

A CLOSER LOOK AT THE REVISED CHILDREN'S MANIFEST ANXIETY SCALE,
SECOND EDITION (RCMAS-2) PERFORMANCE ANXIETY CLUSTER

by

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A Closer Look at the Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2)
Performance Anxiety Cluster

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Abstract

The present study explored the Revised Children's Manifest Anxiety Scale-Second Edition (RCMAS-2) Performance Anxiety cluster for the possibility of construct bias across gender and age, latent mean differences across gender and age groups, internal consistency reliability for its scores with a U.S. sample, and convergent evidence of validity for its scores with a sample of 1,002 students, ages 7 to 19 years. Confirmatory factor analysis (CFA) results supported a one-factor structure for the Performance Anxiety cluster. The preponderance of the evidence from CFA and reliability methods suggested bias did not exist across gender and age groups. Latent means comparisons showed that females and older students reported higher levels of performance anxiety in comparison to males and younger students. In addition, the results indicated that the Performance Anxiety cluster's scores have acceptable internal consistency reliability and that there is convergent evidence for the validity of the cluster's scores. Limitations, future research directions, and practical implications of the study are discussed.

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CHAPTER I

Introduction

Performance Anxiety

To those who experience performance anxiety, the semantics probably do not matter much—they know that when they are faced with certain situations, such as an examination, class presentation, clarinet concert, or in-class discussion, they probably will feel it, and they probably will not relish it. In contrast, to psychologists, performance anxiety can have multiple meanings that are worth delineating and exploring. *The Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013) does not include a separate diagnostic category for performance anxiety, and this term has been used to refer to multiple constructs, which can cause confusion. Certain psychologists use the term “performance anxiety” to refer to test anxiety (e.g. Powell, 2004a). Others see performance anxiety as a broad category that includes different types of situations or tasks that one might be fearful or anxious about, such as speaking in public, taking exams, playing sports, or performing artistically (e.g. Kenny, 2005). Performance anxiety has also been discussed as one of two components of social phobia or social anxiety disorder (e.g. Hook, Valentiner, & Connelly, 2013), and the DSM-5 now includes a performance-only specifier under social anxiety disorder for individuals who solely experience fears of performance without any other social fears.

Due to the different definitions of performance anxiety, it is especially difficult to determine the prevalence of this problem. When performance anxiety is defined as a dimension of social phobia, it has been estimated to affect .7% to 4.3% of children and adolescents (Burstein et al., 2011; Marmorstein, 2006). Possessing a higher level of performance anxiety has been associated with higher anticipatory anxiety, less confidence, and greater increases in heart rate during public speaking; higher rates of physiological hyperarousal and more somatic

symptoms in general; and more experiences of unhelpful cognitive processes, such as greater self-focused attention during stressful tasks and more repetitive post-event processing (e.g. Holzman, Valentiner, & McCraw, 2014; Hughes et al., 2006; Levin et al., 1993; May et al., 2014).

Measurement of Performance Anxiety

The extant literature reveals three main methods to assess a child or adolescent for performance anxiety. These methods can be used in isolation or in conjunction with one another. The first method is to interview children or adolescents regarding their symptoms of performance anxiety. Specifically, semi-structured interviews have been used to explore and quantify students' experiences of performance anxiety (Beidel, Turner, & Trager, 1994; Schwartz, Snidman, & Kagan, 1999). The second method used and reported in the literature is direct behavioral observation, although this method appears to be rarely used (Hook et al., 2013). The final, and most popular, method used and reported in the literature is using self-report measures to gauge the child or adolescent's performance anxiety symptoms. This method has been used for studies on test-focused performance anxiety, other specific forms of performance anxiety (e.g. public speaking), and performance anxiety as a dimension of social anxiety disorder (e.g. Brooks, 2014; Cheng, Hardy, & Markland, 2009; Holzman et al., 2014; Hopko, Hunt, & Armento, 2005). The popularity of this method speaks to its utility and the availability of self-reports to measure the construct of performance anxiety.

One such measure is the Performance Anxiety cluster on the Revised Children's Manifest Anxiety Scale—Second Edition (RCMAS-2; C. R. Reynolds & Richmond, 2008a). Unfortunately, when adding this new 10-item Performance Anxiety cluster to their measure, C. R. Reynolds and Richmond did not clearly specify which of these types of performance anxiety

the cluster was meant to assess, nor did they provide information about the psychometric properties of the cluster's scores (2008b). The authors noted that children who endorse many of the items on the Performance Anxiety cluster may be at a higher risk for anxiety "that can be paralyzing and prevent singing, acting, or speaking before a group" (p. 19). However, this section also goes on to discuss the fact that academic performance is being emphasized more and more, and that "Performance anxiety specific to test performance is thus increasingly common among students" (p. 20). An examination of the items included in the Performance Anxiety cluster suggests that they are related primarily to children's concerns about others' judgments of them and judgments of their performance on different classroom activities; they ask about feelings surrounding public speaking and making mistakes in front of others, but more general worries about others' judgments of one's competence are also included in the items. Based on a review of these items, it appears that they align most closely with the conceptualization of the performance only specifier of social anxiety disorder.

Limited research has been conducted with the Performance Anxiety cluster of the RCMAS-2 (e.g. Ang, Lowe, & Yusof, 2011; Lowe & Reynolds, 2011), and still, little is known about the properties of this cluster and its scores. Ang and colleagues included internal consistency reliability estimates and temporal stability estimates for the Performance Anxiety cluster in their study with a sample of children and adolescents from Singapore. Lowe and Reynolds assessed the Performance Anxiety cluster for construct bias across ethnicity using EFA methods. Their findings supported a one-factor structure for the cluster and suggested a lack of bias across ethnic groups.

Performance Anxiety and Other Variables

The relationship between gender and performance anxiety is clearer than the relationship

between age and performance anxiety at this time. Most research shows that relative to boys, girls tend to report more symptoms of performance anxiety, both when it is defined as anxiety specific to various situations and when it is defined more broadly as a dimension of a social anxiety disorder (Abrahamsen, Roberts, & Pensgaard, 2008; Harpell & Andrews, 2012; Lowe, 2014b; Marmorstein, 2006; Osborne, Kenny, & Holsomback, 2005; Storch, Masia-Warner, Dent, Roberti, & Fisher, 2004; Thomas & Nettelbeck, 2014). However, this pattern is not universal, and a lack of gender differences in performance anxiety has been found in some studies (Schwartz et al., 1999). With regards to differences across age groups, there are very few studies of the relationship between performance anxiety and age. Marmorstein (2006) suggests a peak of performance anxiety symptoms in early adolescence, but a clear relationship has not yet been established.

Test Bias

A test is biased when its scores are affected by systematic error that is due to a person's group membership (C. R. Reynolds & Lowe, 2009). One focus of the study at hand is assessing the RCMAS-2 Performance Anxiety cluster for construct bias. Construct bias is concerned with whether a test measures the same construct in the same manner across various groups. There are many different techniques to probe a measure for construct bias, and researchers note that several different methods should be employed to provide evidence of a lack of construct bias (Keith et al., 1995; C. R. Reynolds & Lowe, 2009). The present study will assess for construct bias via factor analysis and reliability coefficient comparisons.

Factor Analytic Methods to Assess Construct Bias

Both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) can be used to assess a measure for construct bias. The proposed study will utilize CFAs to determine if

the structure of the RCMAS-2 Performance Anxiety cluster is different across groups, which would indicate construct bias. First, the structure of the Performance Anxiety cluster will be explored for each group of interest in single-group CFAs. Next, a multi-group mean and covariance structure analysis (MG-MACS; M. R. Reynolds & Keith, 2013) will be used to investigate whether the factor structure of the Performance Anxiety cluster differs across gender and age groups. MG-MACS works step-by-step to ascertain whether configural, weak, and strong factorial invariance are present. In order to compare scores between different groups, strong factorial invariance must be established (Meredith, 1993).

Latent Mean Differences. If the factor analytical evidence indicates that strong factorial invariance of the RCMAS-2 Performance Anxiety cluster is tenable, then comparisons between the latent means of the different gender and age groups will be made. Latent means comparisons have been shown to be more accurate than comparisons based on observed scores because latent means are not influenced by random measurement error (Sass, 2011). Through this analysis, the present study will be able to contribute to the growing literature regarding gender and age differences on performance anxiety, while also examining the properties of the RCMAS-2 Performance Anxiety cluster.

Internal Consistency Reliability and its use in Assessing Construct Bias

In this study, reliability methods will be used to determine if there is a significant difference between the internal consistency reliability coefficients of different gender and age groups. First, the Feldt technique will be used to calculate an F -statistic that will be compared to a critical F -value to determine if there is a statistically significant difference between the reliability coefficients. In this case, a significant difference between the coefficients would suggest bias. After the test of statistical significance is conducted using the Feldt technique, an

effect size will also be calculated, allowing for a more realistic interpretation of the meaning of the difference between the coefficients. In addition, the 95% confidence intervals (CIs) of the internal consistency reliability estimates will also be compared across groups. If the 95% CIs for different groups do not overlap, then this would suggest that the internal consistency reliability coefficients are different, and that construct bias is present.

Convergent Evidence for Test Score Validity

The scores of instruments used in psychological research and practice must be scrutinized for evidence of their validity in order to ensure that they are assessing what they are purporting to measure. The RCMAS-2 Performance Anxiety cluster is no exception, and research is needed to explore its scores. The present study will seek convergent evidence for the validity of the RCMAS-2 Performance Anxiety cluster scores. This question will be probed through the calculation of Pearson's r correlations between the Performance Anxiety cluster scores and scores of measures assessing a similar construct (i.e., test anxiety).

