Dimming the Spotlight: Investigating Classroom Assessment Anxiety to Reduce its Effect on Student Performance

by

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Abstract

Many contemporary educators utilize a broad assessment repertoire to understand their students' learning progress. To support students in receiving high-quality education and help them reach their full potential, researchers have investigated the effects of test anxiety on academic performance. However, the effects of anxiety in other assessment contexts are less well-known. This dissertation consists of two studies. In the first study, we developed a measure for classroom assessment anxiety (MCA) with four subscales (i.e., tests, games, questions, presentations). We also evaluated its psychometric properties. In the second study, we investigated CA and classroom assessment shame (CS), and teachers' ability to identify CA. Students (N = 204) in grades 3–8 completed the MCA. The MCA exhibited strong psychometric properties and supported a 4-factor hypothesis of CA (i.e., worry, cognitive interference, physical sensations, off-task/avoidance). All assessment types were potential sources of CA and CS, and shame and anxiety were significantly related. Students' endorsement with negative self-appraisals was also statistically significantly related to CS. Furthermore, female students were more likely than male students to endorse test anxiety. This dissertation contributes to CA literature by developing a measure that, with further research, may provide a useful self-report measure that teachers can use. The findings shed light on students' experiences of CA and CS, offering recommendations that can inform the development of interventions aimed at supporting students in coping with and managing these challenging emotions.

Preface

This dissertation is an original work by Andrea Antoniuk, completed with the supervision of Dr. Damien Cormier. The research project, of which this dissertation is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name: Investigating Anxiety in Classroom Assessments, REB No. Pro00117921. This study also received approval from the Cooperative Activities Program (CAP).

Dedication

I'd like to dedicate this dissertation to my family, who exemplified the work ethic and determination needed to accomplish this milestone.

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List of Tables

List of Figures

Table of Contents

CHAPTER 1: GENERAL INTRODUCTION

Clinical levels of anxiety affect around 9.4% of children and adolescents, making it one of the most prevalent mental disorders within this demographic (Bitsko et al., 2022). Furthermore, research indicates a notable surge in the prevalence of anxiety disorders among ages 18 to 25, demonstrating a marked increase of 139% between the years 2010 and 2020 (Haidt, 2024). This discernible trend warrants significant attention as it suggests a concerning escalation in the incidence of anxiety among children and teens. Severe anxiety, without intervention, can have a substantial impact on school, home, and social functioning and throughout the life course (Masten & Cicchetti, 2010).

Conceptualizing Anxiety

Anxiety is a neuropsychological response to perceived danger, spanning from transient feelings of distress to persistent impairment and avoidance (Beesdo et al., 2009). Fear, worry, and avoidance are adaptive responses to many environmental threats. However, severe anxiety can interfere with functioning and quality of life (Beesdo et al., 2009).

Numerous studies link pathological anxiety to endogenous causes, including trait anxiety (Allport, 1937; Endler & Kocovski, 1999; Spielberger et al., 1971), genetic predispositions (Lindholm et al., 2020), and maladaptive coping (Pang et al., 2015). Additionally, several frameworks posit anxiety as a product of interactions between biological characteristics, peers, family members, school, and other contextual factors (Buckner et al., 2021; Chow et al., 2007; Luttenberger et al., 2018). Moreover, there is agreement that biological factors can create predispositions towards psychopathology, and psychosocial factors can “facilitate, sustain or modify the course of illness” (Fava & Sonino, 2008, p. 1).

Bioecological Model of Development

Bronfenbrenner theorized that development is influenced by complex interrelationships between individual characteristics, their surrounding environment, and other contextual factors (Cassells & Evans, 2020). For instance, children's temperament can influence caregivers' responses to their behaviours (Cassells & Evans, 2020). Caregivers' work demands and factors such as fatigue or burnout can limit their ability to support children's development (Cassells & Evans, 2020). Historical and economic shifts can also influence a child's opportunities for development (Cassells & Evans, 2020).

The work of Fava and Sonino (2008) and Cassells and Evans (2020) apply to the developmental course of anxiety. Numerous internal and external factors are sources of risk factors that increase the likeliness of severe anxiety and/or protective factors that alleviate or prevent symptoms of anxiety. Moreover, children can be particularly vulnerable to the consequences of risk factors because they have limited autonomy and decision-making abilities compared to adults (Lundberg et al., 2009).

Anxiety in a Classroom Context

In most schools, in any given academic year, students will complete a variety of evaluations to gather information about their learning progress. For most students, assessment reveals gaps in their learning where they made errors or did not know the correct answer. This learning process can kindle a plethora of emotions in response to perceived successes and failures (Pekrun, 2006, Pekrun et al., 2007).

Failed attempts to achieve standards, which can be self-imposed or external (e.g., teacher, parents, peers, curriculum), can result in shame (Pekrun et al., 2002; Pekrun, 2006, Pekrun et al., 2007). Negative self-appraisals can exacerbate the symptoms of anxiety and trigger the avoidance that impacts performance on subsequent evaluations. It is also possible that the

inaccurate scores that are influenced by anxiety may lead the student to interpret lower academic performance in one academic subject as representing their academic potential. This overgeneralized appraisal could lead them to disengage from the learning process altogether (McDonald, 2001; Schwinger et al., 2014). Alternatively, they may favour the areas where they feel successful, rather than working on areas that need more practice (McDonald, 2001; Mueller & Dweck, 1998).

Early Intervention

Early intervention can prevent the escalation of anxiety symptoms and the development of maladaptive coping skills (Dadds et al., 2000). Many children respond positively to anxiety interventions (Rapee, 2000). Furthermore, exposing students to manageable stressors and supporting the development of coping skills can help them prepare for and navigate future stressors (Ng et al., 2012). That said, before interventions can be developed to address classroom assessment anxiety (CA), it is imperative to understand the nature of the problem and its manifestation.

Dissertation Overview

The overarching aim of this dissertation was to build knowledge of classroom assessment anxiety (CA) for the purpose of promoting mental wellness and removing obstacles to lifelong learning. Creswell (2014) describes a pragmatic worldview as a focus on identifying problems and finding solutions for them. This study is informed by a pragmatic worldview, as it is centered around a specific problem, namely, understanding CA and providing teachers with information to help them support their students and provide high-quality education.

Methodological Approach

We investigated CA in students (ages 7–12) using the following four-step process:

Step One. We adapted existing measures of CA and shame according to assessment type, giving special care and attention to age-appropriate scale adaptations. For instance, we adapted the extant measures to construct child and educator versions.

Step Two. After obtaining ethical approval, we conducted data collection between January and March, 2023. Students in grades 3–8 (n = 204) completed the measure at their schools. Nine teachers rated 72 participating students' CA indicators.

Step Three. We evaluated the measure's psychometric properties (i.e., reliability, validity). This step included Confirmatory Factor Analysis using lavaan (Rosseel, 2012).

Step Four. We analyzed the data to investigate CA across assessment types, the relationship of shame and anxiety, and teachers' ability to identify CA. We also statistically analyzed the relationship of self-appraisals and anxiety. This step was conducted using Statistical Package for Social Sciences (SPSS) Version 29.9.1.0.

Overview of the Two Studies in this Dissertation

This dissertation consists of two manuscripts. In Chapter Two (working title: *Development and Evaluation of a Measure for Classroom Assessment Anxiety)* we explain how we developed the CA measure and analyze its psychometric properties. In Chapter Three (working title: *Anxiety and Shame Across Classroom Assessments),* we utilize the CA measure in a larger study of CA, shame, and teachers' ability to identify behavioural indicators of CA.

Contribution to Existing Literature

This dissertation advances knowledge of children's anxiety, shame, and associated behaviours (e.g., fear, avoidance) across a wide variety of assessment types. Given that test anxiety affects children throughout the world (Bodas et al., 2008) the results may have national and international impact in informing intervention and research. Additionally, in the process of

completing this dissertation, we have developed a CA measure. With further refinement and research study, the CA measure may assist teachers and clinicians to identify students who are requiring support.

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CHAPTER 2: A NEW MEASURE OF CLASSROOM ASSESSMENT ANXIETY: DEVELOPMENT AND PRELIMINARY VALIDATION

Abstract

Classroom assessment anxiety (CA) refers to symptoms of anxiety that are experienced before, during, and after evaluations. Traditionally, researchers have tended to focus on investigating students' experiences of test anxiety. However, many contemporary educators use a variety of assessments in their teaching practices in addition to tests. As a result of these changes in classroom assessment practices, a pragmatic next step is to investigate anxiety experienced across all types of classroom assessments. Within this study, we developed a measure of classroom assessment anxiety (MCA) and evaluated its psychometric properties. Of note, this study was part of a larger doctoral dissertation that investigated CA and shame. A convenience sample of students in grades 3–8 (n = 204) completed the measure, which consisted of four subscales (tests, games, presentations, and questions). The MCA displayed strong psychometric properties, including support for a 4-factor hypothesis of CA. We also observed several variable CA profiles which may suggest that students experience CA differently in different assessment contexts. The findings contribute to the emerging field of CA.

Keywords: classroom assessment anxiety, test anxiety, presentation anxiety, game anxiety, question anxiety, evaluation anxiety

A New Measure of Classroom Assessment Anxiety: Development and Preliminary Validation

As noted by Spielberger and Vagg (1995), as well as Putwain and colleagues (2021), test anxiety refers to a persisting predisposition to interpret evaluative situations as threatening. There is consensus that test anxiety manifests as fears, worries, and distress that a student experiences before, during, and after an evaluation (Beidel & Turner, 1988; Cassady, 2010). Furthermore, test anxiety is understood as a multidimensional construct encompassing cognitive, affective, physiological, and behavioural components (Zeidner, 2007). There is, however, disagreement about the effects of this phenomenon. On one hand, test anxiety may help to motivate students to build study habits and learn effectively (e.g., Pekrun et al., 2007). On the other hand, test anxiety may lead to cognitive interference (Cassady & Johnson, 2001; Hembree, 1988) or avoidance behaviours (Pekrun et al., 2007), which can interfere with the acquisition and demonstration of knowledge.

Publications dating back as far as 1914 mention test anxiety (Stöber & Pekrun, 2004). Around 30 years later, in the 1950s, test anxiety research became popularized (Pekrun, 2007). In the following years, researchers have introduced numerous measures to incorporate theoretical developments, such as integrating cognitive performance following the emergence of research in cognitive psychology (Putwain, 2008). The fractious history of test anxiety has not only involved its evolution as a construct but also its subsummation into other lines of inquiry, such as academic emotions (Stöber & Pekrun, 2004). Additionally, some researchers have investigated specialized areas of test anxiety such as math anxiety (Richardson & Suinn, 1972; Lai et al., 2015) and reading anxiety (Jalongo & Hirsh, 2010; Zbornik, 2001)

Historically, test anxiety has not been included in the *Diagnostic and Statistical Manual*

of Mental Disorders (DSM). Perhaps its absence is due to its heterogenous presentation as a situation-specific form of anxiety triggered by testing situations, or as a trait form of generalized anxiety or social anxiety (Beidel & Turner, 1988). There is symptom overlap between test anxiety and other anxiety disorders, including generalized anxiety (GAD) and panic disorder (PD; Putwain et al., 2021). Putwain and colleagues (2021) found test anxiety to be symptomatically distinct from GAD and PD, and they posited that test anxiety is sufficiently related to be considered a risk factor for these anxiety disorders. Despite its absence from the DSM as a distinct mental disorder, test anxiety is linked to numerous negative outcomes (Barrows et al., 2013; Bodas et al., 2008; Putwain & Daly, 2014; Segool et al., 2013; von der Embse et al., 2018). As such, researchers call for test anxiety to be further investigated in relation to other anxiety disorders (Putwain et al., 2021) and for facilitating evidence-based interventions (Robson et al., 2013; von der Embse et al., 2018).

Anxiety, as with other forms of arousal, are not inherently harmful or maladaptive. Rather, manageable amounts of arousal can support attention and motivation (Hanoch & Vitouch, 2004). In this study, we focused on the deleterious effects of anxiety, such as thoughts and feelings that impair attention, motivation, and goal-directed behaviour (e.g., Beck, 1976).

Classroom Assessments

Professional teaching standards and international initiatives encourage–and at times, mandate–educators to use a variety of assessments beyond pencil-and-paper tests (Alberta Education, 2018; BC Ministry of Education, 2009; Rao et al., 2016). Formative assessment provides information about students' progress towards curricular outcomes (Looney, 2016). Evaluating learning from different contexts, such as observations, questions, and presentations, can help educators to identify patterns in students' thinking and problem solving (Looney, 2016).

From a Universal Design for Learning (UDL) perspective, alternative methods of assessment can provide equitable assessment opportunities for students who struggle with test-taking (CAST, 2018). Additionally, multiple methods of assessment such as verbal, written, and demonstrative formats can prepare students for a variety of employment and academic opportunities (CAST, 2018). Ultimately, whether used for formative evaluation or UDL, a diverse assessment repertoire leads to high-quality teaching and learning.

Classroom Assessment Anxiety

For many students, tests are sources of physiological responses, cognitive interference, and behaviours that may indicate emotional distress and/or protective withdrawal (Robson et al., 2023; Zeidner, 2007). As well, other forms of classroom assessment may provoke similar reactions. Moreover, context-specific factors such as whether the evaluation is completed in front of peers (e.g., presentations, reading out loud) may produce a different symptom profile. Given the diversity of assessments used in contemporary classrooms, studying classroom assessment anxiety (CA) is timely.

Relevance of This Study

As we discuss in the second paper of this 2-paper dissertation (i.e., Chapter 3), test anxiety is a well-known phenomenon that affects many learners. In contrast, less is known about anxiety experienced during other classroom assessments, such as in-class presentations, verbal questioning, and educational games. Prior to investigating CA across assessment types, a necessary first step was to develop a measure and evaluate its psychometric properties. We intended this study to make theoretical contributions to the emerging field of CA and to provide a foundation with which future research can shift from theory to practice.

Purpose and Research Questions

The purpose of this study was to develop a measure of test anxiety that includes all current methods of classroom assessment. The measure was to be easily administered, scored, and interpreted by classroom teachers, while still showing strong psychometric properties. The following research questions guided our study:

1. Can a measure be developed to assess anxiety responses among four distinct types of classroom assessment?
2. What is the quality of the measure, based on its psychometric properties?

Methods

Operational Definitions

After synthesizing literature, we defined CA using a four-factor model consisting of physical sensations, worry, cognitive interference, and off-task/avoidance. *Physical sensations* include autonomic reactions such as a shaking hand, fast heartbeat, and nausea (e.g., Wren & Benson, 2004). *Worry* refers to thoughts about sub-optimal performance during the assessment or a poor outcome (e.g., Wren & Benson, 2004). *Cognitive interference* includes anxiety-related disruptions to attention and memory during an evaluation (e.g., Putwain et al., 2020). *Off-task/avoidance* refers to rushing through the assessment or wishing to be elsewhere (e.g., Bieleke et al., 2021; Wren & Benson, 2004) and off-task behaviours such as looking around or fidgeting (e.g., Wren & Benson, 2004).

In addition, understanding that we cannot feasibly develop a measure for *all* types of classroom assessments that students complete within a school year, we selected four types: tests, games, presentations, and questions. *Tests* refer to typical classroom tests that teachers administer (e.g., pencil-and-paper assessments that students complete independently). We defined *Games* as educational games (e.g., Kahoot, Blooket) where students are required to demonstrate their

knowledge while competing against peers. *Presentations* involve traditional class presentations (or show-and-share for younger grades) where students complete a pre-prepared verbal demonstration about a specific topic in front of their peers and teacher. *Questions* include verbal assessments that are comprised of a teacher asking a student a brief question.

Item Selections and Adaptations

In our search for published measures appropriate for CA, we found that none exactly fit our research project. Consequently, we broadened our search to encompass related areas of enquiry (e.g., test anxiety, performance anxiety, academic emotions). This expanded search revealed several promising options, including published items and measures available on request. After carefully evaluating these options based on their psychometric properties, relevance to the present study, and individual items, we narrowed our choices to a shortlist. Next, we eliminated redundant and lower-priority items to ensure that the measure would fall within a completion time of 20–30 minutes for students in grades 3 to 8. In addition, we revised some items to increase readability for young children. After revisions, the measure reflected a Flesch-Kincaid grade level of 3.

Anxiety Items

Children's Test Anxiety Scale (CTAS). The Children's Test Anxiety Scale (CTAS) is a self-report measure for children in Grades 3-6 (Wren & Benson, 2004). The CTAS evaluates test anxiety using a four-point scale (i.e., 1 = *almost never,* 2 = *some of the time*, 3 = *most of the time*, 4 = *almost always*; Wren & Benson, 2004). Wren and Benson (2004) found strong psychometric features of the CTAS, including internal consistency estimates of .92 for the overall 30-item scale, and strong internal consistency for their 3-factor model (Off-Task Behaviours, .76; Autonomic Reactions, .82; Thoughts, .89).

To explore the physical sensations, worry, cognitive interference, and off-task/avoidance behaviours encountered by students during classroom assessments, we incorporated items from the CTAS (Wren & Benson, 2004) representing each of these dimensions. We selected CTAS items with the strongest factor loadings, as identified by Wren and Benson (2004), and ensured relevance to Canadian students in grades 3 to 8. For example, we excluded the item "*I check the time*" because it may be relevant only to timed assessments and students who are capable of reading time. We also revised several items to reduce cognitive load, for instance, we reworded "*It is hard for me to remember the answers*" to "*It is hard to remember the answers*". Additionally, we revised some items for specificity, for example, the CTAS item "*I try to finish up fast*" was revised to "*I am so nervous that I rush to get it done*" to differentiate between a speeded approach to the task such as a timed test versus a behavioural response to anxiety. As well, to measure the social implications of test results, we included the item "*I worry about what my parents will say*" and used that item as a template for two other items: "*I worry about what my friends will say*" and "*I worry about what my teacher will say*".

