factors and approaches directly linked to the individual student to reduce their test anxiety, this study investigates how contextual factors—in particular the way teachers interact with their students about low-stakes tests through goal clarification and process feedback—can reduce test anxiety.

Methods

Educational Setting

In this Flemish educational context, secondary education is compulsory until the age of 18, and organized into six years and three grades (i.e., clusters of two consecutive years). Students choose between three program types, each differing in its focus on future career prospects: general education (i.e., academic track with a broad theoretical foundation in various disciplines aimed at future studies in higher education), technical education (i.e., technical track with general and technical-theoretical courses, offering pathways to both further studies and job opportunities) or vocational education (i.e., specialized, practical training tailored to specific jobs). In the current study, we focus on the academic and technical track only, because of their strong theoretical foundations,

and on students from the two last years of secondary education (i.e., third grade; 17-18 years), because those students will soon be transitioning to higher education with research showing that test anxiety is increasing with age and particularly elevated among older secondary school students compared to younger students (von der Embse et al., 2018). Hence, it is important to identify the underlying determinants and potential mitigators of test anxiety in this group of students.

Additionally, schools in the Flemish education system have freedom in deciding their own assessment policy, as long as they adhere to the government-determined standardized curriculum with the learning objectives and can prove their students have achieved these minimal requirements (Ysenbaert et al., 2018). In practice, the majority of assessments are *teacher-developed* classroom tests that are scheduled on a weekly basis for each course students follow and only count for a small percentage towards students' final grade (OECD, 2023; Ysenbaert et al., 2018). Hence, these teacher-developed tests are low-stakes and formative in nature. For instance, Flemish third grade secondary school students have to take, on average, four tests each week across multiple subjects (De Jonge et al., 2024). These low-stakes assessments can vary from class to class, depending on the subject that is covered and the teacher who is developing the test.

Participants

Participants were 237 students from 28 economics classes across seven secondary schools in Flanders (Belgium). To obtain a representative sample of the Flemish education system, we recruited students that were enrolled in the academic (57.80%) or technical (42.20%) track, attended a publicly funded (30.40%) or privately managed

(69.60%) school, and were in Year 11 (46.00%) or 12 (54.00%)¹. Our convenience sample included 97 male (40.90%) and 139 female (58.60%) students² who were, on average, 17.28 years old. The average number of participating students per class was 8.25 ($SD = 4.93$). Their average prior performance for the economics course at the start of this study was 69.95% ($SD = 11.13$).

To ensure consistency in data collection, all data points were collected in economics classes. Economics was chosen as the subject area because it is a core theoretical course in secondary education that is representative of other theoretical courses such as mathematics or Dutch. Furthermore, students receive at least 4 hours a week of economics class, which is comparable to other core theoretical courses. The economics course is also taught at different levels (i.e., grades) of secondary education, further enhancing its representativeness.

The response rate was high, as of the 262 eligible students, 249 students completed the first questionnaire and 247 students completed the second questionnaire (see Procedure). Only the 237 students who completed both questionnaires were included in the analyses shown in this paper³. The study protocol was approved by the Ethical Committee of the researchers' university (UG-EB 2023-E).

¹ Mean differences between the three groups on all variables are included in the supplementary file. Also, additional analyses with these three characteristics as covariates (i.e., track, type of school, and year) indicated that the main results remain valid (see supplementary file).

² One student indicated the option 'I do not wish to answer'.

³ Additional analyses with the 249 students from the pre-test and 247 students from the post-test indicated that the same results were obtained and are included in the supplementary file.

Research Design and Procedure

The current study employed a pretest-posttest survey design and was conducted as a field study where no manipulations were made to the classes. There were no requirements imposed for the low-stakes test students had to take, as the teacher developed the test on the topic that was covered in the lessons at the time. Participants were recruited by sending emails with information letters to teachers from the network of the research team and their respective principals. If they displayed interest, they signed active informed consent. Students from the participating classes gave their active informed consent before participation, while their parents received passive informed consent and information letters. In advance, the main researcher informed all teachers about the timing of the two questionnaires and coordinated these two moments with each teacher.

The first questionnaire (i.e., pretest survey) was administered at the end of a regular class two to five school days before the scheduled low-stakes test. Students reported their anticipated test anxiety for the upcoming economics test, their perceptions of goal clarification and process feedback of the teacher, their feelings of autonomy, competence, and relatedness during the economics classes of last week, and their gender. The second questionnaire (i.e., posttest survey) was completed immediately after students finished the test and assessed their experienced anxiety during the test. Students took 10 and 5 minutes to complete the first and second questionnaires, respectively. Data collection occurred in May 2023 and all questionnaires were administered by a researcher from the research team.