Statement of Purpose

It is important for practitioners and researchers to use tools that result in reliable, valid, and unbiased scores if they wish to accurately assess their clients or participants. School-based practitioners and other psychologists interested in educational problems may be particularly interested in measuring students' levels of anxiety and discomfort related to carrying out classroom activities, such as participating in a discussion or giving a presentation. The RCMAS-2 appears to measure this construct with a cluster of ten items referred to as the "Performance Anxiety cluster." However, this cluster of items is not listed with the RCMAS-2 subscales of Physiological Anxiety, Worry, and Social Anxiety, nor have the authors provided reliability and validity information for its scores in the test manual (C. R. Reynolds & Richmond, 2008b). In

order to be a more useful tool, the RCMAS-2 Performance Anxiety cluster scores are in need of evidence for their reliability, validity, and lack of test bias.

The present study aims to investigate the psychometric properties of the scores of the RCMAS-2 Performance Anxiety cluster, explore whether construct bias exists on the RCMAS-2 cluster across gender and age, and determine whether different gender and age groups tend to report different levels of performance anxiety. More specifically, the scores of the RCMAS-2 Performance Anxiety cluster will be analyzed for factorial invariance across gender and age, differences in latent means across gender and age, internal consistency reliability, similarity of internal consistency reliability coefficients across groups, and convergent evidence of validity. The research questions will be answered through the use of an archival data set that includes the RCMAS-2 and selected additional measures. The sample consists of 1,002 Midwestern children and adolescents participating in regular education.

Research Questions

1. Will confirmatory factor analysis support the 1-factor structure of the RCMAS-2 Performance Anxiety cluster?
2. Is there construct bias in the RCMAS-2 Performance Anxiety cluster scores between groups using the factor analysis method?
 - a. Is there gender bias on the RCMAS-2 Performance Anxiety cluster scores between male and female students?
 - b. Is there age bias on the RCMAS-2 Performance Anxiety cluster scores between younger students (ages 7-11) and older students (ages 12-19)?
3. Are there differences in the levels of performance anxiety reported in different groups?
 - a. Are there gender differences on the RCMAS-2 Performance Anxiety cluster

- scores between male and female students?
- b. Are there age differences on the RCMAS-2 Performance Anxiety cluster scores between younger students (ages 7-11) versus older students (12-19)?
4. Will the RCMAS-2 Performance Anxiety cluster scores demonstrate adequate internal consistency reliability?
 5. Is there construct bias on the RCMAS-2 Performance Anxiety cluster scores between groups using internal consistency reliability methods?
 - a. Is there gender bias on the RCMAS-2 Performance Anxiety cluster scores between male and female students?
 - b. Is there age bias on the RCMAS-2 Performance Anxiety cluster scores between younger students (7-11) and older students (12-19)?
 6. Will the RCMAS-2 Performance Anxiety cluster scores demonstrate positive and moderate correlations with scores of other measures purporting to measure the closely related construct of test anxiety? More specifically, will the RCMAS-2 Performance Anxiety cluster scores demonstrate their highest correlations with scores of similar dimensions on measures of test anxiety?

Significance of the Study

The present study will supply much-needed information about the scores of the RCMAS-2 Performance Anxiety cluster. Ang and colleagues (2011) investigated some psychometric aspects of the Performance Anxiety cluster with a sample of children and adolescents residing in Singapore, and Lowe and Reynolds (2011) assessed the Performance Anxiety cluster for construct bias across ethnicity in the U.S. standardization sample using EFA methods; however, neither of these studies addressed convergent evidence for the validity of the cluster's scores nor

the question of whether construct bias is present across gender or age. This study will result in more complete psychometric information on the RCMAS-2 Performance Anxiety cluster. Addressing this gap in the literature will allow practitioners and researchers to have a greater understanding of the psychometric properties and utility of the RCMAS-2 Performance Anxiety cluster, which should inform their decisions about how to use and interpret this cluster.

Relevance of the Study to School Psychologists

The present study is relevant to the work of school psychologists. School psychologists are known for and relied on for their knowledge of measurement, which is a main focus of this study. Measures such as the RCMAS-2 are widely used in both school and clinical settings. A psychometrically sound brief measure of performance anxiety could be a useful tool for mental health personnel aiming to quantify the different levels of performance anxiety experienced by children and adolescents. Performance anxiety can be distressing and make it difficult for students to fully participate in school and demonstrate what they know. Performance anxiety could cause a student to be overly fearful of and/or avoid activities such as speaking during discussions, asking questions, giving speeches, and presenting to an audience. Avoidance of these activities could be mistakenly attributed to the student having low academic ability in that area, a lack of interest in school, expressive language difficulties, attention problems, or defiant behavior. A well-made brief measure of performance anxiety could be helpful in differentiating students with performance anxiety from other students and identifying individuals who could benefit from treatment for this issue.

Summary

“Performance anxiety” can refer to: test anxiety, anxiety in various performance situations, or a dimension of social anxiety disorder. It is difficult to determine the prevalence of

performance anxiety, because the term is used in so many ways. Performance anxiety is associated with numerous negative effects (e.g. Holzman et al., 2014; Hughes et al., 2006; Levin et al., 1993; May et al., 2014). Girls appear to report more performance anxiety than boys (e.g. Abrahamsen et al., 2008; Lowe, 2014b; Marmorstein, 2006; Osborne et al., 2005; Storch et al., 2004; Thomas & Nettelbeck, 2014). The literature is not yet clear on the relationship between performance anxiety and age, and more research is needed on this point. Interviews, behavioral observations, and self-report measures are all tools that can be used for assessing performance anxiety. Of these three, the most often used instrument reported in the literature is the self-report. One such scale is the Performance Anxiety cluster on the RCMAS-2 (C. R. Reynolds & Richmond, 2008a). Regrettably, little is known about the Performance Anxiety cluster or its scores. The current study seeks to address this need. Data from a sample of 1,003 Midwestern students in grades 2-12 will be used to explore the scores of the RCMAS-2 Performance Anxiety cluster for factorial invariance across gender and age, differences in the latent means across gender and age groups, internal consistency reliability, similarity of internal consistency reliability coefficients across groups, and convergent evidence of validity. Knowing more about the RCMAS-2 Performance Anxiety cluster will help psychologists understand and appropriately use this cluster in practice and research.

CHAPTER II

Review of the Literature

The purpose of this chapter is to review the literature on performance anxiety and discuss measurement invariance, internal consistency reliability, and convergent evidence for validity. First, performance anxiety is defined and the different meanings of this term are explored. The prevalence and impact of performance anxiety and social anxiety are discussed. Multiple methodologies for assessing performance anxiety are elucidated, and specific instruments are introduced. Details are supplied regarding the history and development of the Revised Children's Manifest Anxiety Scale—Second Edition (RCMAS-2; C. R. Reynolds & Richmond, 2008a) and its predecessors. Research on the relationships between performance anxiety and gender and age is reviewed. Following this discussion of the measure of interest, test bias is explored, and both factor analytical and reliability methods for assessing construct bias are reviewed. Finally, there is a brief discussion of validity and, specifically, the collection of convergent evidence for validity.

Defining Performance Anxiety

In this section, the construct of performance anxiety is introduced. The three main meanings of the term “performance anxiety” are explored. In addition, the item content of the RCMAS-2 Performance Anxiety cluster is scrutinized and compared to the descriptions of performance anxiety found in the literature.

The term “performance anxiety” has been used to refer to many different constructs and is not recognized as its own diagnostic category in the DSM-5 (APA, 2013). Occasionally authors, such as Powell (2004a), use the term “performance anxiety” interchangeably with test anxiety, which is when a person experiences anxiety related to taking tests. Others consider

performance anxiety to be a broader construct of which test anxiety is one type among many, such as anxiety experienced in relation to playing sports, interacting sexually or romantically, performing on stage, participating in classroom discussions, public speaking, and so forth (e.g. Huberty & Dick, 2006; Kenny, 2005). Finally, some researchers see performance anxiety as one of two dimensions of the DSM's social phobia/social anxiety disorder (e.g. Hook et al., 2013; Hughes et al., 2006). These researchers define performance anxiety as an unreasonable concern or fear of others evaluating oneself or one's abilities in performance situations. The second recognized dimension of social phobia is called "social interaction anxiety," and it is defined as heightened difficulty and discomfort when dealing directly with others in conversations, romantic contexts, or other interactive situations. Under the criteria of the fourth edition of the DSM, having symptoms of both performance anxiety and social interaction anxiety prompted a diagnosis of generalized social phobia (May et al., 2014).

C. R. Reynolds and Richmond (2008b) did not specifically indicate which of these types of performance anxiety they sought to measure when discussing the Performance Anxiety cluster in the RCMAS-2 manual; however, the items on the scale are related primarily to children's concerns about others' judgments of them and judgments of their performance on different classroom activities. The RCMAS-2 Performance Anxiety cluster's items ask about feelings surrounding public speaking and making mistakes in front of others, but more general worries about others' judgments of one's competence are also included in the items. For instance, the cluster also contains items asking about whether the child worries about others having negative thoughts about him or her. All together, the content of the items suggests that C. R. Reynolds and Richmond's (2008a) Performance Anxiety cluster could align with the conceptualization of performance anxiety as a dimension of social phobia, where it includes worries about others'

evaluations of one's own qualities as well as one's performances of various acts.

Performance anxiety has been discussed and treated as a dimension of social anxiety in research. Originally, Leary (1983) referred to the two dimensions of social anxiety as "interaction anxiety" and "audience anxiety." He theorized that interaction anxiety occurs in situations where people interact with others and their responses are contingent on the responses of others, such as in conversations. In contrast, audience anxiety occurs in situations where people are behaving in front of others and their behavior is not contingent on others' responses, like when one is giving a speech or performing (Leary, 1983). Leary believed that these types of social anxiety needed to be measured individually so that researchers could more fully understand their distinct causes, effects, and correlates, so he created separate measures for interaction and audience anxiety. The DSM-III-R (APA, 1987) discussed these two types of social anxiety as two aspects of social phobia, which helped solidify the distinction between them.