Multidimensional Test Anxiety Scale (MTAS). The Multidimensional Test Anxiety Scale (MTAS) was developed by Putwain and colleagues (2020) to evaluate test anxiety experienced by high school students. The MTAS is a self-report measure that uses a 5-point rating scale (1 = *strongly disagree,* 3 = *neither*, 5 = *strongly agree*; Putwain et al., 2020). Previous studies have shown good model fit, reliability, and validity evidence for the MTAS (Putwain et al., 2020; 2021). We adapted two items from the Cognitive Interference domain of the MTAS by reducing the wording for use with elementary and junior high reading levels. Specifically, we revised "*I find it hard to concentrate*" to "*It is hard to concentrate*." We also changed "*I forget previously known material during tests/exams*" to "*It is hard to remember the*

answers."

Achievement Emotions Questionnaire (AEQ). The AEQ was developed to assess nine achievement emotions (e.g., enjoyment, pride, anxiety, shame) experienced in classroom, learning, and test settings (Bieleke et al., 2021; Pekrun et al., 2011). This self-report measure uses a 5-point rating scale (1 = *strongly disagree*; 5 = *strongly agree*; Pekrun et al., 2011). The AEQ was originally developed for university students and has been adapted for children and adolescents (e.g., Lichtenfeld et al., 2012). Bieleke and colleagues (2021) found that the AEQ demonstrated strong psychometric properties including acceptable data fit and validity evidence. In addition, Bieleke and colleagues (2021) reported that the AEQ demonstrated acceptable reliabilities for all items, including the 12-item test anxiety subscale ($\alpha = .90$). Accordingly, we rephrased the item from the AEQ's test anxiety subscale "*I get so nervous I can't wait for the exam to be over*" to "*I get so nervous that I wish I could just skip it*".

Assessment Categories. Although many of the items were relevant across assessment categories (i.e., tests, games, presentations, questions), some items required slight adjustments to different contexts. As such, we adapted the worry items to reflect differing assessment outcomes including worries about grades (i.e., tests), scores (i.e., games), incorrect answers (i.e., questions). For presentations, we included items examining worries about grades and the presentation going poorly.

Symptom Frequency. We measured the frequency of CA using a similar 4-point scale used in the CTAS (Wren & Benson, 2004). Four-point rating scales have the benefit of preventing respondents from selecting a neutral response. Furthermore, we adjusted the CTAS's four-point rating scale by changing "*almost never*" to "*never*" to avoid forcing students' responses towards the presence of test anxiety symptoms. Secondly, we revised items for

concision. For example, we revised "*some of the time*" to "*rarely*". See Appendix B for a list of items that we included in each measure, along with their coded numbers.

Target Population

We developed the measure for students in grade 3 to 8. Prior research has demonstrated that students in these grade levels experience anxiety in response to some forms of classroom assessment (i.e., Beidel et al., 1988; Bodas et al., 2008; Chapman et al., 2020; Hembree, 1988).

Participants and Data Collection

A total of 204 students (122 female and 82 male; M_{age} = 10.82, SD = 1.79) completed the measure. Of the participating students, 21% were enrolled in programming intended for gifted children. We recoded the data to reflect the diversity of ethnicities reported by caregivers. Data collection occurred in 2023 (January to March) at schools in and around Edmonton, Alberta. Parents/legal guardians provided consent for their children to participate in the study and participating students also provided assent. We made no exclusions (e.g., demographic variables). See Appendix B for demographic information.

Design

The CA measure developed in this study was intended to target the wholistic experience of anxiety across all types of classroom assessments. A self-report measure was ideal for the present study because it provided access to students' internal experiences and captured the covert symptoms of anxiety. Additionally, rating scales can be completed quickly by many students, facilitating the compilation of a large dataset for statistical analysis. This efficiency also aids in the early identification of anxiety.

Data Preparation

We coded the data using a Microsoft Excel spreadsheet, in small batches of 5–10

protocols that were re-checked to ensure accuracy. For the CA and shame items, we coded the items as follows: *Never = 1; Rarely = 2; Sometimes = 3; Often = 4.* For the appraisal items, we coded the items: *Really unlike me = 1; Somewhat unlike me = 2; Somewhat like me = 3; Really like me = 4.*

Regarding individual item responses, there were several instances where student participants circled multiple responses for an item. Specifically, both *Sometimes* and *Often* were endorsed within the same item by seven participants. Six participants circled both *Never* and *Rarely* for one of their rating scale items. Seven participants circled both *Never* and *Sometimes* for one of their rating scale items, with one participant repeating this approach for an additional item. Three participants circled both *Never* and *Often.* Four participants circled both *Rarely* and *Sometimes.* Two participants circled both *Rarely* and *Often* for two items. One participant circled three responses for the same item (i.e., *Never, Rarely, Sometimes).* Similarly, another participant circled *Never, Rarely,* and *Often* for the same item. Regarding the appraisals scale, a total of nine participants circled multiple items. Of note, few participants exhibited this approach to the task, and generally only circled multiple responses in one item, with a small number of participants repeating this approach two or three times. Given that only 24 items were circled multiple times, each participant was able to complete a maximum of 83 items, and 204 students participated in the study, the frequency of this approach to the task is negligible. Participant-specific responses were analysed and identified no concerns with response patterning; as such, this phenomenon is likely attributed to student response error.

Multiple responses within the same item might increase item scores and means. To address this potential validity threat, we recoded such cases by systematically eliminating one of the responses while alternating between each of them. For instance, if a student had circled both

Never and *Rarely* for a particular item, we alternated between eliminating *Never* and *Rarely* during the recoding process. This approach aimed to maintain the integrity of our data analysis by ensuring that each response was appropriately accounted for without skewing the results. In addition, we eliminated item #7 ("*I look at other people"*) from all rating subscales. During administration, we noticed that several students asked questions about this item. It became clear that this item could be interpreted in multiple ways, which again would cause validity issues when interpreting the data.

We transferred the data into Statistical Package for Social Sciences (SPSS) Version 29.9.1.0, and performed descriptive analyses. We also added a variable summing the total frequency of anxiety symptoms for each assessment type. Next, we conducted Confirmatory Factor Analysis using lavaan (Rosseel, 2012) in R to investigate the measure's construct validity.

Results

Each item displayed a range of three with a minimum of one and a maximum of four. Means ranged from 1.47 to 3.25. Individual z-tests for skewness and kurtosis were implemented and analyzed using a criterion value over ±3.29 (i.e., Kim, 2013). The most skewedness indices that exceeded the criterion value of ±3.29 were observed in the games subscale (i.e., 9 items, all displaying positive skew). The questions subscale exhibited four positively skewed items and one negatively skewed item. The presentations subscale displayed four negatively skewed items and one positively skewed item. The test subscale exhibited two positively skewed items and three negatively skewed items. Many items in all subscales displayed kurtosis exceeding the criterion value of ±3.29, and most of the kurtotic items were negative (platykurtic). See Appendix C for descriptive statistics for all CA items discussed in this study.

Missing data analysis revealed that between 0 to 3.9% of data was missing within each

item. Little's MCAR test was non-significant, suggesting that data are missing completely at random, $X^2 = 5029.41$, df = 4834, $p = .03$. We used deletion methods (e.g., pairwise and listwise deletion) in all statistical analyses.

Visual analysis of boxplots identified 32 possible outliers within 8 items (20 potential outliers in 5 game subscale items; 12 potential outliers in 3 question subscale items). We re-checked the items for coding accuracy and found no indications of error. Next, we examined the potential outliers for themes, and we found that the potential outliers were responses from mostly unique students except for Participant #160 (4 outlier responses) and Participant #183 (3 outlier responses). Two other participants had selected two outlier responses each. Thus, we chose to retain all elevated values because we found no evidence of entry errors or consistent patterns in participant responses. Moreover, it is plausible that some students may experience symptoms of anxiety more consistently than other students due to endogenous (trait) anxiety or sensitivities to contexts that trigger (state) anxiety.

Internal Consistency

The overall measure indicated high internal reliability (83 items; α = .97). Internal consistency coefficients were high for each subscale including tests (14 items, α = .87), games (14 items, α = .87), presentations (14 items, α = .89, and questions (14 items, α = .91). For each subscale, we examined the coefficient alpha as if each item were deleted and found a consistent negative impact upon deletion. Inter-item correlations satisfied criteria (< 0.70) with the exception of one item in the question anxiety subscale that exhibited an inter-item correlation of 0.70. (See Appendix C).

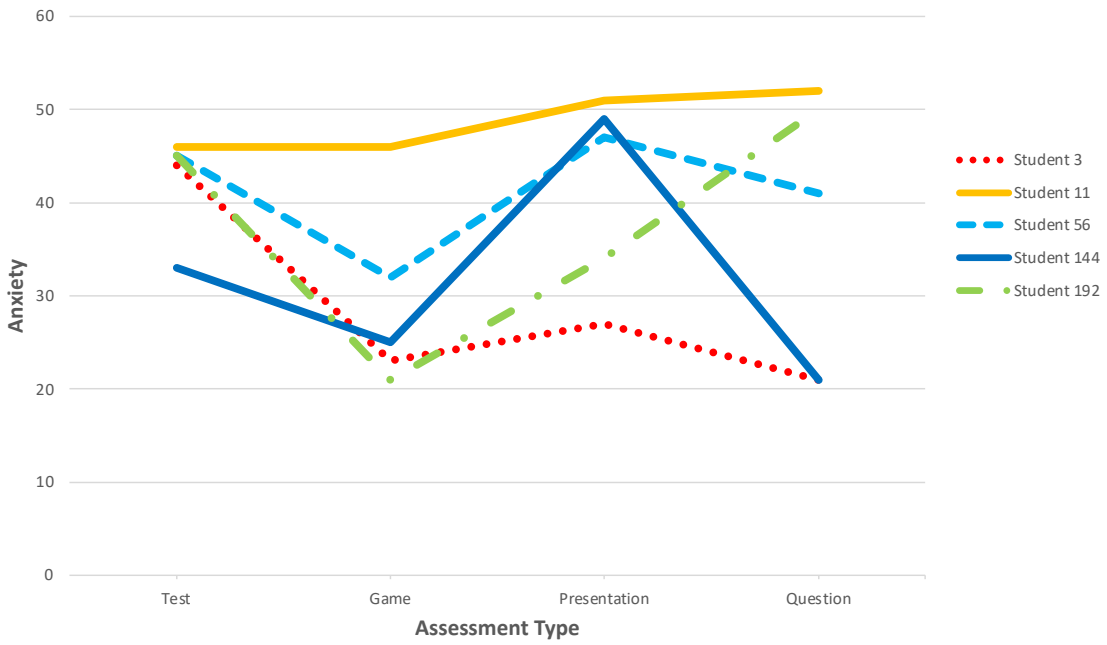
Profile Variability

Nearly all students (203 out of 204) reported *sometimes* or *often* experiencing symptoms

of anxiety in at least one assessment. After summing each student's subscale scores, several different profiles emerged. For instance, some students exhibited relatively lower or higher CA across assessment types. Interestingly, some students self-reported more frequent CA for presentations than tests or other assessment types (and vice versa). Other students reported similar CA for both tests and presentations. See Figure 2.1, below.

Figure 2.1

Profile Variability



Note. This figure compares five students' self-reported anxiety across assessment types.

Confirmatory Factor Analysis

Hypothesized Model

We performed a confirmatory factor analysis using Lavaan 0.6.16 (Rosseel, 2012). We hypothesized a 4-factor model consisting of Worry, Cognitive Interference, Avoidance/Off-Task,

and Physical Sensations based on previous research. The items assigned to each of the four factors in our CFA model can be found in Appendix B.

Test Anxiety. For the RMSEA, we calculated a 90% confidence interval (i.e., as recommended by MacCallum et al., 1996). In general, RMSEA less than .08 and .05 demonstrate acceptable and good fit, respectively (MacCallum et al., 1996). CFI values above .90 and .95 demonstrate good fit, with values for the SRMR below .10 indicating acceptable fit, and values below .05 indicating good fit (Schermelleh-Engel et al., 2003).

The 4-factor test anxiety model exhibited acceptable fit solely for the SRMR, but it failed to meet the criteria for other indicators (X^2, RMSEA, CFI). In response, we pursued a refinement by testing a 3-factor model after excluding the two Cognitive Interference items. Despite this adjustment, the fit indices did not suggest a noticeable enhancement (as shown by Table 2.1, below). It is noteworthy that in both models, every coefficient (other than the factor loading that was set to 1) was statistically significant ($p < .001$). See Figure A1 (Appendix A).

Table 2.1

Summary of Test Anxiety CFA

	X^2 (df)	RMSEA	CFI	SRMR
4-factor model	185.27 (71) $p < .001$	.09 [90% CI: .00 - .89)]	.86	.06
3-factor model	150.90 (51) $p < .001$	.10 [90% CI: .00-.97]	.86	.07

Games. Fit indices suggested acceptable model based on RMSEA less than .08, CFI above .90, and SRMR below .10 (see Table 2.2, below). All factor loadings were significant ($p < .001$; See Figure A2, Appendix A).

Table 2.2

Summary of Game Anxiety CFA

	X^2 (df)	RMSEA	CFI	SRMR
4-factor model	131.91 (71) $p < .001$	.07 [90% CI: .05-.14]	.93	.05

Presentations. Fit indices again suggested acceptable model fit due to RMSEA less than .08, CFI above .90, and SRMR below .10. All factor loadings were significant ($p < .001$). However, we received an error message in Lavaan output stating "covariance matrix of latent variables is not positive definite; use laInspect(fit,"cov.lv") to investigate". Upon investigating the correlations between latent variables, we identified a high correlation between Cognitive Interference and Worry (.90) and an implausible high correlation between Avoidance and Cognitive Interference (1.1). Next, we ran a 1-factor CFA to investigate whether the data would be better explained with a single factor. Model fit indices for the 1-factor model indicated that RMSEA fell above .08, CFI less than .90, and SRMR below .10. In comparison to the 4-factor model, the 1-factor model demonstrated a higher X^2 value, weaker RMSEA and CFI, and a stronger SRMR (See Table 2.3, below). See Figure A3 (Appendix A) for our CFA model for the presentation anxiety subscale.

Table 2.3

Summary of Presentation Anxiety CFA

	X^2 (df)	RMSEA	CFI	SRMR
4-factor model	146.80 (71) $p < .001$	.07 [90% CI: .01 - .26]	.93	.05
1-factor model	255.03 (77) $p < .001$	.11 [90% CI: .00 - 1.0]	.85	.07

Questions. Indices suggested acceptable model fit based on RMSEA less than .08, CFI above .90, and SRMR below .10. All factor loadings were significant ($p < .001$; See Figure A4,

Appendix A). We received the same error message that we did with presentations "i.e., covariance matrix of latent variables is not positive definite" and found high correlations among several latent variables. As a result, we ran another CFA using a single-factor model. The 1-factor model exhibited a higher X^2, RMSEA, and .06, and a lower CFI, in comparison to the 4-factor model. These fit indices do not necessarily suggest that a 1-factor model is a better fit for the data (as noted below in Table 2.4).

Table 2.4

Summary of Question Anxiety CFA

	X^2 (df)	RMSEA	CFI	SRMR
4-factor model	95.38 (71)	.04	.98	.04
	p = .03	[90% CI: .02 - .06]		
1-factor model	184.38 (77)	.09	.91	.06
	p < .001	[90% CI: .00 - .73]		

Discussion

Process of Developing the Measure

In developing a measure that can be completed in 20–30 minutes, along with additional items as part of our larger study on anxiety and shame, we selected four assessment types (i.e., tests, games, presentations, questions). As a result, this measure did not include subscales for several frequently-used assessment methods (e.g., worksheets, take-home tests, essays). Future research could reduce subscale length to facilitate the development of a comprehensive, yet time-efficient, measure of CA. Nevertheless, the results of this study set the foundation for a modular set of subscales, allowing teachers to choose the subscales that are appropriate for their classroom assessments.

Evaluation of the MCA

Sixteen items exhibited a significant, positive skew. These results suggest that many

students did not report high frequency of anxiety on several items within each assessment type. Relatedly, clinical measures of emotional difficulties are often positively skewed when used within a nonclinical population (Pallant, 2010). Conversely, eight items exhibited negative skew, which suggests many students reported frequently experiencing anxiety on some items in tests, questions, and presentations. Moreover, based on an examination of skewedness (and kurtosis) values, many items in the measure did not appear to be normally distributed, and it is uncertain how this lack of normality affected the current results.

The subscales demonstrated strong psychometric properties, as expected, because we based the items on existing measures known for their strong psychometric properties. The measure exhibited high internal consistency, with subscales also showing acceptable internal consistency. In terms of construct validity, the 4-factor model (i.e., physiological responses, worry, cognitive interference, off-task/avoidance behaviours) provided acceptable model fit for the data in each subscale. These results support conceptualizations of test anxiety as a multidimensional construct consisting of the four abovementioned factors (i.e., Bieleke et al., 2021; Putwain et al., 2020; Wren & Benson, 2004). All items loaded significantly on their hypothesized constructs, which is also consistent with findings from previous research.

Some latent variables in the presentation and question subscales may be related and perhaps redundant, as suggested by high several high correlations. In addition, a standardized covariance (i.e., correlation) in the presentation subscale exceeded a value of one. According to (Long, 1983), unreasonable estimates may be related to pairwise deletion, normality, or other model specification problems. To investigate these issues, follow-up factor analysis might streamline these subscales. Additionally, future research may expand the operational definitions of question and presentation anxiety and lead to subscale improvements. That said, the

correlations between latent variables may be consistent with emotion theories such as Beck (1976) that describe interrelationships between thoughts, feelings, and behaviours.

General Discussion and Limitations

The MCA displayed strong psychometric properties, but it will require further validation to better understand CA in other assessment contexts. The MCA also possesses limited ability to evaluate the intensity of anxiety symptoms. Likewise, the impact of CA on academic outcomes and social-emotional well-being is beyond the scope of this study. In addition, the findings of this study are from a convenience sample and may be limited by cohort effects, geographical region, and social desirability. Nevertheless, the MCA makes a theoretical contribution to the emerging field of CA and provides a foundation upon which future research can be conducted. Continued research in this area holds promise, potentially paving the way for early intervention strategies that can alleviate CA and promote engagement with learning.