Measures

Goal Clarification and Process Feedback

To capture students' perceptions of goal clarification and process feedback for the upcoming test, we used the Students Assessment for Learning Questionnaire (Pat-El et al., 2013). To reduce students' cognitive overload and following the approach of Krijgsman et al. (2019) in a low-stakes assessment context, we selected six items that most closely aligned with the definitions of goal clarification (two items) and process feedback (four items) in this low-stakes testing context (see supplementary file). To ensure theoretical and empirical rigor, we chose to retain only two items for goal clarification. Our confirmatory factor analyses (CFA), and its modification indices, indicated that one item, originally assigned to the goal clarification construct ("I knew the areas I need to work on to improve my results"), conceptually aligned more closely with the definition of process feedback. Therefore, that item was reassigned to the process feedback subscale. The CFA with two goal clarification items and four process feedback items (see below) supported this modification and showed a significantly better model fit compared to the original model with three items for goal clarification and three items for process feedback. This modification strengthened the construct validity of both subscales. An exemplary item for goal clarification was "The teacher told us what the criteria are by which the test will be evaluated," and for process feedback "My teacher discussed with me how to exploit my strengths to improve my result of the upcoming test". Items were scored on a five-point Likert scale, from 1 (*Strongly disagree*) to 5 (*Strongly agree*).

Internal reliability for goal clarification was measured with the average inter-item correlation (AICC), that is recommended for (sub)scales consisting of only two items (Cohen & Swerdlik, 2009). Internal reliability was satisfactory with AIIC = .43

which is between .20 and .50, indicating good internal reliability (Cohen & Swerdlik, 2009). Internal reliability for process feedback was rated with McDonald's omega, as this measure had less risk of over- or underestimating reliability in comparison with Cronbach's alpha (Dunn et al., 2014). The omega value for process feedback was acceptable ($\omega = .76$). We also performed a CFA using maximum likelihood estimation performed with Mplus version 8 (Muthén & Muthén, 1998-2017) to evaluate model fit. The chi-squared test, the Comparative Fit Index (CFI), the Root Mean Squared Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR) were used to evaluate model fit. Following the guidelines of Hu & Bentler (1999) and Kline (2011), combined cut-off values of 0.90 for CFI, 0.06 for RMSEA, and 0.08 for SRMR are considered as good fit. The CFA results indicated a good fit for this two-factor model: $\chi^2(8) = 12.48, p > .05$, CFI = 0.98, RMSEA = 0.06 (90% confidence interval (CI): 0.000–0.122), and SRMR = 0.04. All factor loadings were significant ($p < .001$) and above 0.52 (see supplementary file).

Psychological Need Satisfaction and Need Frustration

To measure students' need satisfaction and frustration in class, the school-specific Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015) was used. This scale consists of 12 items that were scored a five-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*), and is divided into six subscales (i.e., autonomy satisfaction, competence satisfaction, relatedness satisfaction, autonomy frustration, competence frustration, and relatedness frustration). Each subscale is measured with two items. An exemplary item for autonomy satisfaction was "I felt a sense of choice and freedom in the things I did in class", for autonomy frustration "I felt forced to do many things I wouldn't choose to do in class", for competence satisfaction "I felt confident that I could do things well", for competence frustration "I felt insecure

about my abilities”, for relatedness satisfaction “I felt connected to my peers”, and for relatedness frustration “I felt excluded from the group fellow students I want to belong to”.

For the purpose of this study and in line with previous research (Vandekerckhove et al., 2019), the six items for satisfaction were averaged to obtain a composite score for need satisfaction, and the six items for frustration were averaged to obtain a composite score for need frustration. Internal consistency for the BPNSFS was considered to be acceptable with $\omega = .61$ for need satisfaction and $\omega = .69$ for need frustration, which is comparable to previous research ($\alpha_{\text{need satisfaction}} = .66$; $\alpha_{\text{need frustration}} = .63$; Vandekerckhove et al., 2019). The results of the second-order CFA indicated a good model fit for need satisfaction: $\chi^2(6) = 13.08$, $p > .01$, CFI = 0.97, RMSEA = 0.07 (90% CI: 0.012–0.124), and SRMR = 0.05. All factor loadings were significant ($p < .001$) and above 0.36 (see supplementary file). Also, the second-order CFA for need frustration showed a good fit to the data: $\chi^2(6) = 5.20$, $p > .05$, CFI = 1.00, RMSEA = 0.00 (90% CI: 0.000–0.078), and SRMR = 0.02 with all factor loadings being significant ($p < .001$) and above 0.56 (see supplementary file).