Later, Mattick and Clarke (1998) concurrently developed two instruments to measure the two dimensions of social anxiety: the Social Interaction Anxiety Scale (SIAS) and the Social Phobia Scale (SPS). As its name suggests, the SIAS was built to measure social interaction anxiety. The SPS purported to measure "anxiety or fear at the prospect of being observed or watched by other people"—which Leary would call "audience anxiety," but Mattick and Clarke named "social phobia" (p. 457, 1998). Others would go on to call this dimension of social anxiety "performance anxiety," and its existence appears to be widely accepted in the literature (e.g. May et al., 2014; Hook et al., 2013; Hughes et al., 2006). Notably, factor analytic studies have also supported the distinction between these two dimensions of social anxiety (e.g. Habke, Hewitt, Norton, & Asmundson, 1997; Safren et al., 1999). Although the research literature as a

whole acknowledges and supports the existence of a performance anxiety dimension of social anxiety, the distinction between performance anxiety and social interaction anxiety is not always made when examining social anxiety. May and colleagues (2014) point out the following contradiction: the SIAS and SPS are commonly used to assess social anxiety in research, which suggests that knowledge about the two separate dimensions is important; however, when relationships between social anxiety and other variables are investigated, the two dimensions are seldom examined independently.

In the lead-up to the publication of the DSM-5 (APA, 2013), the performance anxiety dimension of social anxiety disorder received a closer look from the APA's DSM-5 Task Force and its committees. Bögels and colleagues (2010) conducted a literature review targeting specific questions about social anxiety disorder/social phobia that were posed by those working on the new DSM-5 and other experts in the field. Among other issues, Bögels and colleagues addressed the question of whether the social anxiety disorder entry should include any specifiers or subtypes. Fears of performance, social interaction, being observed, and having others notice one's visible anxiety symptoms were all investigated as possible specifiers or subtypes, but the authors concluded that the literature could only support the addition of a predominantly performance specifier for social anxiety disorder. The DSM-5 took Bögels and colleagues' suggestion and included a performance only specifier that was to be used "If the fear is restricted to speaking or performing in public" (APA, 2013, p. 203). However, as Burstein and colleagues (2011) noted, the performance only specifier might have been more useful if it were defined more broadly, because many young people with social anxiety disorder may be *primarily* affected by performance fears, but they still may have other social fears as well.

Impact and Importance of Performance Anxiety

This section explores the impact and significance of performance anxiety. First, research on prevalence rates of performance anxiety and social anxiety disorder among children is reviewed. Second, theory about how anxiety affects performance is discussed. Finally, the negative effects of performance anxiety and the negative effects of social anxiety are outlined.

Prevalence Rates. Estimates for the prevalence of performance anxiety as a subtype of social anxiety vary, possibly due to differences in the delineation of the construct and methods (e.g. Burstein et al., 2011; Marmorstein, 2006). For example, Burstein and colleagues (2011), administered the Composite International Diagnostic Interview Version 3.0 (CIDI; Kessler & Ustun, 2004) to a sample of 13 to 18-year-olds ($n = 10,123$). Those who reported *only* fears of performance situations were considered to meet the proposed DSM-5 criteria for performance-only social phobia—only 0.7% of their participants met these criteria. As the authors noted, those that endorsed any additional social fears were filtered into categories of generalized (> 7 fears) and non-generalized (1 - 6 fears) social phobia. Marmorstein (2006) looked at prevalence and comorbidity of different types of social phobia among 9 to 17-year-olds ($n = 1,295$). Her participants and their parents were interviewed with the Diagnostic Interview Schedule for Children version 2.3 (DISC-2.3; Fisher, Wicks, Shaffer, Piacentini, & Lapkin, 1992), and 4.3% met the criteria for performance-focused social phobia. In this study, those that met criteria for performance-focused social phobia *and* for generalized social phobia were considered to have generalized social phobia. However, unlike Burstein and colleagues' study, there was no “non-generalized” social phobia category.

The prevalence rates for the broader category of social phobia or social anxiety disorder appear to vary even more than those for performance anxiety (e.g. Burstein et al., 2011; Costello

et al., 1996; Epkins, 2002; Morris & Masia, 1998; Storch et al., 2004). For example, Costello and colleagues' Great Smoky Mountains Study first screened 4,500 randomly-selected 9, 11, and 13-year-old children from the southeastern United States for psychiatric symptoms. The high-scorers ($n = 1,015$ at wave 1) were then interviewed annually for the following four years with the Child and Adolescent Psychiatric Assessment (CAPA: Angold et al., 1995), which is a highly-structured interview. Costello and colleagues found that only .58% of their sample met the criteria for social anxiety disorder over the course of the study. In contrast, Epkins (2002) administered the Social Phobia and Anxiety Inventory for Children (SPAI-C; Beidel, Turner, & Morris, 1995) and the Social Anxiety Scale for Children-Revised (SASC-R; La Greca & Stone, 1993) to a community sample of 8 to 12-year-olds ($n = 178$). She found that on the SPAI-C and the SASC-R, respectively, 37% and 20% of the participants met cutoffs for clinically significant social anxiety or social phobia. One of the key differences between these two studies is the type of measure used (interview versus self-report measures). An additional caveat to note is that the screening measure used by Costello and colleagues consisted of the externalizing broad-band scale items from the parent report form of the Child Behavior Checklist (CBCL; Achenbach, 1991), which the researchers believed would also identify children with emotional problems such as anxiety and depression due to the high comorbidity between behavioral and emotional problems (1996).

Impact of Performance Anxiety. Performance anxiety has the potential to have negative effects on those who experience it. In a study that has had a lasting impact, Yerkes and Dodson (1908) first showed that mice performing a difficult task performed better on that task as their level of arousal was increased to a moderate level, but that beyond that level of arousal their performance began to worsen. The graphic representation of this relationship between arousal

and performance is an inverted-U. The findings of Yerkes and Dodson have since been replicated in humans (e.g. Anderson, 1994; Bregman & McAllister, 1982; Dickman, 2002).

Although the Yerkes and Dodson (1908) curve suggests that a moderate amount of anxious arousal can optimize task execution, Powell (2004b) believes that the relationship between *performance anxiety* and task execution is slightly different. Powell (2004b) points to literature from sports psychology wherein performance anxiety has facilitating effects up to a moderate level, but that once a moderate level of performance anxiety is reached, one's ability to do well on tasks plummets dramatically, rather than curving downward gently like the Yerkes and Dodson curve. This pattern of performance has been demonstrated in the context of sports such as bowling and basketball (Hardy & Parfitt, 1991; Hardy, Parfitt, & Pates, 1994). This steeper drop in functioning also fits well with anecdotal reports of people blanking or choking during a performance, game, speech, or test. Regardless of its hypothesized differences with the Yerkes and Dodson (1908) curve, both of these models would suggest that high levels of anxiety or performance anxiety do not facilitate effective performance.

The negative relationship between performance anxiety and task execution has been supported in research focusing on public speaking tasks. Compared to those without performance anxiety or social anxiety, people with performance anxiety have been shown to have higher anticipatory anxiety before public speaking and have less confidence during public speaking (Levin et al., 1993). People with performance anxiety also speak for less time than controls when asked to give an impromptu speech (Hofmann, Newman, Ehlers, & Roth, 1995). The physiological effects of performance anxiety have also been explored, and several studies have found that when compared to those without performance anxiety, people with performance anxiety have greater increases in heart rate when delivering speeches (Boone et al., 1999;

Heimberg, Hope, Dodge, & Becker, 1990; Hofmann et al., 1995; Levin et al., 1993). For example, Levin and colleagues (1993) compared heart rate changes of participants with performance-focused social anxiety ($n = 8$), generalized social anxiety ($n = 28$), and no social anxiety disorder ($n = 14$) before and after a 10-minute public speaking task. They found that those with performance-focused social anxiety had significantly higher heart rate elevations during a public speaking task, as compared to those with generalized social anxiety and controls.

It appears that people with performance anxiety also report having more unpleasant physical sensations and have differences in their thought processes surrounding feared situations. For instance, Hughes and colleagues (2006) found that performance anxiety is associated with higher self-reported physiological hyperarousal. Similarly, May and colleagues (2014) found that people with performance anxiety have significantly more somatic symptoms than controls. Holzman and colleagues (2014) explored performance anxiety's relationship with self-focused attention and post-event processing. The authors explain that self-focused attention is where one focuses inward on the self and one's own physiological and cognitive distress, and post-event processing is where a person repetitively and painstakingly reviews events after they have occurred. Holzman and colleagues' data showed that higher levels of performance anxiety are associated with experiencing a higher level of self-focused attention during feared situations and more post-event processing after the fact.

Unfortunately, the sparse body of literature on performance anxiety's effects and correlates becomes even slimmer when restricted to samples of children and adolescents. This is likely due to the fact that researchers have typically focused on the broader construct of social phobia/social anxiety disorder, rather than breaking the construct down to understand associations with performance anxiety, specifically. However, Marmorstein's (2006) prevalence

and comorbidity study of 9 to 17-year-olds did explore performance-focused social anxiety and found that it is associated with several other anxiety disorders, dysthymia (now called persistent depressive disorder), oppositional defiant disorder, and conduct disorder. Marmorstein (2006) found a particularly strong association between performance anxiety and dysthymia, which she hypothesized could be due to children having low self-esteem or general feelings of stress and tension that would cause them to be at risk for both dysthymia and performance anxiety.