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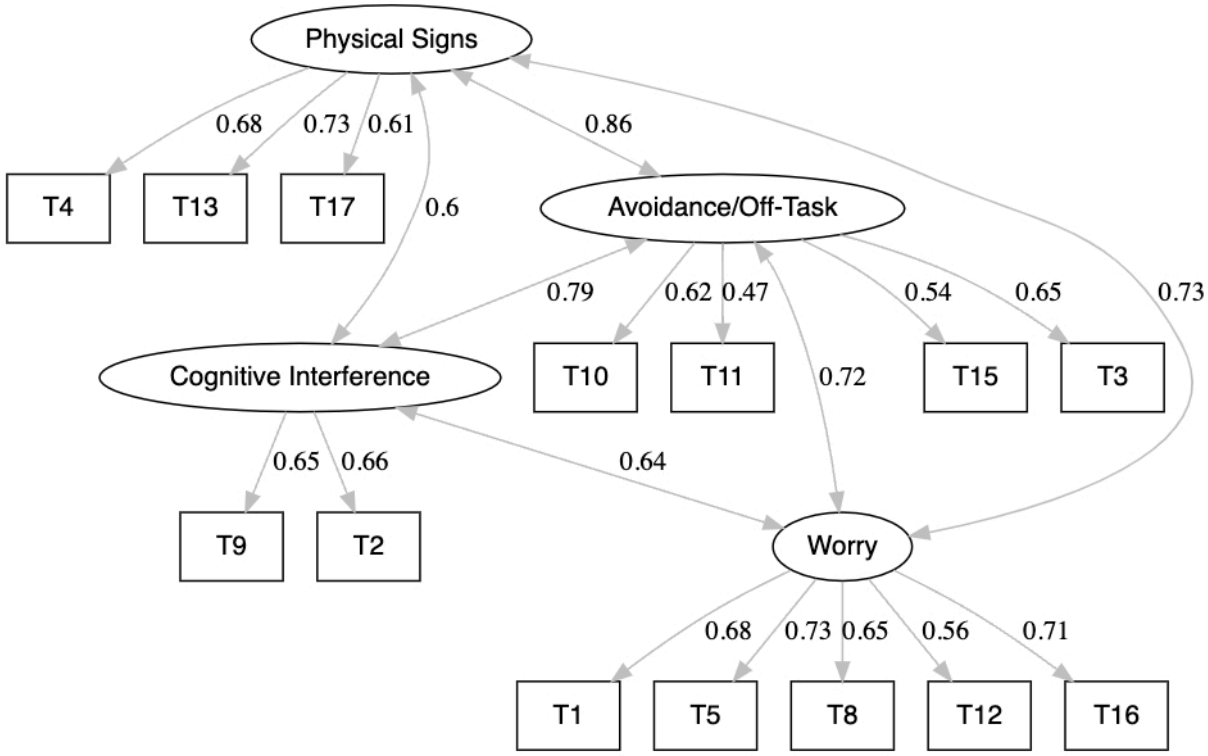
Appendix A

Figure A1

CFA Model for the Test Anxiety Subscale

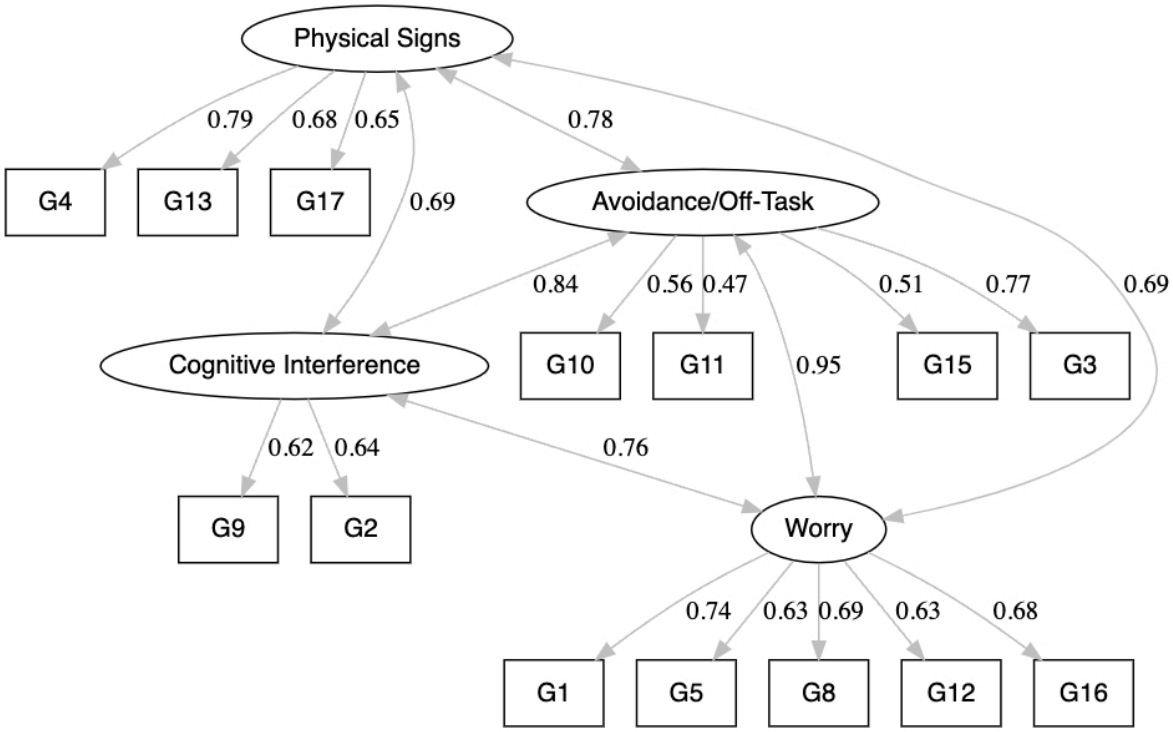


Note. Coefficients are standardized to the latent variables.

Data visualization was conducted with lavaanPlot (v. 0.8.1)

Figure A2

CFA Model for the Game Anxiety Subscale

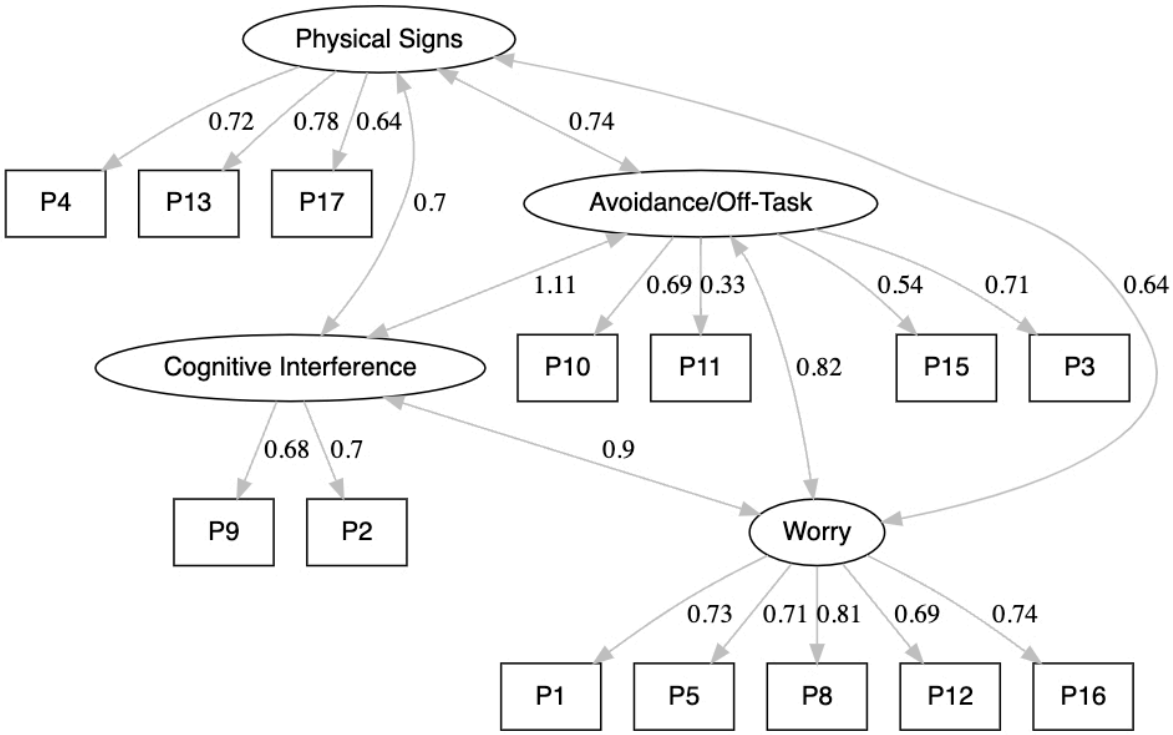


Note. Coefficients are standardized to the latent variables.

Data visualization was conducted with lavaanPlot (v. 0.8.1)

Figure A3

CFA Model for the Presentation Anxiety Subscale

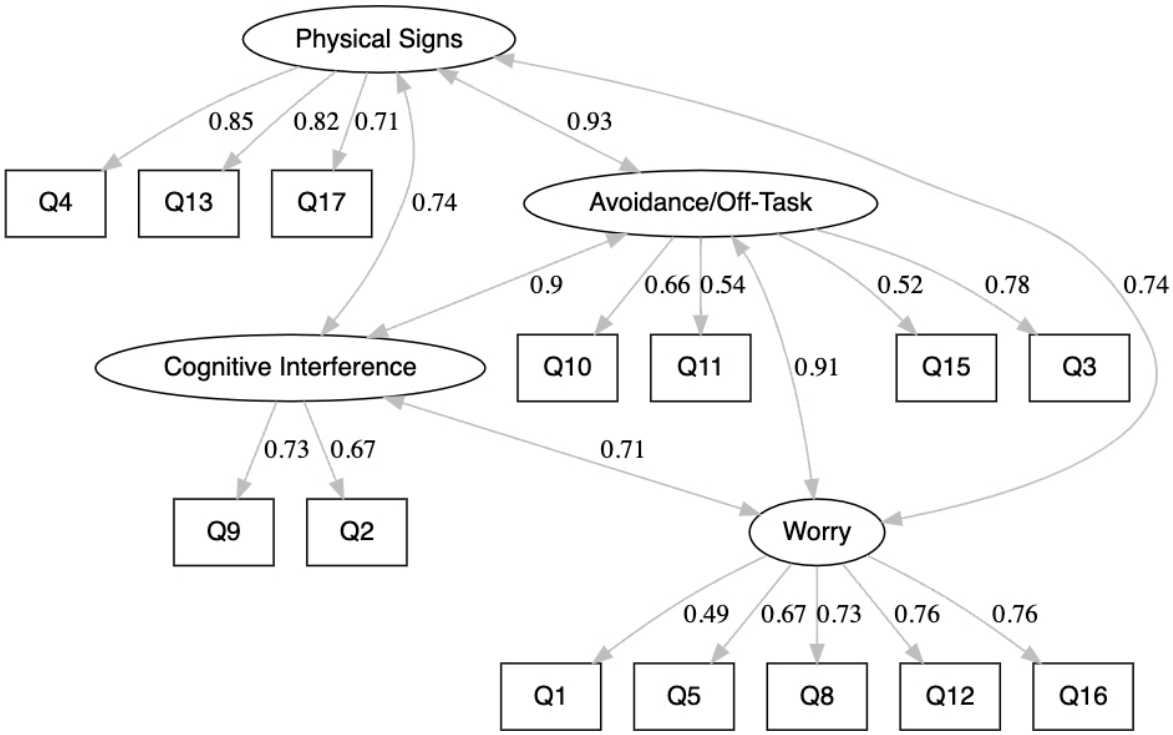


Note. Coefficients are standardized to the latent variables.

Data visualization was conducted with lavaanPlot (v. 0.8.1)

Figure A4

CFA Model for the Question Anxiety Subscale



Note. Coefficients are standardized to the latent variables.

Data visualization was conducted with lavaanPlot (v. 0.8.1)

CHAPTER 3: ANXIETY AND SHAME ACROSS CLASSROOM ASSESSMENTS

Abstract

Test anxiety can have short-term and long-term consequences for many students. Performance anxiety has largely been studied in contexts beyond classrooms, however, less is known about anxiety experienced during assessments completed in front of peers. In this study, we turned focus on the emerging area of classroom assessment anxiety (CA). We investigated students' experience of CA, the relationship of shame and anxiety, and teachers' ability to identify behavioural indicators of CA. Students (N = 204) in grades 3–8 self-reported their thoughts, feelings, and behaviours during assessments (i.e., tests, games, questions, presentations) including self-appraisals after making mistakes and/or not knowing the correct answer. Teachers (n = 9) completed an educator version of the measure, rating their participating students' symptoms of CA. We found that all assessment types were potential sources of anxiety and shame. Our results aligned with previous research highlighting the difficulties with noticing the subtle (and often covert) signs of anxiety. We also found that the more students identified with negative self-appraisals, they also reported experiencing more frequent shame. Regarding antecedents to test anxiety, increased agreement with the appraisal "*I never feel good about my work"* increased the odds of test anxiety by 2.22. Additionally, female students were 3.01 times more likely to endorse test anxiety than male students. Although there are limitations, the results contribute to CA literature and may inform the development of interventions to support students.

Keywords: classroom assessment anxiety, test anxiety, presentation anxiety, game anxiety, question anxiety, evaluation anxiety, shame

Anxiety and Shame Across Classroom Assessments

For many children, classroom assessments are a double-edged sword. The benefits are well-known—teachers use evidence of students' learning to inform a variety of decisions. For example, they may redevelop the next lesson, modify the level of challenge they are providing to students, and identify students who need extra learning support. As such, assessment facilitates the delivery of high-quality instruction. On the other hand, children's early experiences with assessment can have profound effects on *how* and *what* they learn. For instance, classroom assessment anxiety can interfere with students' ability to demonstrate their knowledge and results in lower grades (Putwain & Daly, 2014; Segool et al., 2013; Von der Embse et al., 2018). Furthermore, anxiety emanating from classroom assessments can have long-term effects by limiting course selection, career prospects, and financial outcomes (Bodas et al., 2008). It may also interfere with the ability to apply academic skills in the pursuit of life goals (Barrows et al., 2013). Finally, test anxiety during childhood, left untreated, increases the likelihood of developing more severe anxiety and other mental health difficulties into adulthood (Masten & Cicchetti, 2010; Putwain et al., 2021).

Test anxiety affects many children. In fact, up to 40% of children experience test anxiety (Thomas et al., 2018) and 16% live with *debilitating* test anxiety (Putwain & Daly, 2014). Although performance anxiety has been studied in other contexts, such as music (Ryan, 2004, 2005) and sports (Smith et al., 2006), little is known about anxiety experienced during assessments that are completed in front of peers. The social nature of these evaluations can lead to anxiety if a child is aware that other people are thinking critically about them, or if they assume that others are doing so (Chapman et al., 2020). Negative social situations can also induce shame, the feeling of being "fundamentally defective" (Ferguson et al., 1999, p. 347), and

cause children to fear similar situations (Johnson, 2012; Reiss, 1991; Turner & Schallert, 2001). Thus, a seemingly mundane task, such as reading out loud in class, can elicit feelings of shame or fear, which causes avoidance, impairs learning, and limits achievement. Furthermore, the prevalence of assessment anxiety, as well as the severity of its symptoms, may be higher when all types of classroom assessments are considered.

Test Anxiety

As we also discuss in Chapter Two, test anxiety is marked by fears, worries, and distress that a student experiences before and/or during a test (Beidel & Turner, 1988). The cognitive interference model explains test anxiety as the cause of impaired information processing and recall that negatively affects academic performance (Cassady & Johnson, 2001; Hembree, 1988). Numerous cognitive components of test anxiety have been proposed, but, general themes deal with worries about failure, peer comparisons, and parents' reactions (Cassady & Johnson, 2001). Some researchers such as Hembree (1988) argued that emotionality, or physiological arousal (e.g., dizziness, nausea, panic), triggers the cognitive components of test anxiety and should also be considered as part of the definition and treatment of test anxiety. Furthermore, some theorists consider off-task behaviours such as looking around the room or at others to indicate distraction or avoidance due to test anxiety (Wren & Benson, 2004).

Shame

Shame is "a private self-conscious experience in which individuals feel that a weakness or vulnerability has been exposed not only to others, but also to themselves, leaving them feeling deficient and humiliated" (Leitch, 1999, abstract). The experience of feeling that oneself is defective is often associated with intense emotional pain (Lewis, 2000) and a desire to escape the shame-provoking situation (Turner & Schallert, 2001). There is some thought that situation-

specific shame regulates social behaviour, by reducing the likeliness of impulsive behaviour and/or behaviour that intentionally harms others (Greenwald & Harder, 1998; Monroe, 2009). Shame can serve as a reminder that a person is human and that making mistakes is an expected part of the learning process (Leach & Cidam, 2015; Monroe, 2009). However, shame that loses its transience and becomes internalized as a pervasive state of worthlessness or deficit produces maladaptive ruminations that can erode self-efficacy and confidence, and promote avoidance (Leach & Cidam, 2015; Leitch, 1999; Monroe, 2009). Additionally, maladaptive shame is a risk factor for social-emotional and behavioural difficulties, including anxiety, depression, aggression, and risky behaviour (Ang & Khoo, 2004; Bennet et al., 2010; Stuewig et al., 2015). Shame is likely unavoidable in *all* aspects of school, however, without guidance on how to navigate evaluation and social comparisons in ways that do not produce maladaptive shame, students are at risk of disengaging from academic tasks (Johnson, 2012; Turner & Schallert, 2001; Wolfe, 2017).

Appraisals

According to control-value theory, achievement emotions stem from students' appraisals about their control (i.e., competence) over academic activities and outcomes, and the value (i.e., importance) that they place on academic success (Pekrun et al., 2002; Goetz et al., 2006; Pekrun, 2006, Pekrun et al., 2007). Mistake-making, such as giving a wrong answer to a question or making performance errors, is inevitably part of the learning process, but can result in negative self-appraisals that affect students' identity as learners capable of growth (i.e., Johnson, 2012; Pekrun et al., 2007). Whether formative or summative, the aim of classroom assessment is to provide feedback on students' mistakes to support further academic development. In applying control-value theory to mistake-making, mistakes can be positive if students' self-appraisals

sustain competence and value. Conversely, mistakes that result in feelings of severe incompetence and/or shame could be associated with fear and avoidance. Appraisals can be influenced by a student's cognitions, such as perfectionistic beliefs that hold themselves to impossibly high standards (Abdollahi et al., 2018; Eum & Rice, 2010) or interpretations of others' evaluations (Chapman et al., 2020).