Test Anxiety

Students’ test anxiety for the economics test was measured with the anxiety subscale of the Test Emotions Questionnaire (TEQ; Pekrun et al., 2004). This scale reflects the multidimensional nature of test anxiety by measuring the motivational component of test anxiety in addition to the traditional cognitive, physiological, and affective components. This 12-item scale, divided into four subscales, was rated on a five-point Likert scale, from 1 (*Strongly disagree*) to 5 (*Strongly agree*). An example pre-test item was “For the upcoming test, I am already worried whether I have studied enough”. An example post-test item was “I felt panicky when taking the test”. By averaging all items,

students' composite test anxiety score was computed. The scale was internally consistent for both measurements with $\omega_{\text{PRE}} = .94 = \omega_{\text{POST}}$, which is comparable to previous research ($\alpha = .90$; Pekrun et al., 2011). The second-order CFA indicated a good fit for the pre-test: $\chi^2(50) = 125.73, p < .001$, CFI = 0.95, RMSEA = 0.08 (90% CI: 0.064–0.096), and SRMR = 0.04. All factor loadings were above 0.73 and significant ($p < .001$). The post-test model fitted the data well according to the second-order CFA: $\chi^2(50) = 121.79, p < .001$, CFI = 0.96, RMSEA = 0.08 (90% CI: 0.062–0.094), and SRMR = 0.04 with all factor loadings above 0.71 and significant ($p < .001$; see supplementary file). Next, to ensure that observed changes in test anxiety from pre-test to post-test were attributable to the effects of goal clarification and process feedback rather than changes in item interpretation from the pre-test to the post-test, we conducted a measurement invariance analysis (Putnick & Bornstein, 2016; Wang et al., 2018). The result of this additional analysis (see supplementary file) supported metric invariance, indicating that students interpreted the 12 items similarly at both measurement occasions.

Data Analysis

Preliminary analyses included descriptive statistics and bivariate Pearson correlations. As students (Level-1) were nested in classes (Level-2), these correlations were calculated at the student-level and classroom-level. To investigate the research questions, we used multilevel models in MPlus Version 8 (Muthén & Muthén, 1998–2017). The analyses consisted of multilevel regression for the first research question to explore how goal clarification and process feedback relate to test anxiety, and multilevel path analysis for the second research question to capture the mediating roles of need satisfaction and need frustration.

Although no multicollinearity between goal clarification and process feedback was found (see Table 1 in the Results section), our initial analysis indicated that the full model, with both goal clarification and process feedback as independent variables, baseline test anxiety and gender as control variables, and both need satisfaction and need frustration as mediators in the prediction of post-test test anxiety, was too complex and not identified. Therefore, we decided to run models for goal clarification and process feedback separately.

Before answering the research questions, intercept-only models without explanatory variables were fitted to justify the two-level structure and estimate how much of the variance in post-test test anxiety was explained at the student-level and classroom-level (Enders & Tofighi, 2007). Moreover, we included students' gender and baseline test anxiety as covariates in all following models for two reasons. First, previous research consistently showed that females report higher test anxiety compared to males (von der Embse et al., 2018). Second, students high on baseline test anxiety may experience stronger decreases in test anxiety than those who initially score low on test anxiety, and vice versa (Putwain & Symes, 2011). Therefore, controlling for baseline test anxiety was necessary.

For the first research question, we entered the independent variables at Level-1 and Level-2 to investigate the student-level and classroom-level effects (Enders & Tofighi, 2007). Baseline test anxiety and gender were only added at the student-level. Regarding the second research question, three multilevel path models were fitted for each independent variable, resulting in a total of six models. The first model included need satisfaction as a Level-1 and Level-2 mediator. In the second model, we entered need frustration as mediator at Level-1 and Level-2. The final model included need satisfaction and need frustration as two simultaneous mediators at both levels (see

Figure 1 Panel A). We chose to first investigate the mediating roles of need satisfaction and need frustration separately to understand the unique effect and magnitude of each mechanism. The same procedure with three models was repeated for process feedback (see Figure 1 Panel B). For all mediation models, we tested the indirect effect of each mediator at each level, following the procedure of Preacher et al. (2010). Moreover, for both independent variables, we calculated the sum of indirect effects at both levels in the model with two mediators to investigate the joint influence of need satisfaction and need frustration on students' test anxiety.

In all tested models, the slopes were fixed (i.e., random intercept fixed slope) and the maximum likelihood estimator was used. To facilitate interpretation and convergence, goal clarification, process feedback, need satisfaction, and need frustration were entered class-mean centered (i.e., centered around the class mean of each cluster) at the student-level and grand-mean centered i.e., centered around the sample mean) at the classroom-level. Gender as control variable was uncentered, while baseline test anxiety as control variable was grand-mean centered (Enders & Tofighi, 2007).