Impact of Social Anxiety. In comparison to performance anxiety, the broader category of social anxiety disorder or social phobia has been explored in greater depth in the research literature. Several studies have found a link between social anxiety and social skills deficits in children (e.g. Beidel, Turner, & Morris, 1999; Spence, Donovan, & Brechman-Toussaint, 1999). Beidel and colleagues (1999) administered interviews, self-report measures, parent and teacher ratings, and behavioral observations with 7 to 13-year-olds ($n = 50$) who had been referred for treatment for social phobia. When compared to their peers, those with social phobia were significantly less extroverted and significantly lonelier. On a 10-minute read-aloud task those with social phobia were rated as significantly less skilled and more anxious than normal peers. Finally, behavioral observations during five social skills tasks suggested that they were also less interpersonally skilled, more anxious, and paused longer before speaking. Beyond these findings of general social skills deficits, it has also been found that, in comparison to an age-matched control group, 9 to 14-year-olds with social phobia are significantly worse at recognizing facial affect, which may interfere with their ability to interact socially and interpret others' behavior (Simonian, Beidel, Turner, Berkes, & Long, 2001). In regards to relationships with others, boys who experience social anxiety appear to receive less social support from friends, and girls with social anxiety experience more peer victimization or bullying (Tillfors, Persson, Willén, & Burk,

2012).

Social anxiety has also been associated with educational difficulties, including school dropout (Stein & Kean, 2000; Van Ameringen, Mancini, & Farvolden, 2003). Stein and Kean (2000) administered the CIDI and several indicators of disability and quality of life to a sample of 15 to 64-year-olds ($n = 8,116$). Stein and Kean's results showed that people who meet criteria for social phobia are significantly more likely to have at least one failing grade and to drop out of school.

Research also shows a link between social anxiety and additional psychopathology, such as other anxiety disorders, major depression, dysthymic disorder, substance abuse disorders, and suicidality (e.g. Belzer & Schneier, 2004; Chartier, Walker, & Stein, 2003; Dalrymple & Zimmerman, 2011; Fehm, Beesdo, Jacobi, & Fiedler, 2008; Gould et al., 1998; Ohayon & Schatzberg, 2010; Stein et al., 2001). As part of a larger project, Fehm and colleagues (2008) administered the Munich Composite International Diagnostic Interview (M-CIDI; Wittchen & Pfister, 1997) to 18 to 65-year-olds ($n = 4,174$). They identified a group of individuals who met the DSM-IV criteria for social anxiety disorder/social phobia, a group of sub-threshold individuals who met all but one criterion, and a group of symptomatic individuals who reported social fears, but did not meet two or more of the necessary criteria for the diagnosis. Fehm and colleagues found that 87.8% of those with social anxiety disorder met criteria for at least one other diagnosis. In addition, they found that social anxiety disorder was significantly associated with panic disorder, agoraphobia, generalized anxiety disorder, specific phobia, obsessive-compulsive disorder, major depressive disorder, dysthymia, bipolar disorder, nicotine dependence, and alcohol dependence. A similar analysis on the two lower severity groups showed that sub-threshold and symptomatic social anxiety disorder were also significantly

associated with multiple other disorders. Further, Fehm and colleagues noted that social anxiety disorder appeared to precede the development of other disorders, which suggests that it could be a risk factor. In fact, at least two studies have substantiated a link between social anxiety during the adolescent or early adult years and an elevated risk for later depressive disorders, which appears to support the idea of social anxiety disorder as a risk factor (Beesdo et al., 2007; Stein et al., 2001).

Performance Anxiety Assessment

This portion of the literature review explains different ways to assess for performance anxiety. First, interview methods are outlined. Second, behavioral observations for performance anxiety symptoms are explored. Finally, the most popular and pertinent method, using self-report, is described.

There are several methods used to assess performance anxiety in research and in practice, such as interviews, behavioral observations, and self-report. Semi-structured interviews with questions about individuals' symptoms and the degree of impairment they experience have been employed to identify performance anxiety and differentiate it from other types of anxiety disorders. For example, Marmorstein (2006) and Schwartz and colleagues (1999) used portions of the DISC-2.3 to assess adolescents' specific fears, separation anxiety, performance anxiety, and generalized anxiety.

Another method used for assessing performance anxiety is through behavioral observation, although few studies employ it, due to the fact that anxiety is an internalizing issue. In one example, Hook and colleagues (2013) included an observational measure of performance anxiety in their study, in conjunction with other measures. In the study, participants were given one minute to prepare a speech and then three minutes to give it. Two trained raters watched the

speeches afterwards and rated, among other things, each participant's level of anxiety based on what they had observed, from *no anxiety* (1) to *extreme anxiety* (7; Hook et al., 2013). The interclass correlation coefficient of the observational anxiety ratings was .78. The dearth of research utilizing behavioral observations of performance anxiety could be due to two main problems with this method. First, clearly defining what performance anxiety looks like in behavioral terms for observers is likely challenging, and any physical markers of performance anxiety may vary from person-to-person. Second, symptoms of performance anxiety that are observable to others likely do not accurately reflect the construct of performance anxiety. A person may have inner cognitions, emotional states, and physiological discomfort related to performance anxiety that are not easily observable to others. Therefore, observational methods are not likely to capture a person's level of performance anxiety, due to its nature as an internalizing problem.

A third method for assessing performance anxiety is through the use of self-reports, which, in contrast to behavioral observations, allow for measurement of the individual's own experience of performance anxiety. Self-report appears to be exceedingly popular in the literature exploring performance anxiety in specific areas such as testing, sports, public speaking, and musical performance (e.g. Brooks, 2014; Cheng et al., 2009; Hopko et al., 2005; Kenny, Fortune, & Ackerman, 2013). Self-reports used in these studies are sometimes applicable to multiple activities, such as the five-item adaptation of the Anxiety/Excitement Scale (Brooks & Schweitzer, 2011) used in Brooks' (2014) article; however, more activity-specific performance anxiety measures are also seen in this area of the literature, such as measures for sports performance anxiety and music performance anxiety (e.g. Cheng et al., 2009; Kenny et al., 2013). Self-report also seems to be a preferred method for evaluating performance anxiety when

it is considered to be a dimension of social anxiety disorder or social phobia (e.g. Holzman et al., 2014; Hughes et al., 2006; Iwase et al., 2000). For example, Mattick and Clarke's (1998) SPS and SIAS were created specifically to measure performance anxiety and social interaction anxiety, respectively, as dimensions of SAD or social phobia in adults.

Although some researchers and practitioners question the validity of self-reports, they have been found to be one of the most effective ways to gauge inner thoughts and emotional experiences (Zeidner, 2008). Some individuals may be particularly concerned about using self-report measures with children, but researchers such as Wagner, Abela, and Brozina (2006) have found that self-reports of children are not significantly discrepant from data gathered via an interview format, suggesting that children's self-reports should not be discounted as invalid simply due to their format. Further, it should be noted that self-report data are particularly important to collect when assessing the internal experiences of children and adolescents, because parents are sometimes unaware of internalizing symptoms that their children are experiencing (Merrell, 2007).

Self-Report Performance Anxiety Measures for Children and Adolescents

This section touches on the extant self-report measures that have been employed to assess performance anxiety among children and adolescents. The response modalities and psychometric information for six different measures of performance anxiety are described.

There are several self-reports that have been used to gauge performance anxiety as a dimension of social phobia among children and adolescents. The Visual Analog Scale for Anxiety—Revised (VAA-R; Bernstein & Garfinkel, 1992) has a short (3-item) Performance Anxiety scale. The VAA-R items consist of two unisex faces on either end of a scaling line. An upset face on the left side of the line is labeled "*Jittery Nervous*," and a calm face on the right is

labeled “*Steady*” (p. 225). For each item, children are asked to place a mark on the line where they feel their recent level of anxiety is for that particular statement. The distance, in centimeters, from the right endpoint of the line to the child’s mark is the child’s score on that item. Bernstein and Garfinkel investigated the psychometric properties of the VAA-R in a sample of clinic-referred 8 to 17-year-olds ($n = 86$) and community sample of non-referred 14 to 18-year-olds ($n = 1,089$). In support of the validity of the VAA-R Performance Anxiety scores, the authors noted that the scale’s scores could be used to differentiate between community and referred samples and that it had significant correlations with the Worry/Oversensitivity subscale scores on the Revised Children’s Manifest Anxiety Scale ($r = .30$), and the scores of the State Trait Anxiety Inventory for Children (STAI-C; Spielberger, 1973) State ($r = .31$) and Trait ($r = .35$) scales. However, the authors did not provide information about the reliability of the VAA-R Performance Anxiety scale’s scores.

March’s (2013) Multidimensional Anxiety Scale for Children—Second Edition—Self Report (MASC-2-SR) includes a four-item Performance Fears subscale under its Social Anxiety scale. The MASC-2-SR items have four response options (0 = *never*, 1 = *rarely*, 2 = *sometimes*, 3 = *often*). The MASC-2-SR normative sample consisted of 8 to 19-year-olds ($n = 1,800$). The MASC-2-SR manual states that CFAs provided evidence for the factor structure of the measure. The internal consistency reliability of the MASC-2-SR Performance Fears scores was $\alpha = .67$ for the full sample. The scores of the MASC-2-SR Performance Fears subscale had a test score stability of $r = .78$, using a subsample of the standardization sample ($n = 98$) with an average of 19.8 days between test times. The MASC-2-SR manual also cites convergent evidence for the validity of the Performance Fears subscale scores in the form of a significant correlation between it and the scores of the Conners Comprehensive Behavior Rating Scales-Self-Report (Conners

CBRS-SR; Conners, 2008) Social Phobia scale ($r = .56$).