Test Anxiety Research

Of the many test anxiety correlates that have been investigated over the decades, perfectionistic concerns have been consistently related to test anxiety (Burcaş & Creţu, 2020). More female students report significantly higher rates of test anxiety than males (von der Embse et al., 2018). Additionally, Santos and colleagues (2020) found that shame was related to test anxiety among adolescents. Similarly, Tang (2019) found that test anxiety and shame were related among their sample of undergraduate students. In terms of symptoms of anxiety that are experienced in different types of assessments beyond tests and exams, Wang and Tahir (2020) reviewed literature studying the effectiveness of Kahoot (an online game-based learning platform) on learning outcomes. Through their review, the researchers found that Kahoot could have a positive impact on students' anxiety (Wang & Tahir, 2020). Moreover, although test anxiety has been studied since the 1950s (von der Embse et al., 2018), students in elementary and middle years have often been neglected in this line of inquiry. Furthermore, although there is a small number of studies that examine how test anxiety might be experienced by gifted students (e.g., Zeidner & Schleyer, 1998), little is known about gifted students who are attending Canadian schools.

Test Anxiety Identification

Teachers who can identify signs of CA can support their students in three impactful ways.

First, teachers can factor in CA when they assess their students' learning to make informed instructional decisions. Second, teachers can support students as they overcome thoughts and feelings associated with CA (e.g., shame, fear). Third, in more extreme cases, teachers can help struggling students connect with mental health professionals (e.g., counsellors, psychologists).

Teachers' accuracy in identifying students with social-emotional difficulties varies, often including correct identifications, misses, and false positives (Cunningham & Suldo, 2014; Gelley, 2014; Neil & Smith, 2017). Correct identification is consistent with the results of Headley and Campbell (2011), who found that many teachers are familiar with and can identify symptoms of anxiety when presented with vignettes of fictional students. Overt signs of anxiety, such as crying, are most salient to teachers (Neil & Smith, 2017). However, anxiety is largely an internalizing disorder with covert symptoms that may be missed (Neil & Smith, 2017). Neil and Smith (2017) suggest that expecting teachers to identify all signs of anxiety is unrealistic. Instead, Neil and Smith (2017) recommend supplementing teacher training with a self-report measure to capture students' internal experiences of anxiety.

Purpose and Research Questions

The purpose of this study was to investigate students' experience of CA, the relationship between CS and CA, and teachers' ability to identify CA among their students. Understanding possible sources of CA can inform interventions and support teachers in gathering high-quality evidence of learning. To advance these aims, the following research questions guided the present study:

1. How do students' self-reports of classroom assessment anxiety (CA) and shame (CS) compare among different methods of classroom assessment?
2. Are CS and CA related?

3. To what extent do teachers' ratings of their students' CA and CS align with students' self-report?
4. What signs of CA are teachers able to identify?
5. Are negative self-appraisals after making errors or not knowing the correct answer associated with CA or CS?

Please note: in the following sections, the research questions will be denoted as such:

RQ 1: CA and CS by Assessment Type

RQ 2: Self-Reported CA and CS

RQ 3: Student and Teacher Reports of CA

RQ 4: Sensitivity and Specificity

RQ 5: Self-Reported Appraisals, CS, and CA

Methods

Participants

Children in grades 3–8 whose caregivers provided consent, and their regular classroom teacher, were invited to participate in the study. During assessments, students in these grade levels are aware that they experience symptoms associated with anxiety (Beidel et al., 1988; Bodas et al., 2008; Chapman et al., 2020; Hembree, 1988) and shame (Ferguson et al., 1991, 1999). Understanding these emotions as they relate to classroom assessments can inform early intervention and prevention of difficulties associated with anxiety and shame, such as cognitive interference, avoidance, and disengagement from learning. No exclusions were made (e.g., demographic variables).

Participant Characteristics

A total of 204 students (122 female and 82 male; M_{age} = 10.82, SD = 1.79) participated in

the study. Of the participating students, 21% were enrolled in programming intended for gifted children. See Appendix C for demographic information.

Nine teachers (5 female and 4 male; $M_{\text{Years Teaching}} = 12.39$, $SD = 8.60$) rated 72 participating students in grades 6 to 8. Participating teachers completed the measure for 4–17 participating students, depending on their availability and the number of participants in their class. Some teachers did not use presentations in their courses and resultantly did not complete the presentation items on the measure.

Recruiting

Before recruiting research sites, we applied to all relevant ethics boards (i.e., University of Alberta Research Ethics Board, Cooperative Activities Program, school board). Ultimately, we received permission to recruit research sites in two charter schools (grades 3–8) and one school district (grades 4–8). To recruit research sites within the school district, we contacted 29 schools in that district using the general email contact stated on their public websites (September to November, 2022). Two public schools participated as research sites. We provided recruiting materials (i.e., graphic, letter of information/consent) to administrators for circulation using their preferred communication channels. Schools and caregivers chose to either return signed consent forms to school or to email the form directly to the principal investigator.

Measures

To measure CA, participating students indicated the frequency that they had experienced related thoughts, feelings, behaviours, and physical sensations on a 4-point scale ranging from *Never* to *Often*. They completed 17 items for each subscale (i.e., tests, games, questions, presentations). Their teacher rated their students' CA and CS. The teacher version of the measure included four items for each of the four assessment types. The CA items were adapted from the

Children's Test Anxiety Scale (CTAS; Wren & Benson, 2004), the Multidimensional Test Anxiety Scale (MTAS; Putwain et al., 2020), and the Sport Anxiety Scale-2 (Smith et al., 2006). We also adapted items from the test and anxiety and shame subscales of the Achievement Emotions Questionnaire (AEQ; Bieleke et al, 2021). See Chapter Two for more details about the development and evaluation of the CA measure.

To measure students' appraisals after making mistakes, participating students indicated the extent to which 14 brief statements describe them, using a 4-point scale that ranged from "*Really unlike me"* to "*Really like me".* For this subscale, we adapted items from the Adaptive/Maladaptive Perfectionism Scale (Rice & Preusser, 2002) and constructed several items based on mindset literature (Dweck, 2006).

Data Collection

Data collection occurred between January and March 2023. The children's version of the measure (including assent form) was administered in groups of students in their classroom, library, or meeting room. Before completing the pencil-and-paper booklet, the principal investigator discussed assent with the students. During administration, the principal investigator monitored the students and was available to answer questions. Participating teachers completed the measure independently.

Analytic Strategy

We planned to analyze the data quantitatively using methods appropriate for ordinal data. As such, analyzing frequency data enabled us to identify themes and trends among signs of CA and CS among assessment types. Given the ordinal nature of our data, Spearman's rank order correlations were appropriate for analyzing the relationships between variables. We also planned to use sensitivity and specificity calculations to explore teachers' ability to identify CA. Finally,

we selected logistic regression to analyze whether shame increased the odds that students would report test anxiety.

Sample Size & *A Priori* Power Analysis

A minimum sample size of 120 was sufficient for planned analyses (i.e., Faul et al., 2007). However, a larger sample size such as 200 would allow for more in-depth item analyses. We achieved a sample size of 204 after two students withdrew assent. For sensitivity and specificity calculations, assuming a 40% prevalence and using a .80 power, 20–30 teachers would be acceptable (Bujang & Adnan, 2006). Nine teachers participated in the study and rated 72 students. Even though our teacher sample was smaller than recommended by Bujang and Adnan (2006), we did not recruit more teachers due to data collection deadlines and to avoid exceeding our research sites' resources.

Results

Data Preparation

The data was coded using a Microsoft Excel spreadsheet and transferred into Statistical Package for Social Sciences (SPSS) Version 29.9.1.0 for analysis. Details on coding, missing data analysis, and psychometric properties of the measure are presented in Chapter Two. Recoding specific to research questions are noted in the relevant sections below.

Data Analysis

RQ 1: CA and CS by Assessment Type

RQ1a: Self-Reported CA by Assessment Type. We analyzed frequency data true to the 4-point rating scale and identified general themes. See Appendix E. Over 1 in 3 students reported *often* experiencing symptoms of test anxiety, including worry, cognitive interference, and off-task/avoidance behaviours. Slightly above half (51%) of students reported *often* experiencing

outcome-related worry during tests ("*I worry about what my grade will be*"). Similarly, over 1 in 3 students endorsed *often* experiencing symptoms of anxiety during presentations. Relatively fewer students reported *often* experiencing symptoms of anxiety during in-class games (e.g., Kahoot). The highest frequencies were for off-task/avoidance behaviours; specifically, *often* looking around the room (28%), looking at other people (22%), and playing with nearby things (19%). In terms of questions being asked in class, we some observed variability among the frequency data. For example, students' report of *often* experiencing worry during questions ranged from 8% *("I worry about what my parents will say if I answer incorrectly*) to 46% (*"I worry about giving the wrong answer"*). Physical sensations of anxiety were reported from between 14% (upset stomach) to 20% (shaking hand) of students. Fewer than 1 out of 5 students reported *often* experiencing cognitive interference when their teacher asks them a question in class. Off-task/avoidance behaviours ranged from 16% ("*I [often] look at other people*") to 24% (*"I [often] get so nervous that I wish I could just skip it"*).

Dichotomous Frequency Data. We recoded the dataset dichotomously (0 = *never, rarely*; (1 = *sometimes, often*) because some students may report *sometimes* experiencing symptoms of anxiety instead of *often* due to social desirability. Furthermore, for intervention planning, students who *sometimes* exhibit symptoms can perhaps benefit from interventions aimed to reduce the frequency to a more negligible level. In general, CA was reported more frequently in tests and presentations than in games and questions. See Appendix F.

Research Question 1b: Self-Reported CS by Assessment Type. The most students reported *often* feeling embarrassed during presentations ("*I get embarrassed if I make mistakes when I read out loud*; 50%). On the parallel item ("*I get embarrassed if I can't answer the questions correctly")*, fewer students endorsed this item for questions (41%), tests (24%), and

games (21%). Regarding the item ("*I feel ashamed*"), questions displayed the highest frequency (24%), followed by presentations (20%), tests (12%), and games (8%). See Appendix F.

RQ 2: Self-Reported CA and CS

Of the 60 Spearman's rank order correlations computed, *all* but three showed a positive, significant relationship between CA and CS. For presentations, neither shame item was significantly related to the anxiety item "*I look at other people.*" Additionally, the item "*I look around the room*" was not significantly related to embarrassment ("*I get embarrassed if I make mistakes when I read out loud*"). See Appendix G.

RQ 3: Student and Teacher Reports of CA

See Figure H1 (Appendix H) for a description of the teacher report items that were compared with student' self-report. Of the 40 computations, two were statistically significant, and both were symptoms of anxiety experienced during games. There was a significant, negative correlation between teachers' identification of physical signs of anxiety and students' self-report that their hand shakes during games, $r_s(70) = -.24$, $p = .04$. Teachers' ratings of worry *("whether they are not going to do their best, what others will think about the outcome"*) was negatively related to students' self-report (*"I worry about what my teacher will say if I get a low score"*), $r_s(70) = -27$, $p = .02$. All other Spearman's rank correlations were nonsignificant, $p > .05$. See Appendix I.

RQ 4: Sensitivity and Specificity

We selected sensitivity and specificity analyses to evaluate the accuracy of teachers' ratings. First, to prepare the dataset for this analysis, we recoded the data dichotomously (*Never* or *Rarely* = 0; *Sometimes* or *Often* = 1). Using SPSS, we ran crosstabulations to identify the following:

True positives (i.e., the teacher response is 1 and the student's response is 1)

True negatives (i.e., teacher response = 0; student response = 0)

False negative (i.e., teacher response = 0; student response = 1)

False positive (i.e., teacher response = 1; student response = 0)

Next, we created new variables in SPSS to compare each student and teacher's response Next, using Microsoft Excel (and checking with hand calculations) we calculated sensitivity and specificity using the following formulas:

$$\text{Sensitivity} = \text{true positive} / (\text{true positive} + \text{false negative})$$

$$\text{Specificity} = \text{true negative} / (\text{true negative} + \text{false positive}) \quad (1)$$

Sensitivity scores ranged from 0% to 55%, results that suggest that the probability of correctly identifying symptoms of anxiety among students fell from zero to just over chance. Specificity ranged from 22% to 94%. These specificity scores suggest that the probability of teachers identifying the absence of anxiety (i.e., either *never* or *rarely* experiencing a given symptom of anxiety) ranged from almost one-quarter to nearly perfect. Taken together, these results suggest that the participating teachers experienced difficulties with correctly identifying students who were *sometimes* or *often* experiencing symptoms of CA. Additionally, the teacher participants were relatively more accurate in identifying the absence of CA. Of note, the highest specificity scores across classroom assessments (i.e., tests, games, questions, presentations) were obtained for expressed worries. See Appendix J.

RQ 5: Self-Reported Appraisals, CS, and CA

RQ 5a: Self-Reported Appraisals and Shame. To facilitate analysis, we examined positive and negative appraisals separately. Out of the 112 Spearman's rank correlations

conducted for RQ5a, most yielded significant results at either $p < .05$ or $p < .001$. Specifically, all negative self-appraisals were statistically significant and indicated that higher endorsement with negative appraisals was associated with higher shame. All positive appraisals were negatively related to each shame item, however, four were nonsignificant. The positive appraisal "*I notice more things that I do right than what I do wrong"* was not significantly related to the shame item "*I feel ashamed"* for tests, games, and presentations ($p > .05$). The same positive appraisal "*I notice more things that I do right than what I do wrong"* was also not significantly related to the presentation item *"I get embarrassed if I make mistakes when I read out loud."* See Appendix K.

RQ 5b: Self-Reported Appraisals and Test Anxiety. We used logistic regression to evaluate the ability of appraisals to predict test anxiety. The criterion variable (i.e., test anxiety) was measured using the item "I have test anxiety" measured on a 4-point ordinal scale (really unlike me/somewhat unlike me/somewhat like me/really like me). Further, we recoded test anxiety dichotomously ("really unlike me"; "somewhat unlike me" = 0; "somewhat like me"; "really like me" = 1). The predictor variables were the 14 self-appraisals previously described. To evaluate additional characteristics that might influence the ability of appraisals to predict test anxiety, we added grade, gender, and gifted/non-gifted program into the regression model. We recoded gender (0 = male; 1 = female) and gifted programming (non-gifted program = 0; gifted program = 1). We also added the two test shame items "I feel embarrassed when I don't know the answers" and "I feel ashamed" into the model.

Initial Checks. A total of 177 cases were included in the regression model due to casewise deletion for 27 cases (13.2% of the dataset). In addition, we examined crosstabulations of the predictor and outcome variables and found that test anxiety was not perfectly predicted (or not predicted) by any of the predictors in the logistic regression model. However, some cells for

students' grades were populated by a small number of participants for disagreement that test anxiety was really unlike them/unlike them. For example, five students in each of grade 4 and 6 endorsed disagreement with test anxiety. See Appendix L for crosstabulations.

Assumption Checks. No predictors exhibited substantial correlations (i.e., $r < 0.9$). Correlations are displayed in Appendix M. The Variance Inflation Factor (VIF) was well below 10 for each predictor. Tolerance was well above the criterion value of 0.2 for each predictor. The results of correlations, VIF, and tolerance indicated that multicollinearity was low and was expected to pose a negligible validity threat.

Residual statistics were checked for influential cases and outliers. Only one value for Cook's distance was higher than one (1.06). All DF_{Beta} values were less than an absolute value of 1. Six standardized residuals exceeded an absolute value of two, which comprised 3.39% of the dataset. Taken together, there was agreement that the data was absent of influential cases and outliers.

Model Building. In terms of previous research findings, little is known about the relationship of the predictors to test anxiety. Therefore, we selected a direct approach to model building and added all predictors into the logistic regression model simultaneously.

Main Analysis of Logistic Regression. Comparing the constant-only model with the full model revealed a significant probability value, X^2 (23) = 56.21, $p < .001$ indicating that the predictors, as a set, significantly predicted test anxiety. The p-value was smaller than .05, a result that indicates that the null hypothesis (i.e., that the predictors have no effects on the outcome variable) should be rejected. Thus, the model as a whole fit significantly better than an empty model (i.e., without any predictors). Using Cox & Snell's Pseudo R^2, the logistic model explained 27% of the variance in test anxiety.

Two predictors were statistically significant. The appraisal "*I never feel good about my work"* (M9) significantly predicted test anxiety, B = .80, OR (Exp(B)) = 2.22, p = .003. Agreement with this statement increased the odds of endorsing test anxiety (i.e., every one ordinal unit of agreement increased the odds of reporting test anxiety by 2.22). Gender also significantly predicted test anxiety, B = 1.10, OR (Exp(B)) = 3.01, p = .01. Female students were 3.01 times more likely to endorse test anxiety than male students. Appendix N for the results of logistic regression analysis. Analysis of the classification table revealed 32 true negatives and 100 true positives, resulting in a 74.6% accuracy rate.

Discussion

RQ 1: CA and CS by Assessment Type

RQ 1a: Self-Reported CA by Assessment Type

More than 1 in 3 students reported *often* experiencing CA during tests, including worries and off-task/avoidance behaviours. Over 50% of students reported *sometimes* or *often* experiencing cognitive interference during tests. These results align with previous research (Thomas et al., 2018; Putwain & Daly, 2014). Similar to test anxiety, over 1 in 3 students endorsed *often* experiencing symptoms of anxiety during presentations.

Most students reported *never* or *rarely* experiencing symptoms of anxiety during games. Given that educational games such as Kahoot *often* include teacher-developed questions, it is interesting that the frequency of anxiety was consistently lower than that reported during questions. This finding aligns with Wang and Tahir (2020), suggesting Kahoot's potential to promote positive emotions in the learning process. In addition to promoting enjoyment, games such as Kahoot provide opportunities for students to use aliases rather than their actual names (Wang & Tahir, 2020). This anonymity may reduce CA in comparison to assessments where

aliases are not permitted. That said, nearly half of students reported symptoms of anxiety during educational games (*sometimes* or *often*). This result suggests that anxiety during games may impact many students, even if the proportion is relatively smaller than in other assessments.