Results

Preliminary Analyses

Table 1 presents descriptive statistics and Pearson correlations. While more than half of the students (53.60%) reported low post-test test anxiety (score below 2.50 on a five-point Likert scale), 35.90% of the students experienced moderate anxiety (score between 2.50 and 3.50), and a small percentage (10.50%) experienced high test anxiety (score between 3.50 and 5.00). At the student-level, perceived goal clarification and students' post-test test anxiety ($r = -.15, p < .05$), and perceived process feedback and post-test test anxiety negatively correlated ($r = -.14, p < .05$). Furthermore, experienced

need satisfaction ($r = -.37, p < .001$) and experienced need frustration ($r = .40, p < .001$) significantly correlated with post-test test anxiety at the student-level. A MANOVA (not tabulated) revealed that females reported significantly higher test anxiety (baseline and post-test) than male students ($F(2,233) = 28.35; p < .001$). Therefore, we included gender and baseline test anxiety as control variables in the main analyses.

Main Analyses

Direct Relation Between Goal Clarification, Process Feedback, and Test Anxiety

The intraclass correlation of post-test test anxiety (Table 1) indicated substantial variance (15%) at the classroom-level. Therefore, a two-level multilevel model was warranted. Addressing the first research question and as illustrated in Table 2 M1, the results of our first model indicated that goal clarification at the student-level, but not at the classroom-level, was statistically significantly and negatively related to students' post-test test anxiety ($\beta = -0.08$, Standard Error (SE) = 0.03, $p = .012$), even after controlling for baseline test anxiety and gender, explaining 17.30% of the variance within classes (i.e., at the student-level). The second model addressing our first research question showed a statistically significant and negative relation between process feedback and test anxiety at both the student-level ($\beta = -0.10$, SE = 0.04, $p = .013$) and classroom-level ($\beta = -0.69$, SE = 0.17, $p = .000$), after controlling for baseline test anxiety and gender, explaining 19.50% of the student-level variance and 1.00% of the classroom-level variance, respectively (see Table 2 M2).

Need-Based Experiences as Underlying Mechanism

Addressing the second research question, Figure 1 shows that in our third model, goal clarification, statistically significantly and positively related to experienced need satisfaction, at the student-level, which in turn negatively related to test anxiety (Panel A.I). The direct effect of goal clarification on test anxiety remained statistically significant ($p = .045$), even after accounting for the mediating role of need satisfaction. A test for the indirect effect showed that need satisfaction statistically significantly mediated the student-level relation between goal clarification and test anxiety ($b = -0.03$, $SE = 0.01$, $p < .05$).

Based on the results of the fourth model, goal clarification statistically significantly and negatively related to need frustration, which positively related to test anxiety at the student-level (see Figure 1 Panel A.II). The direct effect of goal clarification on test anxiety was still statistically significant ($p = .049$) after accounting for the mediating role of need frustration. When testing for the indirect effect, need frustration was found to statistically significantly mediate the student-level relation between goal clarification and test anxiety ($b = -0.03$, $SE = 0.01$, $p < .05$).

In the final model for goal clarification (Figure 1 Panel A.III), with need satisfaction and need frustration as simultaneous mediators, the student-level relations between goal clarification, need satisfaction, need frustration, and test anxiety remained statistically significant, except for the direct effect of goal clarification on test anxiety ($p = .078$). However, at the student-level, only need satisfaction was a statistically significant mediator in the relation between goal clarification and test anxiety ($b = -0.02$, $SE = 0.01$, $p < .05$), while need frustration was not ($b = -0.02$, $SE = 0.01$, $p > .05$). Yet, the sum of indirect effects was statistically significant ($b = -0.04$, $SE = 0.01$, $p < .01$), indicating that the joint experience of increased need satisfaction and reduced need

frustration accounted for the influence on test anxiety. Moreover, in all three models, no significant mediation of need satisfaction or frustration at the classroom-level was observed.

Addressing the second research question for process feedback, the sixth model (Figure 1 Panel B.I) indicated that student-level process feedback statistically significantly and positively related to need satisfaction, which in turn negatively related to post-test test anxiety. The direct effect of process feedback on test anxiety remained statistically significant ($p = .046$) after accounting for need satisfaction. A test for the indirect effect showed that need satisfaction statistically significantly mediated the student-level relation between process feedback and test anxiety ($b = -0.03$, $SE = 0.02$, $p < .05$).

In the seventh model (Figure 1 Panel B.II), process feedback was statistically significantly and negatively related to need frustration and need frustration was positively related to test anxiety at the student-level. The direct effect of process feedback on test anxiety remained statistically significant ($p = .034$) after accounting for the mediating role of need frustration. However, the indirect effect at the student-level was not statistically significant ($b = -0.02$, $SE = 0.01$, $p > .05$).