The Social Phobia and Anxiety Inventory for Children (SPAI-C) has a seven-item Public Performance Factor as well. The SPAI-C consists of two types of items, both using three response choices (0 = *never or hardly ever*, 1 = *sometimes*, and 2 = *almost always or always*)—some items require children to note their level of distress in one situation with different groups of people (e.g. with boys and girls I know, with adults, etc.), and the remaining items ask children to note their level of distress in general without specifying a group of people that might be present. Beidel and colleagues (1995) investigated the psychometric properties of the SPAI-C with a sample of 8 to 17-year-olds ($n = 154$), some with previously diagnosed disorders and others who did not have diagnoses. The authors of the SPAI-C found factor analytical evidence for a Public Performance factor; they also noted that this factor could be used to differentiate between children with social anxiety versus normal controls and that the scores of the SPAI-C had a two-week test score stability of $r = .73$. No internal consistency reliability information was supplied by the authors for this factor.

The current measure of focus is the Performance Anxiety cluster on the Revised Children's Manifest Anxiety Scale—Second Edition (RCMAS-2, C. R. Reynolds & Richmond, 2008a). The RCMAS-2 Performance Anxiety cluster consists of 10 items rated on a dichotomous scale, using a *yes/no* format. C. R. Reynolds and Richmond (2008b) explored the structure and psychometric properties of the RCMAS-2 with a sample of 6 to 19-year-olds ($n = 2,368$). The authors did not supply information regarding the reliability or validity of the scores of the RCMAS-2 Performance Anxiety cluster. This cluster may be a promising tool for better understanding the nature of students' anxiety symptoms, screening for those at risk for social anxiety disorder, and helping determine whether a child or adolescent experiences only

performance fears, which would necessitate the addition of the DSM-5 performance-only specifier to a diagnosis of social anxiety disorder. Professionals who wish to intervene with those experiencing sub-threshold symptoms of social anxiety disorder may also find the information provided by this cluster to be useful.

History of the RCMAS-2

In this portion of the literature review the historical roots of the measure of focus (the RCMAS-2) are reviewed. There is a description of the source of the items for the first anxiety scale. The downward extension of this instrument for use with children is discussed. The various revisions of the measures leading to the RCMAS-2 are also described. Finally, the focus turns to the RCMAS-2 and research that has utilized it.

The RCMAS-2 can be traced back to the first self-report measure of psychological symptoms, the Minnesota Multiphasic Personality Inventory (MMPI; McKinley & Hathaway, 1943). The MMPI was a broadly used instrument that employed a series of questions using a true/false format and had many scales, but it lacked a separate anxiety scale. Janet Taylor selected MMPI items she believed were related to the behavioral, cognitive, emotional, and physiological aspects of anxiety and created the Manifest Anxiety Scale (MAS; Taylor 1953). Taylor believed that these items would measure what she called “manifest anxiety,” which was thought to be an indicator of a person’s level of drive or motivation to satisfy needs in the face of a possible threat (1951). The MAS originally consisted of 65 anxiety-related items, but it was later winnowed to 50; the response type remained *true/false* in keeping with the MMPI (Taylor, 1953). Taylor noted a test score stability coefficient of $r = .82$ over five months, and, in support of the validity of the MAS scores, she found that a group of psychiatric patients scored markedly higher than those in a control group.

Shortly after its advent, the MAS was extended downward for use with children in grades 4-6, and the resulting measure was named the Children's Manifest Anxiety Scale (CMAS; Castaneda, McCandless, & Palermo, 1956). The CMAS consisted of 42 MAS items that had been rewritten for younger readers and 11 new lie scale items. The CMAS response format was slightly modified from the MAS, in that it asked children to select "yes" or "no" in response to the items, rather than "true" or "false." The authors reported a one-week test-retest reliability of $r = .90$ for the anxiety scores and $r = .70$ for the lie scale scores (Castaneda et al.).

C. R. Reynolds and Richmond updated the CMAS later on and called it the Revised Children's Manifest Anxiety Scale (RCMAS; 1978). The RCMAS included 37 items with a *yes/no* response option written at a third grade reading level (C. R. Reynolds & Richmond, 1978). In response to research that had been conducted by Finch, Kendall, and Montgomery (1974) on the CMAS and an expanding body of literature suggesting that anxiety is a multidimensional construct, C. R. Reynolds and Richmond (1979) conducted an EFA on the RCMAS. The authors found evidence for three subscales underlying the Total Anxiety scale: Physiological Anxiety, Worry/Oversensitivity, and Social Concerns/Concentration, and these subscales came to be accepted and used in later literature. In contrast to the CMAS, the RCMAS used more developmentally appropriate language, had a shorter administration time, and its scores had higher reliability and validity (C. R. Reynolds & Paget, 1983).

The RCMAS was used with great regularity in both practice and research (Myers & Winters, 2002; Silverman & Ollendick, 2005). Silverman and Ollendick (2005) called the RCMAS "the most widely used and widely researched youth self-rating anxiety scale" (p. 387). Even when newer self-report anxiety measures were introduced in the 1990s, clinicians and researchers continued to use the RCMAS and debate whether the latest measures could supplant

it (for further discussion, see Myers & Winters, 2002; Seligman, Ollendick, Langley, & Baldacci, 2004). The RCMAS was not only used in the United States—it has been translated into German, Spanish, Portuguese, French, and Japanese for use in other cultures (e.g. Boehnke, Silbereisen, Reynolds, & Richmond, 1986; Cunha, Pinto Gouveia, & Céu Salvador, 2008; Richmond, Rodrigo, & de Rodrigo, 1988; Richmond, Sukemune, Ohmoto, Hawamoto, & Hamazaki, 1984; Turgeon & Chartrand, 2003). The validity and reliability of the RCMAS scores have been largely supported in several studies across different ethnicities and cultures, age groups, genders, and exceptionalities (e.g. Lee, Piersel, Friedlander, & Collamer, 1988; Mattison, Bagnato, & Brubaker, 1988; Pina, Little, Knight, & Silverman, 2009; C. R. Reynolds & Paget, 1981; Turgeon & Chartrand, 2003; Varela & Biggs, 2006). For example, Varela and Biggs (2006) explored the cross-cultural validity of the RCMAS with a sample including Mexican ($n = 53$), Mexican-American ($n = 46$), and White European American ($n = 51$) children ages 10 to 14. Varela and Biggs used CFAs and parceling and found evidence for the factorial invariance of the RCMAS scores across the three groups. They also found that the RCMAS Total Anxiety score and subscale scores had similar reliability coefficients across the three groups, which is an additional indicator of a lack of measurement bias across these groups.

The RCMAS-2

The most recent version of the RCMAS, the RCMAS-2, was published in 2008, with an aim of addressing concerns about the older measure's inadequately diverse standardization sample and the psychometric properties of its subscale scores (C. R. Reynolds & Richmond, 2008b; Stein, 2010). The main changes to the scale include an expansion from 37 to 49 items and the introduction of a 10-item Short Form and a 10-item Performance Anxiety cluster. The RCMAS-2 Total Anxiety scale, which measures a child's overall level of anxiety, gained 13 new

items for a total of 40 items. The Physiological Anxiety subscale, which gauges a child's physical symptoms of anxiety, gained one new item and now has a total of 12 items. The RCMAS Worry/Oversensitivity subscale, which measures a child's level of cognitive and emotional symptoms of anxiety, was renamed the "Worry" subscale, gained six new items, and now has a total of 16 items. The RCMAS Social Concerns/Concentration subscale, which measures a child's concerns about social interactions, relationships, and performing in front of others, was renamed the "Social Anxiety" subscale, gained six new items, and now has a total of 12 items. The remaining nine items on the RCMAS-2 make up the Defensiveness scale, which measures a child's willingness to report common flaws. The new RCMAS-2 Short Form and the Performance Anxiety cluster are both made up of combinations of items used on other subscales. The Short Form consists of three Physiological Anxiety items, four Worry items, and three Social Anxiety items. The Performance Anxiety cluster contains five Worry items and five Social Anxiety items.

C. R. Reynolds and Richmond (2008b) published the initial evidence for the reliability and validity of the scores of the RCMAS-2 Total Anxiety scale, its three anxiety (Physiological Anxiety, Social Anxiety, and Worry) subscales and its Defensiveness scale. Additional researchers have contributed evidence for the reliability and validity of the RCMAS-2 scores and those of the Urdu translation of the RCMAS-2 (Ahmad & Mansoor, 2011; Lowe, 2014a; 2014b; 2015; Lowe & Ang, 2016; Lowe, Ang, & Loke, 2011; Lowe, Grumbein, & Raad, 2011).

Lowe (2014a) examined the factor structure and factorial invariance of the RCMAS-2 with an independent sample of 2nd-12th grade public school students (n = 1,003). Lowe conducted CFAs and found that a five-factor structure, including three anxiety (Physiological Anxiety, Social Anxiety, and Worry) factors and two Defensiveness (Defensiveness I and II)

factors fit the data better than a three-factor model (i.e., one anxiety factor and two defensiveness factors). This five-factor structure matches that found by C. R. Reynolds and Richmond (2008b) during instrument development in which they performed EFAs to examine the RCMAS-2 factor structure. Lowe (2014a) also found evidence for configural, weak, and partial strong invariance for the RCMAS-2 across gender. The evidence for measurement invariance allowed for gender comparisons to be made, and the latent means of the females were found to be significantly higher than the males for all three anxiety subscales (Lowe, 2014a).