As discussed in Chapter Two, we identified several CA profiles after comparing summed scores. Some students found one or more assessment type to be more anxiety-provoking than the rest, while other students' scores were similar across assessments. For instance, some students' CA scores were highest for presentations, while other students found tests and questions to be similar. These results suggest that there are individual differences in how students respond to these assessment contexts. Some students may experience anxiety across assessment types, or relatively lower levels of anxiety, while others may feel more confident in some assessment contexts than others. As Chapman and colleagues (2020) wrote, situations where students *perceive* that others are thinking critically about them can lead to anxiety. Along these lines, some students may be more sensitive to social comparisons (Ruble et al., 1976; Suls et al., 2002).

RQ 1b: Self-Reported CS by Assessment Type

More students reported experiencing shame during presentations and questions than in tests. Perhaps this difference in shame may be related to the public nature of these assessments. For instance, errors made on a test are often private, and the teacher's feedback is usually received at arm's length. Conversely, errors made during a presentation or when answering a question are often public, with teacher and peers present, and verbal and/or nonverbal feedback may be provided by multiple observers. These results potentially align with Ferguson and colleagues (1999) who wrote that negative social situations can induce shame. Assessments conducted with peers present may trigger social comparisons that lead to maladaptive shame and academic disengagement Johnson, 2012; Turner & Schallert, 2001; Wolfe, 2017).

RQ 2: Self-Reported CA and CS

Shame was positively and significantly related to symptoms of anxiety across all subscales (tests, games, presentations, questions). As students endorsed more frequently experiencing shame, they endorsed more frequently experiencing anxiety. These results are similar to Santos and colleagues (2020) and Tang (2019) who studied test anxiety and shame among adolescent and undergraduate students.

RQ 3: Student and Teacher Reports of CA

Teacher and student ratings were non-significantly related, with the exception of two negatively related symptoms experienced during games. These results speak to the difficulty of identifying signs of anxiety and shame, which is unsurprising, given that anxiety and shame are internal emotional experiences. Additionally, these results are similar to previous findings (e.g., Cunningham & Suldo, 2014; Gelley, 2014; Neil & Smith, 2017). During classroom assessments, teachers are responsible for juggling multiple tasks (e.g., administering assessments, recording students' responses, monitoring academic integrity, managing behaviour). The classroom context likely presents challenges to identifying signs of anxiety and shame while juggling so many different tasks, and as class sizes and teachers' responsibilities continue to grow, it may become increasingly difficult to notice the subtle signs of anxiety and shame.

RQ 4: Sensitivity and Specificity

Although detecting anxiety appeared difficult in the present study, sensitivity scores were highest for expressed worries in comparison to the other items (i.e., off-task behaviours, physical signs of anxiety, signs of shame). It is possible that verbalizations of anxiety are more detectable than the subtle signs of anxiety such as a shaking hand during an assessment, especially in a large class of students. This is consistent with Neil and Smith (2017) who found that overt signs

of anxiety are more detectable than covert indicators. Again, the variability that we observed in teachers' ability to correctly identify anxiety is similar to previous research (Cunningham & Suldo, 2014; Gelley, 2014; Neil & Smith, 2017).

RQ 5: Self-Reported Appraisals, CS, and CA

RQ 5a: Appraisals and CS

The more students identified with negative self-appraisals, they also reported experiencing shame more frequently. Similarly, the more students endorsed positive self-appraisals, they reported experiencing shame less frequently. These findings are similar to previous research linking perceived failure with shame (Pekrun et al., 2002; Pekrun, 2006, Pekrun et al., 2007).

RQ 5b: Appraisals and CA

Students' identification with self-appraisals was related to their identification with test anxiety. Specifically, increased agreement with the appraisal "*I never feel good about my work"* increased the odds of test anxiety by 2.22. Additionally, female students were 3.01 times more likely to endorse test anxiety than male students. All other variables in our logistic regression model did not significantly predict test anxiety, including self-appraisals, shame, grade, and giftedness. These results align with previous findings that female students tend to report test anxiety more than male students (von der Embse et al., 2018). Yet, gendered norms may prevent male students from sharing that they experience difficult emotions such as test anxiety. In addition, it is surprising that more appraisals did not significantly predict test anxiety, since some researchers have found that perfectionistic concerns have been consistently related to test anxiety (Burcaş & Creţu, 2020).

Nonetheless, the logistic regression model explained only 27% of the probability of test

anxiety, and this number may have been inflated by the large number of predictors entered into the model. Nevertheless, a model that explains only 27% of anxiety also suggests that anxiety is a complex emotion that can be influenced by many different variables. Furthermore, small cell populations (e.g., grade, giftedness) may have impacted the ability of these variables to predict test anxiety.

Limitations & Future Directions

By design, the relationships investigated in the present study do not denote causation. Additionally, specific to R3 and R4, the results from the small sample of nine teachers may not represent all teachers. Furthermore, the results are from the self-report of a convenience sample and may be impacted by social desirability, cohort effects, and other contextual factors (e.g., the timing of data collection). Despite these limitations, this study contributes to understandings of the potential pervasiveness of CA, CS, and the difficulties with identifying the subtle signs that a student might be struggling with these emotions. Self-appraisals after making mistakes and/or not knowing the correct answer were related to CS. Shame can be a risk factor for many social-emotional and behavioural difficulties (Ang & Khoo, 2004; Bennet et al., 2010; Stuewig et al., 2015). Our findings also suggest that CS may be a risk factor for CA. That said, future research is needed to evaluate the generalizability of these findings. Also of note, the results of this study may suggest the potential value of interventions that address shame and self-appraisals.

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CHAPTER 4: GENERAL DISCUSSION

Summary of Findings

CA Measure

By adapting extant items, we developed a measure of classroom assessment anxiety (MCA) that evaluates symptoms of CA in four contexts (i.e., tests, games, presentations, and questions). Although this measure does not include all classroom assessments, they represent many assessments conducted by teachers. The MCA exhibited strong psychometric properties including supporting a 4-factor model of CA that aligns with previous research (i.e., Bieleke et al., 2021; Putwain et al., 2020; Wren & Benson, 2004). The results of this study suggest that, with further research and refinement, it may become a useful tool to understand students' experiences of CA.

Investigating CA

All assessments in our study (i.e., tests, games, presentations, questions) were sources of anxiety and shame for many students. We found that there was variability in the types of symptoms that students endorsed, and these differences may be consistent with differences between audience-absent (e.g., tests) and audience-present (i.e., games, presentations, questions). An alternative possibility, however, may be that each assessment method produces a unique profile of anxiety symptoms. Further research may help to disentangle anxiety that is experienced due to task performance and anxiety experienced due to other aspects of the assessment context.

Shame and anxiety were positively and significantly related across assessment types. This finding aligns with previous research that showed positive relationships between test anxiety and shame for adolescent (Santos et. al, 2020) and undergraduate students (Tang, 2019). It is possible

that shame and test anxiety, and other forms of CA, begin early in the life course and before a student begins high-stakes testing (e.g., provincial exams). That being said, the life course trajectory of CA and shame has not yet been substantiated with research.

Teachers' Identification of CA

Our findings may speak to the difficulty of identifying symptoms of anxiety and shame among children, which is consistent with similar research (e.g., Cunningham & Suldo, 2014; Gelley, 2014; Neil & Smith, 2017). Moreover, as class sizes continue to grow, and teachers are tasked with increasing responsibilities, noticing the subtle symptoms of anxiety may become progressively more difficult. As noted by Neil and Smith (2017), self-report measures may be an effective method of measuring anxiety among children. Alternatively (or additionally), implementing anxiety supports within a UDL framework may be an effective way to help students cope with and manage the symptoms of anxiety (Antoniuk & Cormier, 2021).

Self-Appraisals After Making Mistakes

Self-Appraisals and Shame

Students' self-appraisals after errors or not knowing the correct answer were consistently and significantly related with the frequency of embarrassment and shame experienced during assessments. This trend remained consistent for the majority of the self-appraisals that we studied (13 out of 14 appraisals) and for all assessment types (i.e., tests, games, presentations, questions).

Self-Appraisals and Test Anxiety

Using separate Spearman's rank order correlations, we found that students' endorsements with self-appraisals were significantly related with identification with test anxiety ("*I have test anxiety*"). When all self-appraisals were entered into the logistic regression model, along with

shame, grade, and giftedness, most of the self-appraisals non-significantly predicted test anxiety. Interestingly, we found that increased agreement with the appraisal "*I never feel good about my work"* increased the odds of test anxiety by 2.22. Additionally, female students were 3.01 times more likely to endorse test anxiety than male students. That said, the logistic regression model explained only 27% of the probability of self-reported test anxiety, and this number may have been inflated by the large number of predictors entered into the regression model.

Perhaps the collective results of Spearman's rho and logistic regression analysis suggest that self-appraisals and gender may be risk factors for test anxiety. In addition, the consistency of which self-appraisals were related to test anxiety suggests that this may be a concern for many students, despite the contrasting logistic regression results. Nonetheless, neither statistical method is a measure of causation. Future research may be helpful in investigating these differences, for example, investigating mediating and moderating variables within structural equation modelling.

Intervention Recommendations

Many students self-reported symptoms of CA including physiological sensations, worries, cognitive interference, and off-task/avoidance behaviours. As such, interventions that target these symptom clusters may help to reduce CA. In addition, since shame and self-appraisals may be related to symptoms of anxiety, students may benefit from interventions that aim to reduce maladaptive shame and increase positive self-appraisals. At the present time, there is no gold standard intervention for addressing test anxiety among young children (Robson et al., 2023). However, Robson and colleagues (2023) noted that the most successful interventions for school-aged children include Cognitive-Behavioural Therapy, breathing exercises, and guided meditation exercises. Interventions based on addressing perfectionistic thinking, developing

growth mindset, and increasing self-compassion can likely be interwoven with Robson and colleagues' (2023) intervention recommendations. As well, in my experience as a mental health therapist, I have found integrating brief relaxation techniques into children's daily routines to be an effective way of scaffolding coping skills. That way, when children are familiar with a particular coping skill, they may be more likely to use it when they need to. Regular practice may also help to prevent the skill from being associated with stressful events, which may increase anxiety.

Supporting Teachers

Strategies

To apply Robson and colleagues (2023), structured breathing and guided relaxation activities could be incorporated prior to classroom assessments and during assessments as needed. As noted above, these strategies could be integrated into regular classroom routines to build familiarity, and also used around classroom assessments. To avoid singling out students, it might be helpful to engage the entire class in these strategies (Barnes et al., 2008). In addition, to address worries about critical evaluations, teachers might find it helpful to explain the purpose of assessments as providing data about learning (i.e., rather than judging a student). Teachers might also find it helpful to coach positive ways that students can support each other during audience-present assessments (e.g., CASEL, n.d.).

Many children are adept observational learners (Bandura, 1969). Modelling social-emotional skills such as empathetic peer support, self-compassion after making errors, and coping with challenging emotions can further reinforce these skills. Additionally, strategies for coping with CA and CS can be integrated into social-emotional learning (CASEL, n.d., Siegel & Bryson, 2011). Moreover, students may find exploring a diverse repertoire of supports to be

helpful in building their own personalized toolbox of supports.

Some students who experience CA may exhibit off-task/avoidance behaviours that may be perceived as distracted or disrespectful behaviours. It may be helpful to frame interpretations of students' behaviour as hypotheses rather than making potentially-labelling conclusions. Certainly, these behaviours overlap with the symptoms of other mental disorders – I strongly recommend that teachers whose students are exhibiting challenging behaviours collaborate with their school psychologist to find the most appropriate supports.

Assessment Planning and Adaptations

Students may benefit from exposure to manageable stressors, and small amounts of anxiety can enhance performance (Hanoch & Vitouch, 2004). To apply Ng and colleagues (2012), the coping skills acquired through assessments can support individuals as they navigate the multitude of evaluations inevitable in future academic and employment settings. However, severe CA may have deleterious effects on school attendance and engagement. For example, in clinical practise, I have encountered several students grappling with presentation anxiety. Consequently, some avoided attending school on presentation days altogether or delegated the verbal presentation to other group members. While the latter is more desirable than school refusal, this adaptation limits opportunities for students to expand their presentation skills.

Scaffolding responses to assessment tasks, including teaching and supporting coping skills, may have more long-term benefits than accommodating avoidance behaviours around CA. Scaffolding refers to student-centered supports for accomplishing academic tasks (Kusmaryono et al., 2020). That said, it is important to note that overarousal interferes with focus and concentration (Easterbrook, 1959; Hanoch & Vitouch, 2004). Exposure to extreme stress and/or long-term stress can have negative physical and social-emotional consequences (Siegel, 2012). It

is crucial to be mindful of not overwhelming students who are already facing significant stressors, as pushing them beyond their coping capacity can be counterproductive – and possibly harmful.

Assessment Data

Educators who implement a variety of classroom assessments may find that some students exhibit a diverse profile of scores across assessments. For instance, they might attain a high score on tests but struggle during presentations, or vice versa. Although this diverse score profile might indicate an area of strength, another possibility may be that symptoms of anxiety are disrupting that student's ability to demonstrate their knowledge in that assessment task. Teachers might find that checking in with the student could be a helpful way to understand their experiences, and, if appropriate, coordinating student-specific supports. Similarly, symptoms of anxiety that severely impact achievement can present as a learning difficulty.

Methodological Reflections

Teacher Participation

Teacher participation for this study was fairly low. This may relate to contextual factors, such as teachers' busy schedules and the general timing of this study (around the COVID-19 pandemic). Additionally, a study that compares teachers' ratings with students' self-report may cause evaluation anxiety despite being an anonymous task, or raise concerns about the usefulness of the results. If I conduct similar research in the future, I think that it would run more effectively by collaborating with teachers to develop a study that directly meets teachers' needs and is perceived as a useful investment of their time.

For participating teachers, the number of student ratings varied, contingent on the level of student participation. Some teachers expressed concerns about this variability, and although I

attempted to address this concern collaboratively, I believe that this concern could be addressed in the study planning stages. For future research projects using a similar method, I would suggest adding an item into the letter of information/consent asking the participating teacher to specify the maximum number of protocols they would like to receive. This addition would enable the participating teachers to communicate their expectations up-front. An alternative approach might be to set a maximum number of student ratings per teacher at the onset of the study (e.g., maximum 5–10 student ratings) and aim to recruit a larger number of teachers. This approach might increase the generalizability of the results by gathering data from more teachers.

Data Analysis With R

Preceding this study, and for the majority of its duration, I encountered challenges with executing basic R commands. However, through a prolonged and incremental learning process, I achieved sufficient working knowledge to conduct the CFA in the first study. A more streamlined analytical approach may exist compared to the rather piecemeal method used in the first and second studies. But, at the time of writing this dissertation, my working knowledge had not yet reached that point. That said, I am motivated to learn more about R's capabilities and developing my knowledge in this area.

Future Research

Replicating this study with different cohorts and geographical regions would help to test the generalizability of the results. In addition, latent profile analysis might be a helpful way to investigate the CA profiles that we observed in this study. Relatedly, before using the MCA for practical applications such as identifying at-risk and clinically significant students, further research is required. As Robson and colleagues (2023) recommended, intervention studies are needed to identify the most effective ways of supporting students who are struggling with test

anxiety. This may also be true for students who are struggling with CA.

Plan for Future Research

I intend to conduct two intervention research studies based on the results of this dissertation research – a manualized group intervention led by clinicians, and an in-class intervention led by teachers. In addition, I plan to replicate parts of this dissertation to evaluate the generalizability of some of the key findings. I hope to further improve the MCA and eventually release it, along with intervention recommendations, for use in classroom settings. More broadly, I intend to continue investigating emotional and behaviour regulation and how these relate to learning, attention, and memory.

Conclusions

In this dissertation research, we developed a measure that has the potential to help young students reflect on their thoughts, feelings, and behaviours related to classroom assessment anxiety, and to help them express their experiences to adults who can provide scaffolding and support. The results of this study also contribute to understanding of anxiety and shame experienced by students across assessment types.

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SUPPLEMENTAL INFORMATION

Appendix B

Table B1

Test Anxiety Subscale ("When I am writing a test")

Physical Sensations
T4. my hand shakes.
T13. my heart beats quickly.
T17. my belly feels upset.
Worry
T1. I worry about what my parents will say if I get a bad grade.
T5. I worry about what my grade will be.
T8. I worry about what my teacher will say if I get a bad grade.
T12. I worry about what my friends will say if I get a bad grade.
T16. I worry that I will not do my best.
Cognitive Interference
T2. It is hard to remember the answers.
T9. It is hard to concentrate.
Off-task/Avoidance
T3. I get so nervous that I wish I could just skip it.
T10. I am so nervous that I rush to get it done.
T11. I look around the room.
T15. I play with things that are nearby (e.g., pencil, paper, clothing).

Table B2

Game Anxiety Subscale ("When I am playing a game in class")

Physical Sensations
G4. my hand shakes.
G13. my heart beats quickly.
G17. my belly feels upset.
Worry
G1. I worry about what my parents will say if I get a low score.
G5. I worry about what my score will be.
G8. I worry about what my teacher will say if I get a low score.
G12. I worry about what my friends will say if I get a low score.
G16. I worry that I will not do my best.
Cognitive Interference
G2. It is hard to remember the answers.
G9. It is hard to concentrate.
Off-task/Avoidance
G3. I get so nervous that I wish I could just skip it.
G10. I am so nervous that I rush to get it done.
G11. I look around the room.
G15. I play with things that are nearby (e.g., pencil, paper, clothing).

Table B3

Question Anxiety Subscale ("When my teacher asks me a question in class")

Physical Sensations
Q4. my hand shakes.
Q13. my heart beats quickly.
Q17. my belly feels upset.
Worry
Q1. I worry about what my parents will say if I answer incorrectly.
Q5. I worry about giving the wrong answer.
Q8. I worry about what my teacher will say if I answer incorrectly.
Q12. I worry about what my friends will say if I answer incorrectly.
Q16. I worry that I will not do my best.
Cognitive Interference
Q2. It is hard to remember the answers.
Q9. It is hard to concentrate.
Off-task/Avoidance
Q3. I get so nervous that I wish I could just skip it.
Q10. I am so nervous that I rush to get it done.
Q11. I look around the room.
Q15. I play with things that are nearby (e.g., pencil, paper, clothing).