When adding both need satisfaction and need frustration as mediators in the final feedback model (Figure 1 Panel B.III), all student-level relations remained statistically significant, except for the direct effect of process feedback on test anxiety ($p = .062$). Testing for the indirect effects showed that need satisfaction statistically significantly mediated the relation between process feedback and test anxiety ($b = -0.03$, $SE = 0.01$, $p < .05$), while need frustration did not ($b = -0.01$, $SE = 0.01$, $p > .05$). However, the sum of indirect effects was statistically significant ($b = -0.03$, $SE = 0.01$, $p < .05$), indicating that the joint experience of need satisfaction and need frustration

explained the influence of process feedback on students' test anxiety. Moreover, across all models for process feedback, there was no statistically significant mediation of need satisfaction and need frustration at the classroom-level.

Discussion

This study examined whether a student's social context and contextual factors have the potential to reduce secondary school students' test anxiety. More specifically, the aim of this study was to investigate if clarifying learning goals (i.e., goal clarification) and providing feedback on how to reach these learning goals (i.e., process feedback), two key strategies in assessment for learning, can reduce test anxiety on *low-stakes* tests and if students' need-based experiences mediate these relations.

Variability in Test Anxiety

Most students reported low (53.60%) to moderate (35.90%) post-test test anxiety levels, while a small percentage (10.50%) experienced high test anxiety. Compared to international secondary school cohorts completing the TEQ-instrument in high-stake assessments (Pekrun et al., 2014), students from this sample exhibit, on average, higher test anxiety levels in this low-stakes assessment context. Moreover, their anxiety levels were similar to higher education students taking only one high-stakes assessment (Bieleke et al., 2021). One explanation for this finding might be the testing culture in Belgian secondary education, where students face multiple low-stakes tests across different subjects every week (OECD, 2023). The high volume of low-stakes tests can trigger feelings of anxiety (De Jonge et al., 2024), causing students to perceive each test as a threat to their competence, despite the intent of low-stakes testing for simply monitoring learning progress (Wenzel & Reinhard, 2021). This may be especially true

for students in this sample who were enrolled in an economics major and asked about their anxiety with a low-stakes economics test.

Furthermore, results indicated that 85% of the variance (including error) in post-test test anxiety resided at the student-level. Considering this high variability at the individual level, lowering test anxiety may require student-level interventions such as providing students with behavioral techniques and strategies for coping with their worries and irrelevant thoughts (Soares & Woods, 2020). However, still a substantial ($ICC > .10$) part of post-test anxiety (15%) was situated at the classroom-level, implying that contextual variables also matter in explaining test anxiety. This finding aligns with the transactional model of coping and stress (Lazarus & Folkman, 1984), positing that test anxiety results from an interplay between individual characteristics (e.g., academic ability, test-taking skills) and students' perceptions of environmental factors (e.g., test characteristics, test atmosphere, teacher expectations; Zeidner & Matthews, 2005). However, prior test anxiety research mainly focused on individual student variables (e.g., students' test-taking strategies), hereby neglecting the environmental influences of test anxiety (von der Embse et al., 2018). Therefore, this study examined how students' perceptions of goal clarification and process feedback – two contextual factors – affect their test anxiety.

Associations Between Goal Clarification, Process Feedback, Need-Based Experiences, and Test Anxiety

Results revealed that, at the *student-level*, both goal clarification and process feedback were negatively related to students' low-stakes test anxiety, even after accounting for baseline test anxiety and gender. Students who indicated to understand what was expected from them on the test and to receive feedback on how to reach the learning

goals, experienced lower anxiety during the low-stakes test. Hence, Hypotheses 1a and 1b were supported. These findings contradict the paucity of previous empirical studies that found no relation between knowledge about criteria on students' fear of failure, a distinct yet related concept to test anxiety (Haerens et al., 2019). Yet, the latter study took place in the context of physical education and measured anticipated test anxiety during a lesson that did not include the actual test, which differs from this study. Earlier findings on the anxiety-reducing effect of process feedback (Daniels & Gierl, 2017; Pekrun et al., 2014) were furthermore corroborated in our study and extended to low-stakes testing contexts. While previous research demonstrated that both instructional techniques reduce anxiety for high-stakes tests (Yang et al., 2023), our study is, as far as we know, the first to show that goal clarification and process feedback reduce test anxiety in low-stakes testing, a context in which test anxiety apparently also is elevated among a substantial group of students.

Although most of the variance in test anxiety resided at the student-level, finding beneficial effects of goal clarification and process feedback indicate that teachers can create less anxiety-provoking environments through effectively implementing these strategies in their classrooms (Wiliam & Leahy, 2015). The multilevel analyses indicated a positive effect of process feedback at the *classroom*-level. Not only students but also classes perceiving, on average, more process feedback throughout the lessons, experienced lower test anxiety levels. This finding is meaningful because it implies that students who find themselves in classrooms where feedback is generally perceived as sufficient will report lower test anxiety, irrespective of their own individual perception. This result underscores the importance of the social context for students' emotional functioning (Ryan & Deci, 2017), justifying recent calls to acknowledge the dynamic nature and environmental influences of test anxiety (von der Embse et al., 2018).