Lowe (2015) explored the psychometric properties of the RCMAS-2 Short Form using a sample of elementary and secondary school students. CFAs supported a modified one-factor structure for the Short Form. Multi-group CFAs provided evidence that the RCMAS-2 Short Form had configural, weak, and strong measurement invariance across gender, as well as configural, weak, and partial strong measurement invariance across age groups. Females and 12 to 19-year-olds had significantly higher latent means, compared to males and 7 to 11-year-olds, respectively. Convergent evidence for the validity of the RCMAS-2 Short Form was found as well: its scores had the expected moderate correlations with the scores of two test anxiety measures.

Lowe and Ang (2015) also explored the psychometric properties of the RCMAS-2 Short Form, but with a focus on its measurement invariance across gender and culture. The authors employed samples of 12 to 15-year-olds from the United States ($n = 342$) and from Singapore ($n = 661$) and examined the factor structure and measurement invariance of the RCMAS-2 Short Form with a series of CFAs. The one-factor model for the Short Form had adequate fit to the data across all subgroups of the sample (Singapore males, Singapore females, U.S. males, U.S. females, males combined, females combined, U.S. students, and Singapore students) supporting

the one-factor structure of this scale. The multi-group CFA results provided evidence for the Short Form's configural, weak, and strong invariance across gender and configural, partial weak, and partial strong measurement invariance across culture.

Following in the footsteps of the RCMAS, the RCMAS-2 has already been adapted for use in another culture (Ahmad & Mansoor, 2011). Ahmad and Mansoor translated the RCMAS-2 into Urdu and adapted the measure for use with children in Pakistan. The authors gave both versions of the RCMAS-2 to a bilingual sample of 13 to 15 year olds ($n = 40$) and found significant correlations ($r_s = .82$ to $.89$) between the Total Anxiety scores and the three anxiety subscale scores for the English version and the new translation. Ahmad and Mansoor also administered the Urdu version of the RCMAS-2 to a random sample of 6 to 19-year-old students ($n = 400$) and found support for the internal consistency reliability ($\alpha_s = .62$ to $.83$) and temporal stability over a 1-week period ($r_s = .85$ to $.94$) for the Total Anxiety scores and the three anxiety subscale scores.

The RCMAS-2 has also been used in published literature seeking convergent evidence for the validity of the scores of the measures (Lowe, 2014b; Lowe, Ang, et al., 2011; Lowe, Grumbein, et al., 2011). For example, Lowe (2014b) examined the reliability and validity of the scores of the Test Anxiety Measure for Adolescents (TAMA) with a group of 6th to 12th graders ($n = 688$). The author noted significant correlations of the expected strengths ($r_s = .44$ -.70) between the scores on the TAMA and the RCMAS-2 anxiety scales. Other studies have had similar findings with the scores of the RCMAS-2 anxiety scales and the Test Anxiety Scale for Elementary Students (TAS-E; Lowe, Grumbein, et al., 2011) with samples from the United States and from Singapore (Lowe, Ang et al., 2011).

Despite the fact that the RCMAS-2 anxiety scales and the Short Form have been

examined in the literature, very little research has been published that examines or even utilizes the RCMAS-2 Performance Anxiety cluster. Lowe and Reynolds (2011) performed EFAs on the RCMAS-2 Performance Anxiety cluster using the U.S. standardization sample and demonstrated the similarity of its one-factor structure across African American, Hispanic, and White students. To the author's knowledge, only one published study has examined the psychometric properties of the RCMAS-2 Performance Anxiety cluster (Ang et al., 2011), and no published studies have validated the factor structure of the RCMAS-2 Performance Anxiety cluster using CFAs.

Ang and colleagues (2011) set out to study whether the RCMAS-2 was an appropriate tool to assess children and adolescents in Singapore due to the fact that the RCMAS-2 and its norms were developed in the United States. The researchers administered the scale to 1,618 students in Singapore and examined the RCMAS-2 factor structure, and the reliability and validity of its scores. They concluded that the factor structure of the RCMAS-2 was replicated using EFA in the sample from Singapore. The researchers also reported internal consistency and temporal stability estimates for the scores of the RCMAS-2 Total Anxiety scale, its subscales, and the Performance Anxiety cluster. The internal consistency reliability estimates ranged from $\alpha = .68$ to $.86$ and the temporal stability estimates ranged from $r = .61$ to $r = .68$. Ang and colleagues (2011) contributed additional convergent evidence for the validity of the RCMAS-2 by finding correlations of the expected strength and direction between the participants' RCMAS-2 anxiety scores and their scores on the Behavior Assessment System for Children-Second Edition-Self-Report of Personality (BASC-2-SRP; C. R. Reynolds & Kamphaus, 2004) Anxiety scale and the Academic Expectations Stress Inventory (AESI; Ang & Huan, 2006). The authors also reported discriminant evidence for validity in the form of small, non-significant correlations between participants' RCMAS-2 anxiety scores with their scores on the Narcissistic Personality

Questionnaire for Children-Revised (NPQC-R; Ang & Raine, 2009), which measures the theoretically distinct construct of narcissism. However, Ang and colleagues (2011) did not examine convergent or discriminant evidence of validity for the RCMAS-2 Performance Anxiety cluster on its own. In sum, the RCMAS-2 manual does not provide information about the psychometric properties of the RCMAS-2 Performance Anxiety cluster and very little published research has included this cluster.

Relationships Between Performance Anxiety and Other Variables

In this portion of the literature review, the relationships between performance anxiety and other variables are explored. More specifically, this review first focuses on the relationship between gender and anxiety, gender and social anxiety, and gender and performance anxiety. Then, the focus turns to the relationship between age and anxiety, age and social anxiety, and age and performance anxiety.

Performance Anxiety and Gender. Research has shown that females report higher levels of anxiety than males (e.g. Castaneda et al., 1956; Gullone, King, & Ollendick, 2001; Huberty & Dick, 2006; Kirkcaldy, Furnham, & Siefen, 2009; Lowe, 2014a). Even in the initial study on the CMAS, Castaneda and colleagues (1956) noted that female 4th-6th graders reported significantly more anxiety than their male counterparts. This pattern appears to have weathered the test of time, and it has also been found in different age groups. For instance, in a recent study, Lowe (2014a) used the RCMAS-2 and found higher levels of self-reported anxiety among female 2nd-12th graders than males.

The literature on social anxiety and gender shows that females also experience more social anxiety than males (e.g. Aune & Stiles, 2009; Essau, Conradt, & Petermann, 1999; Inderbitzen-Nolan & Walters, 2000; La Greca & Lopez, 1998; Ranta et al., 2007; Wittchen,

Stein, & Kessler, 1999). Wittchen and colleagues (1999) used a sample of 14 to 24-year-olds ($n = 3021$) to study the prevalence, risk factors, and comorbidity of social anxiety in adolescents and young adults. The researchers used the M-CIDI to interview participants and determine whether they met the criteria for social phobia, then they followed up with them at 15 and 30 months. Among other findings, they reported that females had significantly higher prevalence rates of social phobia than males (9.5% vs 4.9%, respectively). In the same study, the authors also noted that social phobia tends to persist over a longer time period for females than males.

Overall, the findings on the relationship between gender and performance anxiety suggest that females tend to score higher on measures of this construct (see Table 1). Research has found this trend in the individual areas of music performance, testing situations, public speaking/performance, and sports (Abrahamsen et al., 2008; Harpell & Andrews, 2012; Lowe, 2014b; Osborne et al., 2005; Thomas & Nettelbeck, 2014). Similarly, when considering performance anxiety as a dimension of social phobia, some studies also have suggested that females are more likely to be affected by it (Marmorstein, 2006; Storch et al., 2004). Marmorstein (2006) used the DISC to interview 9 to 17-year-olds ($n = 1,295$) regarding their anxiety symptoms, and the authors found that 4.8% of females versus 3.9% of males fit the criteria for performance-focused social phobia. Storch and colleagues administered the SPAI-C to a sample of 13 to 17-year-old students ($n = 1,178$). They noted that females scored significantly higher than males on the Public Performance scale. In contrast to the above findings, Schwartz and colleagues (1999) employed interviews and direct observations to gauge 13-year-olds' generalized social anxiety, specific fears, separation anxiety, and performance anxiety, and they found no gender differences for levels of performance anxiety.

Table 1

Performance Anxiety and Gender Differences on Self Report Measures

	Performance Anxiety Type	Measure	Gender Difference
Abrahamsen et al., 2008	Sport	Sport Anxiety Scale-Norwegian (SAS-N; Smith, Smoll, & Schutz, 1990)	Somatic subscale $\eta^2 = .05$ Worry subscale $\eta^2 = .13$ Concentration Disruption subscale $\eta^2 = .03$
Harpell & Andrews, 2012	Test	English version of the German Test Anxiety Inventory (TAI-G; Hodapp & Benson, 1997)	Worry subscale $\eta^2 = .05$ Emotionality subscale $\eta^2 = .04$ Total Scale $\eta^2 = .02$
Lowe, 2014b	Test	Test Anxiety Measure for Adolescents (TAMA; Lowe, 2014b)	Cognitive Interference scale $d = .52$ Physiological Hyperarousal scale $d = .41$ Social Concerns scale $d = .30$ Task Irrelevant Behavior scale $d = .49$ Worry scale $d = .60$
Marmorstein, 2006	Performance-focused social phobia	Diagnostic Interview Schedule for Children-version 2.3 (DISC-2.3; Fisher et al., 1992)	Effect Size Not Available Percentage of sample with Performance focused social phobia Females: 4.8% Males: 3.9%
Osborne et al., 2005	Music Performance	Music Performance Anxiety Inventory for Adolescents (MPAI-A; Osborne et al., 2005)	MPAI-A Total scale $d = .42$
Storch et al., 2004	Public Speaking/Performance	Social Phobia and Anxiety Inventory for Children (SPAI-C; Beidel et al., 1995)	Public Performance scale $d = .28$
Schwartz et al., 1999	Public Speaking/Performance	Modules from the Diagnostic Interview Schedule for Children (Shaffer et al., 1989)	Effect Size Not Available No sex differences for performance anxiety found
Thomas & Nettlebeck, 2014	Music Performance	Music Performance Anxiety Inventory for Adolescents (MPAI-A; Osborne et al., 2005)	MPAI-A Total scale $d = .55$

Note. d = Cohen's d , η^2 = eta squared

Performance Anxiety and Age. The relationship between anxiety and age has not been conclusively determined at this time. For instance, the findings of Lowe (2015) and Kozina (2014) suggest that, when compared to children, adolescents report higher levels of anxiety overall. On the other hand, Olatunji and Cole (2009) and Gullone and colleagues (2001) found that adolescents reported less anxiety than children. Weems, Graham, Scott, Banks, and Russell (2013) noted these discrepant findings and constructed a study of anxiety and age so that 7 to 18-year-olds' (n = 1,099) different types of anxiety were measured on separate subscales, and they also controlled suppressor effects by running simultaneous regression analyses. These authors found that general anxiety had a significant positive association with age, as they hypothesized, and they recommended that future studies attend to possible suppressor effects and the multidimensionality of anxiety.