Table B4

Presentation Anxiety Subscale ("When I am delivering a presentation in class")

Physical Sensations
P4. my hand shakes.
P13. my heart beats quickly.
P17. my belly feels upset.
Worry
P1. I worry about what my parents will say if it goes badly.
P5. I worry about what my grade will be.
P8. I worry about what my teacher will say if it goes badly.
P12. I worry about what my friends will say if it goes badly.
P16. I worry that I will not do my best.
Cognitive Interference
P2. It is hard to remember what to say.
P9. It is hard to concentrate.
Off-task/Avoidance
P3. I get so nervous that I wish I could just skip it.
P10. I am so nervous that I rush to get it done.
P11. I look around the room.
P15. I play with things that are nearby (e.g., pencil, paper, clothing).

Appendix C

Table C1

Number of Male and Female Students by Age

Grade	*N*	Females	Males	M_{Age} (SD)
3	34	19	15	8.04 (.31)
4	22	14	8	9.09 (.29)
5	30	19	11	9.97 (.18)
6	29	21	8	10.97 (.19)
7	46	24	22	12.07 (.33)
8	43	25	18	13.05 (.31)

Note. $N = 204$

Table C2

Ethnic and Cultural Origins Reported by Caregivers

	N	% of 204
African	20	9.80
Asian	62	30.39
Canadian	99	48.53
Caribbean	1	0.49
Caucasian	1	0.49
European	10	4.90
Filipino	2	0.98
Latin, Central, South American	2	0.98
Metis	3	1.47
Middle East/Arab	1	0.49
Muslim	3	1.47
South Asian (e.g., East Indian, Nepal, Pakistani)	18	8.82
Missing	5	2.45

Note. Totals are higher than 100% because some caregivers ($N = 28$) reported multiple ethnicities for their children.

Appendix D

Table D1

Descriptive Statistics for the Test Anxiety Subscale

Item	Mean (SD)	Coefficient α if Item Deleted
T1	2.95 (1.05)	.863
T2	2.76 (.80)	.866
T3	2.54 (1.07	.861
T3	2.03 (1.11)	.862
T5	3.29 (.88)	.860
T8	2.24 (1.14)	.862
T9	2.62 (.99)	.866
T10	2.16 (1.02)	.863
T11	3.00 (1.05)	.869
T12	1.94 (1.11)	.864
T13	2.30 (1.07)	.859
T15	2.75 (1.13)	.865
T16	2.81 (1.09)	.859
T17	1.96 (1.08)	.862

Note. N = 189 (15 cases were excluded using listwise deletion). Coefficient α = .872.

Items were scored on a 4-point rating scale, with higher values indicating greater endorsement of the item.

Table D2

Descriptive Statistics for the Game Anxiety Subscale

Item	*M* (*SD*)	Coefficient α if Item Deleted
G1	1.52 (.92)	.855
G2	2.39 (.92)	.859
G3	1.52 (.86)	.851
G4	1.55 (.93)	.856
G5	2.23 (1.03)	.855
G8	1.69 (.99)	.853
G9	2.11 (1.09)	.860
G10	1.85 (1.08)	.859
G11	2.62 (1.10)	.862
G12	1.94 (1.09)	.858
G13	1.93 (1.07)	.858
G15	2.11 (1.15)	.861
G16	2.12 (1.01)	.853
G17	1.46 (.87)	.858

Note. N = 185 (19 cases were excluded using listwise deletion). Coefficient α = .866. Items were scored on a 4-point rating scale, with higher values indicating greater endorsement of the item.

Table D3

Descriptive Statistics for the Presentation Anxiety Subscale

Item	*M* (*SD*)	Coefficient α if Item Deleted
P1	2.54 (1.18)	.885
P2	2.85 (1.03)	.884
P3	2.91 (1.19)	.884
P4	2.42 (1.25)	.888
P5	3.02 (1.06)	.885
P8	2.45 (1.16)	.881
P9	2.63 (1.17)	.884
P10	2.66 (1.19)	.886
P11	2.95 (1.08)	.898
P12	2.21 (1.15)	.886
P13	2.88 (1.18)	.888
P15	2.29 (1.26)	.890
P16	2.92 (1.13)	.882
P17	2.06 (1.24)	.890

Notes. N = 197 (7 cases were excluded using listwise deletion). Coefficient α = .894. Items were scored on a 4-point rating scale, with higher values indicating greater endorsement of the item.

Table D4

Descriptive Statistics for the Question Anxiety Subscale

Item	*M* (*SD*)	Coefficient α if Item Deleted
Q1	1.57 (.95)	.910
Q2	2.48 (.93)	.907
Q3	2.32 (1.19)	.899
Q4	1.91 (1.18)	.899
Q5	3.13 (1.00)	.905
Q8	2.58 (1.18)	.903
Q9	2.27 (1.14)	.904
Q10	2.03 (1.06)	.903
Q11	2.42 (1.09)	.907
Q12	2.22 (1.19)	.901
Q13	2.22 (1.17)	.900
Q15	2.27 (1.17)	.908
Q16	2.35 (1.12)	.902
Q17	1.72 (1.11)	.903

Notes. N = 190 (14 cases were excluded using listwise deletion). Coefficient α = .910. Items were scored on a 4-point rating scale, with higher values indicating greater endorsement of the item.

Table D5

Inter-Item Correlations for the Test Anxiety Subscale

	T1	T2	T3	T4	T5	T8	T9	T10	T11	T12	T13	T15	T16	T17
T1	-													
T2	.30	-												
T3	.35	.40	-											
T4	.26	.32	.39	-										
T5	.52	.26	.35	.36	-									
T8	.51	.35	.28	.35	.46	-								
T9	.16	.43	.33	.28	.35	.22	-							
T10	.23	.36	.46	.32	.32	.19	.40	-						
T11	.26	.15	.20	.18	.24	.24	.26	.23	-					
T12	.36	.24	.34	.23	.43	.50	.21	.29	.16	-				
T13	.35	.23	.43	.55	.41	.35	.24	.31	.34	.37	-			
T15	.22	.20	.22	.37	.25	.28	.31	.35	.60	.25	.37	-		
T16	.50	.41	.42	.37	.54	.40	.31	.40	.22	.36	.40	.27	-	
T17	.31	.26	.45	.41	.28	.37	.32	.41	.26	.33	.41	.24	.34	-

Note. $N = 189$.

Table D6

Inter-Item Correlations for the Game Anxiety Subscale

	G1	G2	G3	G4	G5	G8	G9	G10	G11	G12	G13	G15	G16	G17
G1	-													
G2	.34	-												
G3	.64	.39	-											
G4	.32	.26	.37	-										
G5	.38	.23	.41	.35	-									
G8	.54	.29	.45	.35	.35	-								
G9	.20	.37	.31	.28	.26	.29	-							
G10	.33	.17	.45	.28	.31	.29	.33	-						
G11	.20	.29	.28	.28	.30	.31	.28	.24	-					
G12	.41	.33	.44	.25	.41	.41	.27	.33	.08	-				
G13	.27	.33	.36	.54	.30	.29	.22	.29	.28	.29	-			
G15	.26	.24	.30	.31	.28	.38	.31	.21	.42	.18	.30	-		
G16	.43	.39	.43	.29	.51	.39	.31	.37	.29	.44	.27	.26	-	
G17	.26	.20	.33	.48	.31	.37	.37	.29	.24	.28	.33	.26	.28	-

Note. $N = 185$.

Table D7

Inter-Item Correlations for the Presentation Anxiety Subscale

	P1	P2	P3	P4	P5	P8	P9	P10	P11	P12	P13	P15	P16	P17
P1	-													
P2	.51	-												
P3	.44	.62	-											
P4	.24	.36	.39	-										
P5	.60	.50	.34	.34	-									
P8	.60	.51	.44	.37	.60	-								
P9	.37	.48	.48	.37	.34	.44	-							
P10	.37	.48	.55	.41	.42	.42	.56	-						
P11	.23	.24	.13	.17	.25	.23	.25	.16	-					
P12	.52	.35	.43	.33	.43	.59	.36	.33	.17	-				
P13	.21	.33	.39	.59	.36	.36	.34	.33	.16	.36	-			
P15	.25	.30	.32	.35	.30	.38	.44	.36	.27	.30	.29	-		
P16	.49	.54	.47	.32	.54	.56	.51	.44	.22	.50	.41	.39	-	
P17	.34	.27	.31	.42	.26	.42	.37	.23	.13	.37	.50	.33	.31	-

Note. $N = 197$.

Table D8

Inter-Item Correlations for the Question Anxiety Subscale

	Q1	Q2	Q3	Q4	Q5	Q8	Q9	Q10	Q11	Q12	Q13	Q15	Q16	Q17
Q1	-													
Q2	.20	-												
Q3	.30	.47	-											
Q4	.30	.43	.63	-										
Q5	.25	.30	.50	.37	-									
Q8	.36	.34	.51	.36	.58	-								
Q9	.34	.49	.48	.54	.39	.37	-							
Q10	.24	.40	.55	.51	.39	.40	.45	-						
Q11	.29	.36	.37	.44	.29	.29	.40	.33	-					
Q12	.44	.32	.55	.55	.51	.51	.40	.47	.36	-				
Q13	.26	.40	.62	**.70**	.44	.44	.39	.54	.40	.51	-			
Q15	.29	.34	.41	.44	.30	.30	.37	.30	.43	.27	.38	-		
Q16	.38	.40	.59	.47	.47	.47	.36	.51	.38	.56	.43	.31	-	
Q17	.30	.31	.44	.62	.34	.34	.41	.45	.36	.49	.60	.38	.41	-

Note. $N = 190$. Items in bold $\geq .07$.

Table D9

Descriptive Statistics for Assessment Anxiety Items

Item							Skewness			Kurtosis		
	N	Range	Min.	Max.	Mean	SD	Statistic	SE	SI	Statistic	SE	KI
T1	204	3	1	4	2.94	1.05	-0.64	0.170	**-3.78**	-0.79	0.339	-2.34
T2	202	3	1	4	2.76	0.79	-0.27	0.171	-1.59	-0.30	0.341	-0.87
T3	203	3	1	4	2.54	1.06	-0.11	0.171	-0.64	-1.21	0.340	**-3.57**
T4	202	3	1	4	2.01	1.11	0.56	0.171	3.27	-1.16	0.341	**-3.40**
T5	204	3	1	4	3.25	0.91	-0.98	0.170	**-5.77**	-0.01	0.339	-0.03
T6	204	3	1	4	2.42	1.15	0.07	0.170	0.39	-1.43	0.339	**-4.22**
T7	203	3	1	4	2.16	1.07	0.41	0.171	2.39	-1.13	0.340	**-3.33**
T8	202	3	1	4	2.25	1.14	0.28	0.171	1.64	-1.35	0.341	**-3.98**
T9	203	3	1	4	2.63	0.99	-0.08	0.171	-0.45	-1.05	0.340	-3.10
T10	200	3	1	4	2.18	1.03	0.45	0.172	2.63	-0.93	0.342	-2.73
T11	203	3	1	4	3.00	1.04	-0.70	0.171	**-4.08**	-0.72	0.340	-2.13
T12	202	3	1	4	1.93	1.11	0.77	0.171	**4.51**	-0.86	0.341	-2.54
T13	204	3	1	4	2.31	1.07	0.21	0.170	1.26	-1.20	0.339	**-3.55**
T14	201	3	1	4	2.06	1.07	0.49	0.172	2.87	-1.10	0.341	-3.21
T15	204	3	1	4	2.75	1.13	-0.37	0.170	-2.15	-1.27	0.339	**-3.74**
T16	203	3	1	4	2.83	1.08	-0.45	0.171	-2.66	-1.07	0.340	-3.16
T17	203	3	1	4	1.96	1.09	0.72	0.171	**4.22**	-0.88	0.340	-2.58
G1	203	3	1	4	1.55	0.95	1.64	0.171	**9.59**	1.43	0.340	**4.21**
G2	201	3	1	4	2.37	0.94	0.00	0.172	0.02	-0.92	0.341	-2.69

G3	202	3	1	4	1.53	0.85	1.47	0.171	**8.58**	1.11	0.341	3.25
G4	203	3	1	4	1.57	0.93	1.47	0.171	**8.63**	0.93	0.340	2.74
G5	196	3	1	4	2.28	1.06	0.24	0.174	1.37	-1.18	0.346	**-3.43**
G6	203	3	1	4	2.32	1.14	0.20	0.171	1.16	-1.38	0.340	**-4.07**
G7	202	3	1	4	2.43	1.13	0.04	0.171	0.24	-1.40	0.341	**-4.10**
G8	203	3	1	4	1.73	1.02	1.12	0.171	**6.57**	-0.08	0.340	-0.23
G9	202	3	1	4	2.13	1.09	0.44	0.171	2.57	-1.16	0.341	**-3.39**
G10	202	3	1	4	1.91	1.11	0.78	0.171	**4.58**	-0.88	0.341	-2.57
G11	197	3	1	4	2.66	1.09	-0.23	0.173	-1.31	-1.25	0.345	**-3.62**
G12	203	3	1	4	1.98	1.10	0.69	0.171	**4.02**	-0.95	0.340	-2.81
G13	203	3	1	4	1.95	1.07	0.69	0.171	**4.02**	-0.91	0.340	-2.68
G14	202	3	1	4	1.72	0.98	1.13	0.171	**6.60**	0.02	0.341	0.07
G15	202	3	1	4	2.12	1.17	0.48	0.171	2.79	-1.30	0.341	**-3.81**
G16	202	3	1	4	2.13	1.01	0.43	0.171	2.51	-0.95	0.341	-2.78
G17	202	3	1	4	1.47	0.89	1.86	0.171	**10.87**	2.31	0.341	**6.79**
Q1	204	3	1	4	1.56	0.94	1.56	0.170	**9.14**	1.22	0.339	**3.59**
Q2	202	3	1	4	2.47	0.92	-0.07	0.171	-0.39	-0.83	0.341	-2.43
Q3	203	3	1	4	2.33	1.17	0.23	0.171	1.36	-1.44	0.340	**-4.23**
Q4	203	3	1	4	1.89	1.17	0.85	0.171	**4.96**	-0.92	0.340	-2.71
Q5	202	3	1	4	3.09	1.02	-0.80	0.171	**-4.65**	-0.57	0.341	-1.69
Q6	203	3	1	4	2.92	1.11	-0.55	0.171	-3.25	-1.09	0.340	-3.21
Q7	201	3	1	4	2.19	1.11	0.35	0.172	2.03	-1.27	0.341	**-3.72**
Q8	200	3	1	4	2.56	1.18	-0.07	0.172	-0.40	-1.50	0.342	**-4.39**
Q9	203	3	1	4	2.27	1.14	0.26	0.171	1.50	-1.38	0.340	**-4.06**

Q10	204	3	1	4	2.02	1.06	0.59	0.170	**3.45**	-0.97	0.339	-2.85
Q11	201	3	1	4	2.42	1.10	0.05	0.172	0.30	-1.32	0.341	**-3.85**
Q12	203	3	1	4	2.18	1.18	0.39	0.171	2.30	-1.38	0.340	**-4.06**
Q13	204	3	1	4	2.19	1.17	0.39	0.170	2.27	-1.36	0.339	**-4.01**
Q14	202	3	1	4	2.28	1.22	0.25	0.171	1.44	-1.55	0.341	**-4.55**
Q15	202	3	1	4	2.27	1.16	0.26	0.171	1.51	-1.42	0.341	**-4.17**
Q16	203	3	1	4	2.33	1.11	0.16	0.171	0.96	-1.34	0.340	**-3.95**
Q17	204	3	1	4	1.72	1.11	1.22	0.170	**7.15**	-0.12	0.339	-0.35
P1	203	3	1	4	2.53	1.18	-0.02	0.171	-0.12	-1.49	0.340	**-4.40**
P2	202	3	1	4	2.86	1.03	-0.44	0.171	-2.58	-0.97	0.341	-2.85
P3	202	3	1	4	2.90	1.19	-0.54	0.171	-3.14	-1.27	0.341	**-3.74**
P4	203	3	1	4	2.42	1.25	0.08	0.171	0.46	-1.63	0.340	**-4.78**
P5	203	3	1	4	3.01	1.07	-0.69	0.171	**-4.02**	-0.84	0.340	-2.47
P6	199	3	1	4	3.08	1.12	-0.83	0.172	**-4.84**	-0.78	0.343	-2.28
P7	200	3	1	4	2.84	1.14	-0.43	0.172	-2.52	-1.27	0.342	**-3.72**
P8	202	3	1	4	2.49	1.17	0.06	0.171	0.32	-1.47	0.341	**-4.31**
P9	202	3	1	4	2.61	1.17	-0.14	0.171	-0.80	-1.46	0.341	**-4.27**
P10	200	3	1	4	2.67	1.19	-0.22	0.172	-1.26	-1.47	0.342	**-4.30**
P11	201	3	1	4	2.94	1.09	-0.62	0.172	**-3.60**	-0.95	0.341	-2.79
P12	202	3	1	4	2.23	1.15	0.33	0.171	1.91	-1.34	0.341	**-3.95**
P13	201	3	1	4	2.86	1.18	-0.48	0.172	-2.78	-1.32	0.341	**-3.87**
P14	202	3	1	4	2.16	1.19	0.40	0.171	2.32	-1.43	0.341	**-4.19**
P15	202	3	1	4	2.29	1.25	0.23	0.171	1.35	-1.60	0.341	**-4.71**
P16	202	3	1	4	2.91	1.13	-0.57	0.171	**-3.32**	-1.12	0.341	**-3.29**

P17	202	3	1	4	2.04	1.23	0.65	0.171	**3.79**	-1.24	0.341	**-3.65**

Note. Items in bold denote skewness or kurtosis indices that exceed an absolute value of 3.29. Items were scored on a 4-point rating scale, with higher values indicating greater endorsement of the item.