Altogether, the findings of the first research question advance previous test anxiety and SDT research by showing that goal clarification and process feedback, two components of teacher structure (Aelterman et al., 2019) and key strategies of assessment for learning (Black & Wiliam, 2009), play crucial roles in reducing low-stakes test anxiety. With growing attention to low-stakes testing in higher education (Schüttpelz-Brauns et al., 2020) and its frequent use in secondary education (OECD, 2023), teachers are encouraged to incorporate these strategies in their communication about low-stakes tests, as it will not only reduce test anxiety, but also improve assessment validity (Zeidner, 2007) and enhance students' learning outcomes (Hattie & Timperley, 2007; Sadler, 1989).

Regarding the second research question, our results showed that increased need satisfaction mediated the student-level relations between goal clarification and test anxiety, and between process feedback and test anxiety, supporting Hypothesis 2a. When students knew what was expected of them and received information on how to improve their results on the upcoming test, their basic psychological needs were relatively more fulfilled. Students felt more control over their learning (i.e., autonomy satisfaction), more confident to take the low-stakes test (i.e., competence satisfaction), and more connected with their peers and teacher (i.e., relatedness satisfaction). These experiences of increased need satisfaction, in turn, led to lower anxiety during the low-stakes test, a finding that is consistent with prior SDT-research on high-stakes test anxiety (Maralani et al., 2016; Spadafora et al., 2020).

Contrary to Hypothesis 2b, need frustration did not statistically significantly mediate the student-level relations between these teacher practices and test anxiety. However, need frustration did positively associate with test anxiety, which supports previous empirical findings on the link between need frustration and test anxiety

(Spadafora et al., 2020). More importantly, the sum of indirect effects at the student-level was found to be significant. This result suggests that goal clarification and process feedback increase the satisfaction and reduce the frustration of the three basic psychological needs simultaneously. These two mechanisms in turn impact students' test anxiety. Since no prior study has examined how goal clarification, process feedback, need-based experiences and test anxiety are interrelated, our study extends the existing literature by uncovering how these variables interact in low-stakes testing contexts.

Although no mediation of need frustration was observed, we found direct, negative relations between goal clarification and need frustration, and process feedback and need frustration. Both teacher practices do reduce feelings of pressure, ineffectiveness, and alienation. When teachers clarified goals and provided process feedback, students felt less forced to do things in class that they would not choose to do in preparation for the test (i.e., autonomy frustration), reported less insecurities about their abilities for the test (i.e., competence frustration) and perceived their teacher and peers to be less distant (i.e., relatedness frustration). Thus, the findings of the second research question are congruent with SDT's theoretical underpinnings (Ryan & Deci, 2017) and confirm earlier claims and empirical literature on the need-satisfying effect of goal clarification and process feedback (Haerens et al., 2019; Krijgsman et al., 2019; Leenknecht et al., 2020). Moreover, the results support meta-analytic evidence showing that feedback is less demotivating when information on how to improve is provided (Fong et al., 2019).

Limitations and Future Directions

Several potential limitations exist that can guide future research. *First*, all variables were assessed using student reports, as we were mainly interested in student perceptions. Including teacher reports and observational data in future studies would be beneficial, as evidence suggests disparities between student and teacher perceptions regarding the implementation of goal clarification and process feedback (Pat-El et al., 2013). Relatedly, we used repeated measures for test anxiety but not for the mediators and independent variables. Future studies could measure need-based experiences, goal clarification and process feedback longitudinally to explore their reciprocal relations with test anxiety.

Second, due to the limited sample size, it was not possible to test the effects of goal clarification and process feedback simultaneously within one model. As prior studies suggest that the combination of goal clarification and process feedback are most effective in enhancing students' need satisfaction (Krijgsman et al., 2019), examining both predictors simultaneously is essential for a more comprehensive understanding. Therefore, future research could benefit from a larger sample size and greater statistical power to test more complex models, thereby enhancing the generalizability of our findings.

Third, we solely focused on test anxiety as the outcome variable, although tests trigger various emotions. Future research could explore a broad range of positive (e.g., pride) and negative (e.g., shame) achievement emotions in relation to goal clarification and process feedback. Examining other variables related to testing, including performance and effort, would also provide valuable insights.

Fourth, despite the low-stakes assessment context in this study that is characterized by the frequent, formative use of classroom tests with limited long-term

consequences, it remains unclear whether students actually experience these assessments as low-stakes. Therefore, investigating whether students perceive the stakes of such teacher-developed classroom tests differently may be a fruitful avenue for future research. *Fifth*, the construct of goal clarification was measured using only two items. Although these items stem from a well-validated scale, align with previous research, and demonstrated acceptable reliability in this study, some caution is warranted when interpreting the results of goal clarification.