Similar to general anxiety, research findings regarding social anxiety's relationship with age have been mixed. The different age ranges of various studies may be obscuring an overall pattern, if one exists. Aune and Stiles (2009) used the SPAI-C to determine whether 6th through 9th grade students (n = 2,148) differed in clinically significant levels of social anxiety, and they found no age differences. In contrast, Essau and colleagues (1999) note that rates of social anxiety disorder increase with age—with the largest jump occurring from the 12 to 13-year-old age group to the 14 to 15-year old age group. Regarding the increasing report of social anxiety symptoms with age, Rao and colleagues (2007) suggest that although adolescents tend to report more symptoms on scales measuring social anxiety, their higher scores are due to their more mature ability to reflect on their own worries, rather than a truly higher level of social anxiety. Other researchers have found a different pattern, in which young adolescents (approximately 11 to 14-year-olds) have higher levels of self-reported social anxiety than older adolescents

(Inderbitzen-Nolan & Walters, 2000; Storch et al., 2004). Interestingly, in a recent study Miers, Blöte, Heyne, and Westenberg (2014) suggested that there are two developmental pathways related to social anxiety, and that those individuals who become entrenched in a pathway where they avoid social interactions are more likely to develop social anxiety as they grow older—so it may be that age is not necessarily associated with social anxiety unless a child or adolescent is on this avoidance trajectory.

In the realm of performance-focused social anxiety, its relationship with age has seldom been studied. It may be that findings related to the broader construct of social anxiety will apply to performance anxiety as well, but this remains an open question. Marmorstein (2006) studied the prevalence and comorbidity of different types of social phobia among 9 to 17-year-olds and found that 5.6% of children ages 12-14 met the required criteria, versus 2.9% of 9-11 year olds and 4.6% of 15-17 year olds. With regards to specific types of performances, both Harpell and Andrews (2012) and Storch and colleagues (2004) also noted some age differences in levels of anxiety (see Table 2). Harpell and Andrews found that 12-year-old participants had higher emotionality scale scores on a test anxiety inventory than 15-year-old participants. Storch and colleagues found that on average ninth graders had slightly higher scores than 10th graders on a public performance anxiety scale. Together the results from these three studies lend some support to the idea of an increase in performance anxiety coinciding with the young adolescent years, much like the results of Inderbitzen-Nolan and Waters (2000) and Storch and colleagues (2004) with reference to the broader concept of social anxiety.

Table 2

Performance Anxiety and Age or Grade Differences on Self Report Measures

	Performance Anxiety Type	Measure	Age/Grade Difference
Harpell & Andrews, 2012	Test	English version of the German Test Anxiety Inventory (TAI-G; Hodapp & Benson, 1997)	Emotionality subscale Significantly higher scores for age 12 versus age 15 $d = .73$
Marmorstein, 2006	Performance-focused social phobia	Diagnostic Interview Schedule for Children-version 2.3 (DISC-2.3; Fisher et al., 1992)	Effect Size Not Available Percentage of sample with Performance focused social phobia Ages 9-11: 2.9% Ages 12-14: 5.6% Ages 15-17: 4.6%
Storch et al., 2004	Public Speaking/Performance	Social Phobia and Anxiety Inventory for Children (SPAI-C; Beidel et al., 1995)	Public Performance Scale Higher scores for 9 th vs 10 th grade $d = .15$

Note. d = Cohen's d

Test Bias

This portion of the literature review explores test bias. First, test bias is defined and its importance is discussed. Second, the focus turns to explaining construct bias.

It is important to investigate whether a test is biased. An unbiased test or scale measures the level or presence of the variable of interest, and any differences between people's scores are due to the amount of the trait or variable a person possesses or experiences, rather than capturing systematic error due to their membership in a particular demographic group (C. R. Reynolds & Lowe, 2009). Biased measures can mislead practitioners with scores that are not a true reflection of the underlying construct of interest. These biased scores can contribute to decisions that are inappropriate in terms of screening, treatment, and/or educational placement.

There are several different types of test bias. C. R. Reynolds and Lowe (2009) describe bias in content validity, predictive validity, and construct validity. As they note, bias in content validity is concerned with whether the items on the test or scale are functioning the same way for different groups, and bias in predictive validity is concerned with whether a test's results are equally useful for predicting a related outcome for people in different groups. The study at hand will investigate whether construct bias is present in the RCMAS-2 Performance Anxiety cluster. Construct bias concerns whether the test in question measures the same construct in the same way across different groups of people. There are multiple ways to test a measure for construct bias, and researchers advise that multiple methods be used to provide evidence of a lack of construct bias (Keith et al., 1995; C. R. Reynolds & Lowe, 2009). Two approaches for testing construct bias are factor analysis and reliability coefficient comparisons.

Factor Analytic Methods to Assess Construct Bias

This section of the literature review discusses using factor analysis to assess for construct bias. It begins with a discussion of EFA and CFA methods. It continues by explaining CFA methods proposed for use in the current study. Then using the results from the CFA methods to determine whether latent means analysis can be performed to examine group differences is discussed. Finally, the section concludes with a discussion of previous studies that have assessed construct bias and latent mean differences using the RCMAS-2.

Both EFA and multi-group CFA have been employed to test for construct bias in measures. The method using EFA allows researchers to determine how similar the factor structure of a test is across groups; in contrast, the CFA method gauges how *different* the factor structure of a test is across groups (C. R. Reynolds & Lowe, 2009). Both of these methods help to ascertain whether a test is measuring different groups in the same way on the same construct,

and when this occurs the test is said to possess factorial invariance (Cicchetti, 1994). If a test does not have factorial invariance, then it is very challenging to compare test scores between groups, because researchers cannot assume that the test measures the same construct within each group (Vandenberg & Lance, 2000).

As described in M. R. Reynolds and Keith (2013), the first step of multi-group CFAs, otherwise known as multi-group mean and covariance structure analyses (MG-MACS), is to create a multi-group model that demonstrates adequate fit with the data across groups—this is called configural invariance. In configural invariance, the pattern of fixed and free parameters is the same between groups. After this, MG-MACS is used to determine whether there is a significant difference in the corresponding unstandardized factor loadings between groups. If there is not a significant difference in the corresponding unstandardized factor loadings, then weak factorial invariance is established. However, in order to compare scores across groups, further exploration must be undertaken. The next step in the process is to determine whether the corresponding factor loadings and the corresponding indicator means (i.e., intercepts or in this study thresholds) are relatively equal between the groups. If there is not a significant difference, then strong invariance is established. If strong factorial invariance is established, then comparisons between groups can be made (Meredith, 1993). The final test of measurement invariance determines whether there is a significant difference in the corresponding indicator residuals or error terms between the different groups. To test for strict invariance, constraints on the corresponding indicator residuals between groups and the previous model are imposed. This final type of measurement invariance is called strict factorial invariance, and the need to investigate strict factorial invariance is unclear. M. R. Reynolds and Keith (2013) discuss testing for strict factorial invariance and note that it is “most consistent with the definition of

measurement invariance” (p. 69), but sources such as Little (1997) imply that testing for strict factorial invariance is not necessary to examine latent mean differences.

Testing for Differences Between Groups Using Latent Means. As mentioned earlier, several studies have investigated differences in the observed scores of performance and/or test anxiety of different age and gender groups (e.g. Harpell & Andrews, 2012; Huberty & Dick, 2006; Marmorstein, 2006). However, it should be noted that an important precursory step to complete before examining differences between groups on a measure is establishing evidence for measurement invariance as described above. If the measure is not invariant across different groups, then comparisons between those groups on that variable can be misleading and inaccurate (C. R. Reynolds & Lowe, 2009).

In addition to this caveat regarding first establishing measurement invariance, some argue that comparing different groups’ observed mean scores is not the most accurate way to determine whether group differences are present. Sass (2011) argues that comparing groups’ latent mean scores on a construct is a much more effective method to gauge whether, on average, the groups differ on the amount of the construct of interest that they possess. Latent mean scores do not contain the random measurement error that is included in observed scores, so results of comparisons between latent scores should be purer.

Conveniently, there is a simple way to test for differences between the latent means of groups at the same time one is investigating the measurement invariance of an instrument or scale. M. R. Reynolds and Keith (2013) recommend simply referencing the significance tests for the latent means on the output for the strong factorial invariance model. They note that if there is a negative and significant difference between the latent means of the groups, then the reference group’s latent mean is higher than the other group; if there is a positive and significant

difference, then the other group's latent mean is higher than the latent mean of the reference group.