Appendix E

Table E1

Tests ("When I am writing a test") Frequency Analysis

	Never (%)	Rarely (%)	Some-times (%)	Often (%)
Physical Sensations				
4. my hand shakes.	96 (47.1)	34 (16.7)	46 (22.5)	26 (12.7)
13. my heart beats quickly.	59 (28.9)	58 (28.4)	52 (25.5)	35 (17.2)
17. my belly feels upset.	97 (47.5)	45 (22.1)	34 (16.7)	27 (13.2)
Worry				
1. I worry about what my parents will say if I get a bad grade.	30 (14.7)	29 (14.2)	69 (33.8)	76 (37.3)
5. I worry about what my grade will be.	12 (5.9)	29 (14.2)	60 (29.4)	103 (50.5)
8. I worry about what my teacher will say if I get a bad grade.	73 (35.8)	44 (21.6)	47 (23.0)	38 (18.6)
12. I worry about what my friends will say if I get a bad grade.	103 (50.5)	39 (19.1)	32 (15.7)	28 (13.7)
16. I worry that I will not do my best.	33 (16.2)	38 (18.6)	62 (30.4)	70 (34.3)
Cognitive Interference				
2. It is hard to remember the answers.	12 (5.9)	57 (27.9)	100 (49.0)	33 (16.2)
9. It is hard to concentrate.	29 (14.2)	65 (31.9)	62 (30.4)	47 (23.0)
Off-task/Avoidance				
3. I get so nervous that I wish I could just skip it.	45 (22.1)	48 (23.5)	66 (32.4)	44 (21.6)
10. I am so nervous that I rush to get it done.	62 (30.4)	70 (34.3)	39 (19.1)	29 (14.2)
7. I look at other people.	73 (35.8)	55 (27.0)	45 (22.1)	30 (14.7)
11. I look around the room.	26 (12.7)	31 (15.2)	63 (30.9)	83 (40.7)
15. I play with things that are nearby (e.g., pencil, paper, clothing).	43 (21.1)	34 (16.7)	59 (28.9)	68 (33.3)
Shame				
6. I get embarrassed if I can't answer the questions correctly.	61 (29.9)	44 (21.6)	51 (25.0)	48 (23.5)
14. I feel ashamed.	83 (40.7)	47 (23.0)	46 (22.5)	25 (12.3)

Note. Some percentages do not add up to 100 due to missing data on items. $N = 204$.

Table E2

Games ("When I am playing a game in class") Frequency Analysis

	Never (%)	Rarely (%)	Sometimes (%)	Often (%)
Physical Sensations				
4. my hand shakes.	136 (66.7)	32 (15.7)	21 (10.3)	14 (6.9)
13. my heart beats quickly.	97 (47.5)	43 (21.1)	39 (19.1)	24 (11.8)
17. my belly feels upset.	147 (72.1)	29 (14.2)	12 (5.9)	14 (6.9)
Worry				
1. I worry about what my parents will say if I get a low score.	139 (68.1)	34 (16.7)	12 (5.9)	18 (8.8)
5. I worry about what my score will be.	59 (28.9)	55 (27.0)	51 (25.0)	31 (15.2)
8. I worry about what my teacher will say if I get a low score.	119 (58.3)	39 (19.1)	25 (12.3)	20 (9.8)
12. I worry about what my friends will say if I get a low score.	96 (47.1)	44 (21.6)	34 (16.7)	29 (14.2)
16. I worry that I will not do my best.	67 (32.8)	65 (31.9)	46 (22.5)	24 (11.8)
Cognitive Interference				
2. It is hard to remember the answers.	42 (20.6)	64 (31.4)	73 (35.8)	22 (10.8)
9. It is hard to concentrate.	78 (38.2)	50 (24.5)	44 (21.6)	30 (14.7)
Off-task/Avoidance				
3. I get so nervous that I wish I could just skip it.	134 (65.7)	37 (18.1)	23 (11.3)	8 (3.9)
10. I am so nervous that I rush to get it done.	107 (52.5)	34 (16.7)	34 (16.7)	27 (13.2)
7. I look at other people.	59 (28.9)	43 (21.1)	55 (27.0)	45 (22.1)
11. I look around the room.	39 (19.1)	44 (21.6)	58 (28.4)	56 (27.5)
15. I play with things that are nearby (e.g., pencil, paper, clothing).	88 (43.1)	39 (19.1)	37 (18.1)	38 (18.6)
Shame				
6. I get embarrassed if I can't answer the questions correctly.	67 (32.8)	46 (22.5)	48 (23.5)	42 (20.6)
14. I feel ashamed.	117 (57.4)	42 (20.6)	26 (12.7)	17 (8.3)

Note. Some percentages do not add up to 100 due to missing data. $N = 204$.

Table E3

Questions ("When my teacher asks me a question in class") Frequency Analysis

	Never (%)	Rarely (%)	Sometimes (%)	Often (%)
Physical Sensations				
4. my hand shakes.	117 (57.4)	25 (12.3)	27 (13.2)	34 (16.7)
13. my heart beats quickly.	82 (40.2)	42 (20.6)	39 (19.1)	41 (20.1)
17. my belly feels upset.	133 (65.2)	25 (12.3)	17 (8.3)	29 (14.2)
Worry				
1. I worry about what my parents will say if I answer incorrectly.	137 (67.2)	35 (17.2)	16 (7.8)	16 (7.8)
5. I worry about giving the wrong answer.	21 (10.3)	32 (15.7)	56 (27.5)	93 (45.6)
8. I worry about what my teacher will say if I answer incorrectly.	54 (26.5)	42 (20.6)	43 (21.1)	61 (29.9)
12. I worry about what my friends will say if I answer incorrectly.	84 (41.2)	39 (19.1)	39 (19.1)	41 (20.1)
16. I worry that I will not do my best.	64 (31.4)	47 (23.0)	53 (26.0)	39 (19.1)
Cognitive Interference				
2. It is hard to remember the answers.	34 (16.7)	65 (31.9)	77 (37.7)	26 (12.7)
9. It is hard to concentrate.	72 (35.3)	44 (21.6)	47 (23.0)	40 (19.6)
Off-task/Avoidance				
3. I get so nervous that I wish I could just skip it.	69 (33.8)	47 (23.0)	39 (19.1)	48 (23.5)
10. I am so nervous that I rush to get it done.	87 (42.6)	51 (25.0)	41 (20.1)	25 (12.3)
7. I look at other people.	75 (36.8)	46 (22.5)	47 (23.0)	33 (16.2)
11. I look around the room.	55 (27.0)	48 (23.5)	57 (27.9)	41 (20.1)
15. I play with things that are nearby (e.g., pencil, paper, clothing).	74 (36.3)	41 (20.1)	45 (22.1)	42 (20.6)
Shame				
6. I get embarrassed if I can't answer the questions correctly.	33 (16.2)	35 (17.2)	51 (25.0)	84 (41.2)
14. I feel ashamed.	82 (40.2)	30 (14.7)	42 (20.6)	48 (23.5)

Note. Some percentages do not add up to 100 due to missing data. $N = 204$.

Table E4

Presentations ("When I am delivering a presentation in class") Frequency Analysis

	Never (%)	Rarely (%)	Sometimes (%)	Often (%)
Physical Sensations				
4. my hand shakes.	73 (35.8)	31 (15.2)	40 (19.6)	59 (28.9)
13. my heart beats quickly.	41 (20.1)	33 (16.2)	40 (19.6)	87 (42.6)
17. my belly feels upset.	102 (50.0)	34 (16.7)	21 (10.3)	45 (22.1)
Worry				
1. I worry about what my parents will say if it goes badly.	55 (27.0)	46 (22.5)	42 (20.6)	60 (29.4)
5. I worry about what my grade will be.	27 (13.2)	33 (16.2)	54 (26.5)	89 (43.6)
8. I worry about what my teacher will say if it goes badly.	55 (27.0)	51 (25.0)	39 (19.1)	57 (27.9)
12. I worry about what my friends will say if it goes badly.	75 (36.8)	45 (22.1)	43 (21.1)	39 (19.1)
16. I worry that I will not do my best.	36 (17.6)	31 (15.2)	50 (24.5)	85 (41.7)
Cognitive Interference				
2. It is hard to remember what to say.	26 (12.7)	44 (21.6)	64 (31.4)	68 (33.3)
9. It is hard to concentrate.	49 (24.0)	44 (21.6)	45 (22.1)	64 (31.4)
Off-task/Avoidance				
3. I get so nervous that I wish I could just skip it.	41 (20.1)	30 (14.7)	40 (19.6)	91 (44.6)
10. I am so nervous that I rush to get it done.	49 (24.0)	38 (18.6)	44 (21.6)	69 (33.8)
7. I look at other people.	37 (18.1)	38 (18.6)	45 (22.1)	80 (39.2)
11. I look around the room.	32 (15.7)	30 (14.7)	58 (28.4)	81 (39.7)
15. I play with things that are nearby (e.g., pencil, paper, clothing).	85 (41.7)	25 (12.3)	41 (20.1)	51 (25.0)
Shame				
6. I get embarrassed if I make mistakes when I read out loud.	31 (15.2)	24 (11.8)	42 (20.6)	102 (50.0)
14. I feel ashamed.	90 (44.1)	30 (14.7)	42 (20.6)	40 (19.6)

Note. Some percentages do not add up to 100 due to missing data. $N = 204$.

Appendix F

Frequency of Endorsing "Sometimes" or "Often"

	Tests (%)	Games (%)	Presentations (%)	Questions (%)
Physical Sensations				
4. my hand shakes.	72 (35)	35 (17)	99 (49)	61 (30)
13. my heart beats quickly.	87 (43)	63 (31)	127 (62)	80 (39)
17. my belly feels upset.	61 (30)	26 (13)	66 (32)	46 (23)
Worry				
1. parent-related worry[a]	145 (71)	30 (15)	102 (50)	32 (16)
5. worry about outcome[b]	163 (80)	82 (40)	143 (70)	149 (73)
8. teacher-related worry[c]	85 (42)	45 (22)	96 (47)	104 (51)
12. friend-related worry[d]	60 (29)	63 (31)	82 (40)	80 (39)
16. I worry that I will not do my best.	132 (65)	70 (34)	135 (66)	92 (45)
Cognitive Interference				
2. memory[e]	133 (65)	95 (47)	132 (65)	103 (51)
9. It is hard to concentrate.	109 (53)	74 (36)	109 (53)	87 (43)
Off-task/Avoidance				
3. I get so nervous that I wish I could just skip it.	110 (54)	31 (15)	131 (64)	87 (43)
10. I am so nervous that I rush to get it done.	68 (33)	61 (30)	113 (55)	66 (32)
7. I look at other people.	75 (37)	100 (49)	125 (61)	80 (39)
11. I look around the room.	146 (72)	114 (56)	139 (68)	98 (48)
15. I play with things that are nearby (e.g., pencil, paper, clothing).	127 (62)	75 (37)	92 (45)	87 (43)
Shame				
6. embarrassment[f]	99 (49)	90 (44)	144 (71)	135 (66)
14. I feel ashamed.	71 (35)	43 (21)	82 (40)	90 (44)

Note. Survey items are numbered in the order that they appeared on the protocol. $N = 204$.
The following items were altered for assessment type:
[a]I worry about what my parents will say if I get a bad grade(tests)/low score(games)/it goes badly(presentations)/answer incorrectly(questions)
[b]I worry about what my grade will be(tests; presentations)/score will be(games)/giving the wrong answer(questions).
[c]I worry about what my teacher will say if I get a bad grade(tests)/low score(games)/it goes badly (presentations)/answer incorrectly(questions)
[d]I worry about what my friends will say if I get a bad grade(tests)/low score(games)/if it goes badly(presentations)/answer incorrectly(questions)
[e]It is hard to remember the answers (tests; questions; games)/what to say(presentations)
[f]I get embarrassed if I can't answer the questions correctly(tests; games; questions)/make mistakes when I read out loud(presentations)

Appendix G

Table G1

Tests *– Relationship of Shame and Anxiety (Worry, Cognitive Interference)*

Shame Item	Worry					Cognitive Interference		
	T1	T8	T12	T5	T16	T2	T9	T3
Embarrassment	.39**	.42**	.44**	.36**	.39**	.17*	.23**	.32**
N	204	202	202	204	203	202	203	203
Ashamed	.47**	.46**	.50**	.50**	.48**	.24**	.46**	.39**
N	201	199	199	201	200	199	200	200

Note. *$p < .05$; **$p < .001$.
Embarrassment = "I get embarrassed if I can't answer the questions correctly."
Ashamed = "I feel ashamed."
T1 = "I worry about what my parents will say if I get a bad grade."
T8 = "I worry about what my teacher will say if I get a bad grade."
T12 = "I worry about what my friends will say if I get a bad grade."
T5 = "I worry about what my grade will be."
T16 = "I worry that I will not do my best."
T2 = "It is hard to remember the answers."
T9 = "It is hard to concentrate."
T3 = "I get so nervous that I wish I could just skip it."

Table G2

Games *– Relationship of Shame and Anxiety (Worry, Cognitive Interference)*

Shame Item	Worry					Cognitive Interference		
	G1	G8	G12	G5	G16	G2	G9	G3
Embarrassment	.37**	.41**	.52**	.54**	.54**	.32**	.34**	.35**
N	203	203	203	196	202	201	202	202
Ashamed	.47**	.48**	.35**	.44**	.50**	.36**	.35**	.48**
N	202	202	202	195	201	200	201	201

Note. *$p < .05$; **$p < .001$.
Embarrassment = "I get embarrassed if I can't answer the questions correctly."
Ashamed = "I feel ashamed."
G1 = "I worry about what my parents will say if I get a low score."
G8 = "I worry about what my teacher will say if I get a low score."
G12 = "I worry about what my friends will say if I get a low score."
G5 = "I worry about what my score will be."
G16 = "I worry that I will not do my best."
G2 = "It is hard to remember the answers."
G9 = "It is hard to concentrate."
G3 = "I get so nervous that I wish I could just skip it."

Table G3

Questions *– Relationship of Shame and Anxiety (Worry, Cognitive Interference)*

Shame Item	Worry					Cognitive Interference		
	Q1	Q8	Q12	Q5	Q16	Q2	Q9	Q3
Embarrassment	.25**	.65**	.62**	.68**	.49**	.27**	.31**	.55**
N	203	201	202	201	202	201	202	202
Ashamed	.30**	.54**	.56**	.54**	.53**	.29**	.35**	.58**
N	202	200	201	200	201	200	201	201

Note. *$p < .05$; **$p < .001$.
Embarrassment: “I get embarrassed if I can’t answer the questions correctly.”
Ashamed = “I feel ashamed.”
Q1 = “I worry about what my parents will say if I answer incorrectly.”
Q8 = “I worry about what my teacher will say if I answer incorrectly.”
Q12 = “I worry about what my friends will say if I answer incorrectly.”
Q5 = “I worry about giving the wrong answer.”
Q16 = “I worry that I will not do my best.”
Q2 = “It is hard to remember the answers.”
Q9 = “It is hard to concentrate.”
Q3 = “I get so nervous that I wish I could just skip it.”

Table G4

Presentations *– Relationship of Shame and Anxiety (Worry, Cognitive Interference)*

Shame Item	Worry					Cognitive Interference		
	P1	P8	P12	P5	P16	P2	P9	P3
Embarrassment	.41**	.48**	.48**	.47**	.51**	.44**	.44**	.46**
N	199	199	199	199	199	198	199	198
Ashamed	.41**	.49**	.59**	.43**	.52**	.46**	.40**	.41**
N	202	202	202	202	202	201	202	202

Note. *$p < .05$; **$p < .001$.
Embarrassment = "I get embarrassed if I make mistakes when I read out loud."
Ashamed = "I feel ashamed."
P1 = "I worry about what my parents will say if it goes badly."
P8 = "I worry about what my teacher will say if it goes badly."
P12 = "I worry about what my friends will say if it goes badly."
P5 = "I worry about what my grade will be."
P16 = "I worry that I will not do my best."
P2 = "It is hard to remember what to say."
P9 = "It is hard to concentrate."
P3 = "I get so nervous that I wish I could just skip it."

Table G5

Tests *– Relationship of Shame and Anxiety (Physical Sensations, Off-task/Avoidance)*

Shame Item	Physical Sensations			Off-task/Avoidance			
	T4	T13	T17	T7	T10	T11	T15
Embarrassment	.23**	.38**	.38**	.31**	.32**	.24**	.24**
N	202	204	203	203	200	203	204
Ashamed	.33**	.49**	.40**	.20**	.32**	.25**	.29**
N	199	201	200	200	197	200	201

Note. *$p < .05$; **$p < .001$.
Embarrassment = "I get embarrassed if I can't answer the questions correctly."
Ashamed = "I feel ashamed."
T4 = "My hand shakes."
T13 = "My heart beats quickly."
T17 = "My belly feels upset."
T7 = "I look at other people."
T10 = "I get so nervous that I rush to get it done."
T11 = "I look around the room."
T15 = "I play with things that are nearby (e.g., pencil, paper, clothing)."

Table G6

Games *– Relationship of Shame and Anxiety (Physical Sensations, Off-task/Avoidance)*

Shame Item	Physical Sensations			Off-task/Avoidance			
	G4	G13	G17	G7	G10	G11	G15
Embarrassment	.37**	.38**	.35**	.35**	.45**	.35**	.31**
N	203	203	202	202	202	197	202
Ashamed	.38**	.32**	.46**	.46**	.40**	.32**	.30**
N	202	202	201	201	201	196	201

Note. *$p < .05$; **$p < .001$.
Embarrassment = "I get embarrassed if I can't answer the questions correctly."
Ashamed = "I feel ashamed."
T4 = "My hand shakes."
T13 = "My heart beats quickly."
T17 = "My belly feels upset."
T7 = "I look at other people."
T10 = "I get so nervous that I rush to get it done."
T11 = "I look around the room."
T15 = "I play with things that are nearby (e.g., pencil, paper, clothing)."

Table G7

Questions *– Relationship of Shame and Anxiety (Physical Sensations, Off-task/Avoidance)*

Shame Item	Physical Sensations			Off-task/Avoidance			
	Q4	Q13	Q17	Q7	Q10	Q11	Q15
Embarrassment	.37**	.49**	.41**	.36**	.39**	.36**	.25**
N	202	203	203	200	203	200	201
Ashamed	.53**	.55**	.48**	.37**	.44**	.27**	.23**
N	201	202	202	199	202	200	200

Note. *$p < .05$; **$p < .001$.
Embarrassment = "I get embarrassed if I can't answer the questions correctly."
Ashamed = "I feel ashamed."
Q4 = "My hand shakes."
Q13 = "My heart beats quickly."
Q17 = "My belly feels upset."
Q7 = "I look at other people."
Q10 = "I get so nervous that I rush to get it done."
Q11 = "I look around the room."
Q15 = "I play with things that are nearby (e.g., pencil, paper, clothing)."