Sixth, the current study did not distinguish quantity/frequency of clarification and feedback from clarity/content of the goals and feedback. For example, we cannot determine whether the negative relation between process feedback and need frustration stems from feedback frequency or feedback content. Relatedly, it is possible that the communicated learning goals are not in line with test expectations or test questions, causing students to experience heightened test anxiety. Future research can disentangle these dynamics to enrich our understanding of contextual test anxiety-provoking factors.

Educational Implications

Although some of the effects in this study are small due to the short time frame of the study, our findings have clear implications for teachers and teacher educators. Goal clarification and process feedback are two strategies that teachers can use to incrementally reduce students' test anxiety. When these strategies are embedded in teachers' everyday teaching and used consistently over time, their benefits and positive impact on test anxiety might accumulate over time, potentially leading to substantial reductions in students' test anxiety. As such, teachers can try to pay close attention to their communication about assessments to help to reduce students' test anxiety, using a variety of didactic approaches. For example, teachers can use advanced organizers when

introducing a new chapter (Ausubel, 1960; Sherrington & Caviglioli, 2021; Stone, 1983), provide an overview of the learning goals at the start of lesson series (Torrance, 2007; Wiliam & Leahy, 2015), implement rubrics (Panadero & Jonsson, 2013), or discuss example test questions (Guilding et al., 2021) to clarify expectations. Regarding process feedback, teachers can conduct one-on-one conversations and use self-reflection cards for individual feedback (Wiliam & Leahy, 2015), or implement exit tickets (MacDermott et al., 2024; Rodriguez et al., 2024) and discuss common mistakes or misconceptions throughout lessons for feedback directed to the entire class (Hattie, 2009; Metcalfe et al., 2024). Thus, teacher educators are encouraged to incorporate these methodologies into their training programs.

Conclusion

Our student-level results indicated that students experience lower test anxiety with low-stakes tests when they perceive the learning goals to be clear and receive more process feedback. These student-level relations were mainly explained by increased need satisfaction, although the joint experience of greater need satisfaction and lower need frustration was also meaningful. Moreover, classroom-level perceptions of process feedback also related to lower test anxiety, after accounting for baseline test anxiety and gender. Because need satisfaction and need frustration relate to test anxiety, it is recommended for teachers to focus on their messages regarding upcoming low-stakes tests. These findings highlight the importance of students' social context and call for the integration of teacher-student interactions in test anxiety interventions.

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Table 1. Descriptive statistics and Pearson correlations at the student-level and classroom-level

Variable	N	<i>M</i>	<i>SD</i>	Observed range	1	2	3	4	5	6	7
1. Post-Test Test Anxiety	237	2.47	0.87	1.00-5.00		.70***	-.15*	-.14*	-.37***	.40***	.35***
2. Baseline Test Anxiety	237	2.41	0.91	1.00-5.00	.81***		-.08	-.03	-.35***	.42***	.43***
3. Goal Clarification	232	3.37	0.87	1.00-5.00	-.13	.02		.41***	.19***	-.20***	.01
4. Process Feedback	236	2.73	0.74	1.00-5.00	-.07	.27	.45*		.18*	-.13*	.02
5. Need Satisfaction	237	3.47	0.51	1.67-4.75	-.45*	-.63***	.15	-.26		-.49***	.02
6. Need Frustration	237	2.33	0.60	1.00-4.50	.61***	.64***	-.24	.24	-.74***		.08
7. Gender	236				.28	.46*	-.21	.14	-.48*	.41*	
Intraclass correlation					.15	.13	.25	.10	.09	.11	

Note. Descriptives are calculated with raw scores. * $p < .05$; ** $p < .01$; *** $p < .001$. Student-level $n = 237$; classroom-level $n = 28$.

Under diagonal refers to between-class correlations.

Above diagonal refers to between-student correlations.