Table G8

Presentations *– Relationship of Shame and Anxiety (Physical Sensations, Off-task/Avoidance)*

Shame Item	Physical Sensations			Off-task/Avoidance			
	P4	P13	P17	P7	P10	P11	P15
Embarrassment	.46**	.46**	.45**	.09	.47**	.19**	.33**
N	199	198	199	198	197	198	199
Ashamed	.45**	.45**	.38**	.09	.40**	.14	.35**
N	202	201	202	200	200	201	202

Note. *$p < .05$; **$p < .001$.
Embarrassment = "I get embarrassed if I make mistakes when I read out loud."
Ashamed = "I feel ashamed."
P4 = "My hand shakes."
P13 = "My heart beats quickly."
P17 = "My belly feels upset."
P7 = "I look at other people."
P10 = "I get so nervous that I rush to get it done."
P11 = "I look around the room."
P15 = "I play with things that are nearby (e.g., pencil, paper, clothing)."

Appendix H

Figure H1

Teacher and Student Items

When this student is writing a **test**, how frequently do they…	**Student Rating Scale Item ("T" denotes items for test anxiety)**
1. show off-task behaviours (e.g., looking around, playing with clothing or nearby objects)?	T7. I look at other people. T15. I play with things that are nearby (e.g., pencil, paper, clothing).
2. express worries about the task (e.g., whether they are not going to do their best, what others will think about the outcome)?	T16. I worry that I will not do my best. T1. I worry about what my parents will say if I get a bad grade. T8. I worry about what my teacher will say if I get a bad grade. T12. I worry about what my friends will say if I get a bad grade.
3. show physical signs of anxiety (e.g., shaking hand, mention that their stomach is upset)?	T4. my hand shakes. T17. my belly feels upset.
4. show signs of shame (e.g., blushing, lowered head, avoiding eye contact)?	T14. I feel ashamed. T6. I get embarrassed if I can't answer the questions correctly.
When this student is playing an **educational, competitive game**, how frequently do they…	**("G" denotes symptoms experienced during games)**
5. show off-task behaviours (e.g., looking around, playing with clothing or nearby objects)?	G7. I look at other people. G15. I play with things that are nearby (e.g., pencil, paper, clothing).
6. express worries about the task (e.g., whether they are not going to do their best, what others will think about the outcome)?	G16. I worry that I will not do my best. G1. I worry about what my parents will say if I get a low score. G8. I worry about what my teacher will say if I get a low score. G12. I worry about what my friends will say if I get a low score.

7. show physical signs of anxiety (e.g., shaking hand, mention that their stomach is upset)?	G4. my hand shakes. G17. my belly feels upset.
8. show signs of shame (e.g., blushing, lowered head, avoiding eye contact)?	G14. I feel ashamed. G6. I get embarrassed if I can't answer the questions correctly.
When I ask this student a **question** in class, how frequently do they…	**("Q" denotes symptoms experienced during questions**)
9. show off-task behaviours (e.g., looking around, playing with clothing or nearby objects)?	Q7. I look at other people. Q15. I play with things that are nearby (e.g., pencil, paper, clothing).
10. express worries about the task (e.g., whether they are not going to do their best, what others will think about the outcome)?	Q16. I worry that I will not do my best. Q1. I worry about what my parents will say if I answer incorrectly. Q8. I worry about what my teacher will say if I answer incorrectly. Q12. I worry about what my friends will say if I answer incorrectly.
11. show physical signs of anxiety (e.g., shaking hand, mention that their stomach is upset)?	4. my hand shakes. Q17. my belly feels upset.
12. show signs of shame (e.g., blushing, lowered head, avoiding eye contact)?	Q14. I feel ashamed. Q6. I get embarrassed if I can't answer the questions correctly.
When this student is delivering a **presentation**, how frequently do they…	**("P" denotes symptoms experienced during presentations)**
13. show off-task behaviours (e.g., looking around, playing with clothing or nearby objects)?	7. I look at other people. 15. I play with things that are nearby (e.g., pencil, paper, clothing).
14. express worries about the task (e.g., whether they are not going to do their best, what others will think about the outcome)?	16. I worry that I will not do my best. 1. I worry about what my parents will say if it goes badly. 8. I worry about what my teacher will say if it goes badly. 12. I worry about what my friends will say if it goes badly.

15. show physical signs of anxiety (e.g., shaking hand, mention that their stomach is upset)?	4. my hand shakes. 17. my belly feels upset.
16. show signs of shame (e.g., blushing, lowered head, avoiding eye contact)?	14. I feel ashamed. 6. I get embarrassed if I make mistakes when I read out loud.

Appendix I

The Relationship of Student and Teacher Reports of Classroom Assessment Anxiety

	Tests	Games	Questions	Presentations
Physical Sensations				
Shaking hands	.64	-.24*	.04	-.04
Upset stomach	.10	-.12	.01	-.03
Worry				
Performance (not doing their best)	.01	-.19	.01	-.21
What others will think – parents	.12	-.12	-.03	-.17
What others will think – teacher	-.11	-.27*	.03	-.17
What others will think – friends	-.02	-.17	.01	-.15
Off-task/Avoidance				
Looking at others	-.12	-.05	.08	.18
Playing with objects	-.14	-.21	-.15	-.11
Shame				
Embarrassment	-.14	-.19	-.04	-.02
Shame (I feel ashamed)	-.06	-.23	.01	-.08

Note. *$p < .05$. For tests, games, and questions, the sample includes responses from 70 to 72 student-teacher pairs. For presentations, the sample includes responses from 63 student-teacher pairs. The total sample included 9 teachers.

Appendix J

Table J1

Tests: *Sensitivity and Specificity of Teachers' Ratings*

Teacher variable (student variable)	True +ve	True -ve	False -ve	False +ve	Sensitivity	Specificity
Physical Sensations						
Physical signs (shaking hand)	6	32	21	13	22%	71%
Physical signs (upset stomach)	9	19	34	10	21%	66%
Worry						
Expressed worries (not able to do best)	28	6	30	7	48%	46%
Expressed worries (parents)	31	7	29	5	52%	58%
Expressed worries (teacher)	17	20	15	19	53%	51%
Expressed worries (friends)	16	23	13	20	55%	54%
Off-task/Avoidance						
Off-task behaviours (looking around)	4	32	21	14	16%	70%
Off-task behaviours (playing with things)	12	17	37	6	24%	74%
Shame						
Shame (ashamed)	8	27	31	6	21%	82%
Shame (embarrassed)	6	21	37	8	14%	72%

Note. Teachers ($N = 9$) rated students' symptoms of classroom assessment anxiety and shame.

Table J2

Games: *Sensitivity and Specificity of Teachers' Ratings*

Teacher variable (student variable)	True +ve	True -ve	False -ve	False +ve	Sensitivity	Specificity
Physical Sensations						
Physical signs (shaking hand)	0	51	9	12	0%	81%
Physical signs (upset stomach)	1	52	8	11	11%	83%
Worry						
Expressed worries (not able to do best)	7	35	22	8	24%	81%
Expressed worries (parents)	1	49	8	14	11%	78%
Expressed worries (teacher)	1	37	20	14	5%	73%
Expressed worries (friends)	4	34	23	11	15%	76%
Off-task/Avoidance						
Off-task behaviours (looking around)	7	27	32	6	18%	82%
Off-task behaviours (playing with things)	4	35	23	9	15%	80%
Shame						
Shame (ashamed)	1	47	15	9	6%	84%
Shame (embarrassed)	2	29	33	8	6%	78%

Note. Teachers ($N = 9$) rated students' symptoms of classroom assessment anxiety and shame.

Table J3

Questions: *Sensitivity and Specificity of Teachers' Ratings*

Teacher variable (student variable)	True +ve	True -ve	False -ve	False +ve	Sensitivity	Specificity
Physical Sensations						
Physical signs (shaking hand)	6	34	21	11	22%	76%
Physical signs (upset stomach)	6	39	16	11	27%	78%
Worry						
Expressed worries (not able to do best)	14	18	29	11	33%	62%
Expressed worries (parents)	2	40	7	23	63%	22%
Expressed worries (teacher)	15	19	28	10	35%	66%
Expressed worries (friends)	12	23	24	13	33%	64%
Off-task/Avoidance						
Off-task behaviours (looking around)	10	28	23	9	30%	76%
Off-task behaviours (playing with things)	9	27	25	10	26%	73%
Shame						
Shame (ashamed)	2	40	14	16	13%	71%
Shame (embarrassed)	11	10	44	7	20%	59%

Note. Teachers ($N = 9$) rated students' symptoms of classroom assessment anxiety and shame.

Table J4

***Presentations**: Sensitivity and Specificity of Teachers' Ratings*

Teacher variable (student variable)	True +ve	True -ve	False -ve	False +ve	Sensitivity	Specificity
Physical Sensations						
Physical signs (shaking hand)	10	17	25	11	29%	61%
Physical signs (upset stomach)	5	25	17	16	23%	61%
Worry						
Expressed worries (not able to do best)	22	5	29	7	43%	42%
Expressed worries (parents)	25	4	30	5	45%	44%
Expressed worries (teacher)	13	18	15	17	46%	51%
Expressed worries (friends)	11	19	15	19	42%	50%
Off-task/Avoidance						
Off-task behaviours (looking around)	15	16	31	1	33%	94%
Off-task behaviours (playing with things)	8	19	28	8	22%	70%
Shame						
Shame (ashamed)	7	21	27	8	21%	72%
Shame (embarrassed)	11	9	39	4	22%	69%

Note. Teachers ($N = 8$) rated students' symptoms of classroom assessment anxiety and shame.

Appendix K

Table K1

Frequency of Appraisals

	Really unlike me (%)	Somewhat unlike me (%)	Somewhat like me (%)	Really like me (%)
1. When I make a mistake, I feel so bad I want to hide.	102 (50.0)	34 (16.7)	21 (10.3)	45 (22.1)
2. I am sad when I see a mistake on my paper.	44 (21.6)	43 (21.1)	68 (33.3)	46 (22.5)
3. I think that really clever students do not need to try hard.	85 (41.7)	35 (17.2)	43 (21.1)	38 (18.6)
4. I think that mistakes are OK to make.	32 (15.7)	55 (27.0)	66 (32.4)	48 (23.5)
5. I get mad if I make a mistake.	60 (29.4)	38 (18.6)	63 (30.9)	39 (19.1)
6. I think that making one mistake is as bad as making ten mistakes.	85 (41.7)	36 (17.6)	43 (21.1)	37 (18.1)
7. I notice more things that I do right than what I do wrong.	44 (21.6)	49 (24.0)	52 (25.5)	57 (27.9)
8. When one thing goes wrong, I wonder if I can do anything right.	46 (22.5)	50 (24.5)	51 (25.0)	53 (26.0)
9. I never feel good about my work.	69 (33.8)	55 (27.0)	43 (21.1)	35 (17.2)
10. It's embarrassing when my classmates know that I don't understand something.	43 (21.1)	40 (19.6)	45 (22.1)	74 (36.3)
11. I want to be perfect so that others will like me.	62 (30.4)	33 (16.2)	53 (26.0)	53 (26.0)
12. I do not get mad if I make a mistake.	61 (29.9)	54 (26.5)	35 (17.2)	47 (23.0)
13. I think that someone who makes a lot of math mistakes is probably bad at math.	75 (36.8)	45 (22.1)	50 (24.5)	29 (14.2)
14. I think that mistakes help me learn.	32 (15.7)	46 (22.5)	69 (33.8)	56 (27.5)
15. I have test anxiety.	36 (17.6)	32 (15.7)	65 (31.9)	70 (34.3)

Note. Some percentages do not add up to 100 due to missing data. $N = 204$.

Table K2

Relationship of Negative Self-Appraisals, Embarrassment, and Shame

Self-Appraisals	Tests		Games		Questions		Presentations	
	TE	TA	GE	GA	QE	QA	PE	PA
1. When I make a mistake, I feel so bad I want to hide.	.53**	.53**	.56**	.49**	.53**	.53**	.40**	.42**
2. I am sad when I see a mistake on my paper.	.39**	.34**	.43**	.32**	.35**	.42**	.30**	.28**
3. I think that really clever students do not need to try hard.	.30**	.35**	.26**	.23**	.38**	.34**	.30**	.31**
5. I get mad if I make a mistake.	.40**	.41**	.41**	.31**	.39**	.39**	.29**	.27**
6. I think that making one mistake is as bad as making ten mistakes.	.38**	.38**	.46**	.33**	.43**	.37**	.26**	.38**
8. When one thing goes wrong, I wonder if I can do anything right.	.25**	.39**	.31**	.36**	.36**	.41**	.16*	.33**
9. I never feel good about my work.	.45**	.49**	.40**	.41**	.52**	.50**	.47**	.47**
10. It's embarrassing when my classmates know that I don't understand something.	.53**	.53**	.52**	.42**	.56**	.57**	.41**	.47**
11. I want to be perfect so that others will like me.	.39**	.40**	.36**	.32**	.44**	.44**	.36**	.43**
13. I think that someone who makes a lot of math mistakes is probably bad at math.	.22**	.21**	.17*	.16*	.18*	.15*	.26**	.20**

Note. *$p <$ .05; **$p <$ .001. TE (tests), GE (games), QE (questions): *"I get embarrassed if I can't answer*

the questions correctly." PE (presentations): *"I get embarrassed if I make mistakes when I read out loud."* TA (tests), GA (games), QA (questions), PA (presentations): *"I feel ashamed."*

Table K3

Relationship of Positive Self-Appraisals, Embarrassment, and Shame

Self-Appraisals	Tests		Games		Questions		Presentations	
	TE	TA	GE	GA	QE	QA	PE	PA
4. I think that mistakes are OK to make.	-.35**	-.41**	-.36**	-.35**	-.40**	-.45**	-.37**	-.42**
7. I notice more things that I do right than what I do wrong.	-.16*	-.06	-.16*	-.01	-.14*	-.16*	-.15	-.13
12. I do not get mad if I make a mistake.	-.44**	-.28**	-.31**	-.21**	-.39**	-.32**	-.30**	-.30**
14. I think that mistakes help me learn.	-.27**	-.27**	-.31**	-.32**	-.30**	-.35**	-.33**	-.35**

Note. *$p < .05$; **$p < .001$

TE (tests), GE (games), QE (questions): *"I get embarrassed if I can't answer the questions correctly."*

PE (presentations): *"I get embarrassed if I make mistakes when I read out loud."*

TA (tests), GA (games), QA (questions), PA (presentations): *"I feel ashamed."*

Appendix L

Crosstabulations for Predictors and Outcome Variables

	No Anxiety	Anxiety
Grade		
Gr 3	20	14
Gr 4	5	17
Gr 5	10	20
Gr 6	5	24
Gr 7	15	31
Gr 8	13	29
Giftedness		
No	62	120
Yes	6	15
Gender		
Male	39	42
Female	29	93

Note. $N = 177$

Appendix M

Relationship of Appraisals and Self-Reported Test Anxiety

	Test Anxiety
M1. When I make a mistake, I feel so bad I want to hide.	.42**
M2. I am sad when I see a mistake on my paper.	.21**
M3. I think that really clever students do not need to try hard.	.23**
M4. I think that mistakes are OK to make.	-.32**
M5. I get mad if I make a mistake.	.26**
M6. I think that making one mistake is as bad as making ten mistakes.	.28**
M7. I notice more things that I do right than what I do wrong.	-.17*
M8. When one thing goes wrong, I wonder if I can do anything right.	.18**
M9. I never feel good about my work.	.45**
M10. It's embarrassing when my classmates know that I don't understand something.	.33**
M11. I want to be perfect so that others will like me.	.31**
M12. I do not get mad if I make a mistake.	-.28**
M13. I think that someone who makes a lot of math mistakes is probably bad at math.	.11
M14. I think that mistakes help me learn.	-.23**

Note. $^{**}p < .001$; $^{*}p < .05$

Appendix N

Summary of Logistic Regression Analysis for Variables Predicting Test Anxiety

			95% CI for Odds Ratio		
Variables	B (SE)	Wald	Lower	Odds Ratio	Upper
Constant	-3.00 (1.79)				
M1	.12 (.30)	.18	.64	1.13	2.02
M2	-.37 (.26)	2.09	.42	.69	1.14
M3	.04 (.20)	.04	.71	1.04	1.53
M4	.20 (.28)	.52	.71	1.23	2.14
M5	.23 (.26)	.77	.75	1.26	2.10
M6	.05 (.23)	.05	.68	1.05	1.63
M7	-.11 (.20)	.29	.61	.90	1.33
M8	-.24 (.23)	1.08	.50	.79	1.24
M9	.80 (.27)*	8.68	1.31	2.22	3.76
M10	-.16 (.24)	.42	.54	.86	1.37
M11	.15 (.20)	.55	.79	1.56	1.70
M12	-.04 (.24)	.02	.61	.97	1.54
M13	-.05 (.21)	.06	.64	.95	1.42
M14	-.02 (.26)	.01	.59	.98	1.62
T6	.16 (.23)	.44	.74	1.17	1.85
T14	.45 (.27)	2.85	.93	1.57	2.67
Gr		6.17			
Gr(1)	1.34 (.82)	2.68	.77	3.82	18.99
Gr(2)	.55 (.69)	.64	.45	1.74	6.74
Gr(3)	1.28 (.74)	2.99	.84	3.61	15.50
Gr(4)	.94 (.67)	2.02	.70	2.57	9.47
Gr(5)	.17 (.73)	.05	.28	1.18	4.92
Giftedness	1.04 (.70)	2.19	.71	2.83	11.22
Gender	1.10 (.44)*	6.31	1.27	3.01	7.10

Note. N = 177, R^2 = .27 (Cox-Snell), Model X^2 (23) = 56.211, $p < .001$, * denotes $p < .05$.

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