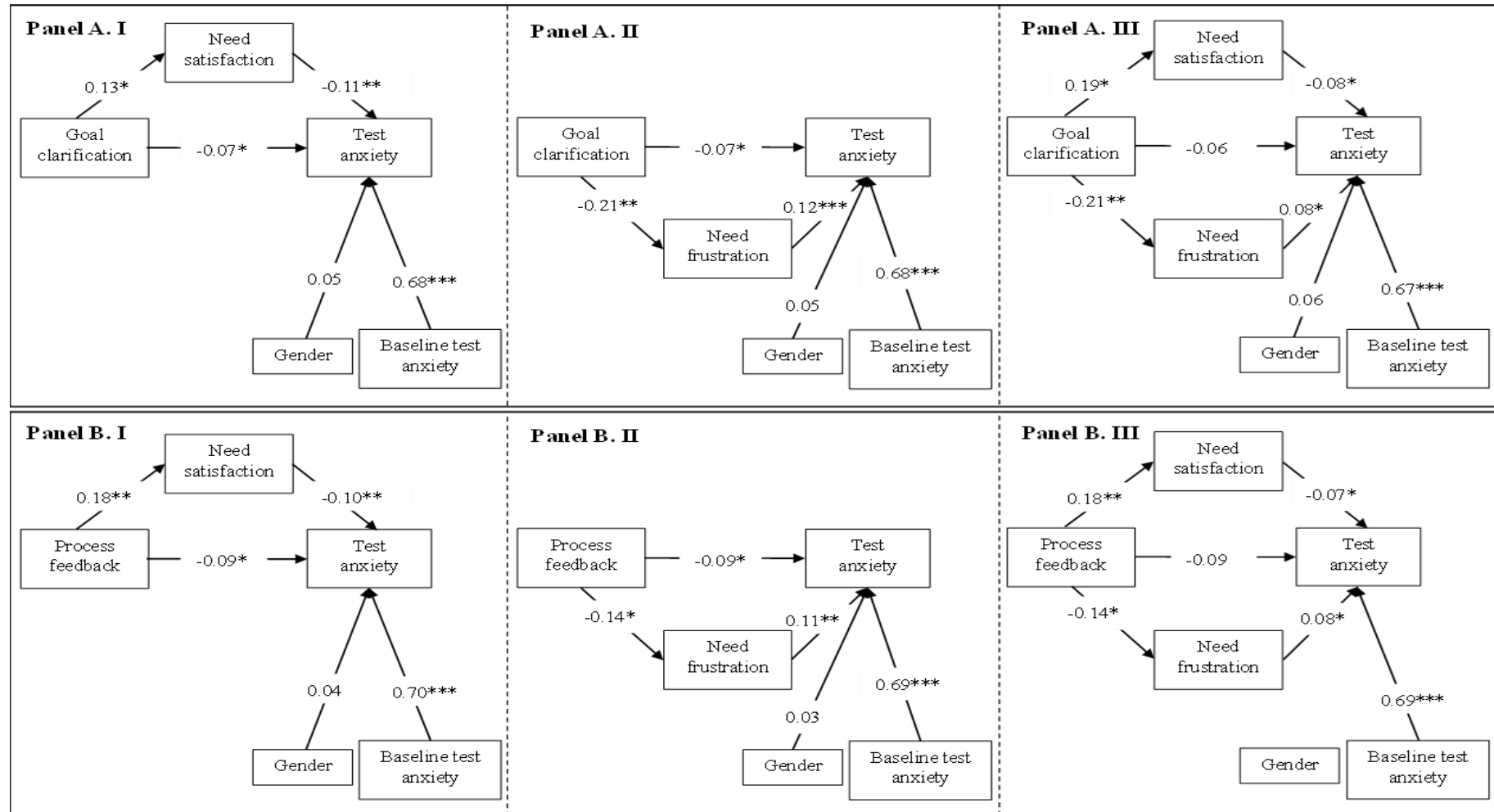
Table 2. Multilevel regression analyses on the relation between student-level and classroom-level goal clarification and students' test anxiety (M1) and process feedback and students' test anxiety (M2).

Parameter	Test anxiety	
	M1	M2
	n = 231 β (S.E.)	n = 235 β (S.E.)
Fixed part		
Intercept	2.43 (0.07)***	2.46 (0.06)***
<i>Student level</i>		
Goal clarification	-0.08 (0.03)*	
Process feedback		-0.10 (0.04)*
Baseline test anxiety	0.71 (0.05)***	0.73 (0.05)***
Gender	0.03 (0.06)	0.03 (0.05)
<i>Classroom level</i>		
Goal clarification	-0.46 (0.33)	
Process feedback		-0.73 (0.17)***
Random part		
σ_e^2 (Student)	0.45 (0.06)***	0.44 (0.05)***
σ_u^2 (Classroom)	0.79 (0.30)**	0.47 (0.24)*

Note: * $p < .05$; ** $p < .01$; *** $p < .001$. All path coefficients are standardized.

M1 with goal clarification as predictor at both levels; M2 with process feedback as predictor at both levels.

Figure 1. Multilevel path models testing the mediating roles of need satisfaction and need frustration in the relation between goal clarification and students' test anxiety (Panel A) and in the relation between process feedback and students' test anxiety (Panel B) at the student level



Note: * $p < .05$; ** $p < .01$; *** $p < .001$. All path coefficients are standardized. Only relations at the student-level are depicted.

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Figure 1. Multilevel path models testing the mediating roles of need satisfaction and need frustration in the relation between goal clarification and students' test anxiety (Panel A) and in the relation between process feedback and students' test anxiety (Panel B) at the student level