The RCMAS-2 and CFA Methods to Assess Construct Bias and Latent Mean Differences. At this time, it does not appear that there is a published study where the researchers have used CFA methods to investigate the RCMAS-2 Performance Anxiety cluster for evidence of construct bias or to compare the latent means of different groups. As described earlier, Lowe and Reynolds (2011) used EFA methods to assess the RCMAS-2 Performance Anxiety cluster for construct bias across ethnic groups. Also noted earlier, previous studies have used EFA and CFA methods to assess for construct bias and compare latent means on the three main RCMAS-2 anxiety factors (Ang et al., 2011; Lowe, 2014a) and the RCMAS-2 Short Form (Lowe, 2015; Lowe & Ang, 2016).

Internal Consistency Reliability and its use in Assessing Construct Bias

This portion of the literature review discusses a second approach to assessing construct bias via reliability methods. It begins with a general description of test score reliability and then provides more detailed information about internal consistency reliability. Finally, this section explains the two main reliability methods used for examining construct bias: the Feldt technique and the examination of confidence intervals surrounding the reliability coefficients.

In measurement, "reliability" refers to how consistently a test's scores are measuring something. There are several types of reliability including internal consistency, temporal stability, inter-rater, and parallel forms. Of all of these types of reliability, the present study is concerned mainly with the internal consistency reliability of the RCMAS-2 performance anxiety scores. Internal consistency reliability helps test-users gauge how well a test's items hang together. This type of reliability is often investigated through the calculation of Cronbach's

alpha, which correlates all possible split-halves of a test or scale measuring a construct and acts as an index for how highly related the scores are on different items (Cicchetti, 1994). For example, the scores on one item measuring depression should correlate somewhat with other items measuring depression, and when they do, it is considered to be evidence that the items are hanging together nicely to measure the same construct—a degree of internal consistency is present.

Reliability methods can be used to test a measure for construct bias. When using reliability methods, researchers calculate reliability coefficients for the scores of each group, and then compare them to determine whether the scores of the test are measuring different groups with the same amount of reliability or consistency (C. R. Reynolds & Lowe, 2009). An unbiased test's scores should have very similar reliability coefficients for different groups. Two main methods are used to compare reliability coefficients across groups: the Feldt technique and examination of the confidence intervals around the reliability coefficients for the different groups.

The Feldt Technique. The Feldt technique is one way of determining whether the difference between two groups' internal consistency reliability estimates is statistically significant (Feldt, 1969). This technique involves calculating an F statistic: the larger error variance is divided by the smaller error variance, and then the resulting number is compared to a critical F -value. When the calculated F is larger than the critical F , then the difference between the two reliability coefficients is considered statistically significant. If this result is found, then there is evidence for construct bias across the groups in question. However, due to the nature of statistical significance testing, it is often considered wise to also calculate an effect size for the difference between the groups. Examining the effect size helps researchers understand how

large of a difference exists between the groups, and this can range from a negligible difference to a large and meaningful difference.

Examination of Confidence Intervals. A second method for investigating the differences between groups' internal consistency reliability coefficients is to ascertain whether the confidence intervals (CIs) of the coefficients overlap. Lowe (2015) suggested that an overlap of the 95% CIs around two groups' reliability coefficients should be interpreted to mean that the reliability coefficients are sufficiently similar across groups. Research on the internal consistency reliability of the scores of the RCMAS-2 Performance Anxiety cluster is lacking in general and has not yet addressed the question of construct bias via reliability methods.

The RCMAS-2 and Reliability Methods to Assess Construct Bias. As previously noted, C. R. Reynolds and Richmond's (2008b) RCMAS-2 manual did not include information about the internal consistency reliability for the scores of their newly-proposed Performance Anxiety cluster. However, only Ang and colleagues (2011) reported an internal consistency reliability estimate for the RCMAS-2 Performance Anxiety cluster's scores. In addition, no known studies have used the Feldt technique or a 95% CI overlap of the internal consistency reliability estimates to assess the RCMAS-2 Performance Anxiety cluster for evidence of construct bias. Lowe (2014a), summarized above, employed the 95% CI overlap method to assess the three main anxiety factors of the RCMAS-2 for evidence of construct bias.

Convergent Evidence for Validity

Evidence for the validity of a test's scores can come in many forms. The following section of the literature review discusses other methods to assess for the validity of the scores of a measure. The section concludes with an examination of the extant evidence for the validity of the RCMAS-2 Performance Anxiety cluster scores.

Validity is concerned with whether a test is assessing the construct it purports to measure. There are several different types of evidence for test score validity that are discussed in psychological measurement. Convergent evidence for validity is established when a test's scores correspond somewhat with other tests that measure a similar construct. Having convergent evidence for the validity of a measure's scores allows for greater confidence that the measure is gauging the construct that it aims to. Researchers accumulate convergent evidence for the validity of a measure's scores by correlating the scores of one sample on two tests that purport to measure similar constructs. If, for example, the scores have a positive and moderate correlation, then there is convergent evidence for the validity of the scores of the measure in question.

The RCMAS-2 and Convergent Evidence for Validity. In stark contrast to the volume of information provided for the Total Anxiety score and the measure's anxiety subscales, the manual for the RCMAS-2 does not include evidence for the validity of the Performance Anxiety cluster's scores (C. R. Reynolds & Richmond, 2008b). No known studies, published or unpublished have sought evidence for the validity of the scores of the RCMAS-2 Performance Anxiety cluster. However, several studies and the RCMAS-2 manual have contributed validity evidence for the scores of the RCMAS-2 Total Anxiety scale, the anxiety subscales, and the Short Form (e.g. Ang et al., 2011; Lowe, 2014a; Lowe, 2015; C. R. Reynolds & Richmond, 2008b). Notably, studies such as Lowe (2015) found convergent evidence of validity for the RCMAS-2 scores using scores from measures of test anxiety. As Lowe (2015) notes, both manifest anxiety (measured by the RCMAS-2) and test anxiety can be considered forms of trait anxiety, so scores on measures of these two constructs should be related. Similar to this, authors such as Huberty and Dick (2006) and Kenny (2005) believe performance anxiety to be a larger construct that includes test anxiety, which suggests that scores of measures of test anxiety and

performance anxiety should be somewhat related.

In light of these previous links between test anxiety and performance anxiety, it was expected that the scores of the RCMAS-2 Performance Anxiety cluster would be positively and moderately correlated with the scores of test anxiety measures. More specifically, the highest correlations were expected to be between the RCMAS2 Performance Anxiety cluster scores and the scores of similar dimensions (i.e., social concerns and worry) on the test anxiety measures.

Summary

“Performance anxiety” is not recognized as a separate diagnostic category in the DSM-5, and this term has been used to refer to several different constructs. Occasionally researchers refer to test anxiety as performance anxiety (e.g. Powell, 2004a). Others see performance anxiety as an overarching category whose members include issues such as test anxiety, public speaking anxiety, and musical performance anxiety (e.g. Huberty & Dick, 2006; Kenny, 2005). Still other researchers and practitioners view performance anxiety as a dimension of social phobia or social anxiety disorder (e.g. Hook et al., 2013). It is unclear which type of performance anxiety the RCMAS-2 Performance Anxiety cluster is meant to measure, but examination of its items suggest that they align with the definition of performance anxiety as a dimension of social anxiety disorder.

Prevalence rates for performance anxiety and social anxiety vary widely. The rates for children meeting criteria for the performance anxiety dimension of social phobia range from .7% to 4.3% (Burstein et al., 2011; Marmorstein, 2006). The rates for children experiencing a clinically significant level of social anxiety disorder have an even wider range: from .58% to 37% (Costello et al., 1996; Epkins, 2002). The negative effects of performance anxiety include more anticipatory anxiety, less confidence, and greater heart rate increases surrounding public

speaking activities; and higher self-reported hyperarousal, more somatic symptoms, a greater focus on one's own distress, and more post-event processing in general (e.g. Boone et al., 1999; Holzman et al., 2014; Hughes et al., 2006; Levin et al., 1993; May et al., 2014). In addition, performance anxiety and social anxiety among children and adolescents have been found to be associated with several other mental health diagnoses (e.g. Fehm et al., 2008; Marmorstein, 2006).

Assessment for performance anxiety takes three main forms: interviews, observations, and/or self-reports. The most popular research method for gauging performance anxiety appears to be via self-report measures. Self-reports have been used to measure performance anxiety in specific areas such as testing, musical performance, and sports (Brooks, 2014; Cheng et al., 2009; Hopko et al., 2005; Kenny et al., 2013); they have also been employed to measure performance anxiety as a dimension of social phobia or social anxiety disorder (Holzman et al., 2014; Hughes et al., 2006; Iwase et al., 2000). Despite the doubts of some, self-reports have been supported as an effective method for assessing internalizing symptoms (Zeidner, 2008).

There are three main methods that have been used to measure performance anxiety symptoms: interview, observation, and self-report. Self-reports appear to be the most popular and widely used method of gauging performance anxiety. Many self-reports or their subscales have been used to measure the performance anxiety of children and adolescents, including the RCMAS-2 Performance Anxiety cluster.

The RCMAS-2 has its roots in the MMPI (McKinley & Hathaway, 1943). Items from the MMPI were used to create the MAS, which was extended downward for use with children (CMAS; Castaneda et al., 1956). C. R. Reynolds and Richmond later updated the CMAS and called it the RCMAS, and then they updated it again in 2008 and named it the RCMAS-2.

Among other changes, the RCMAS-2 now includes a 10-item Performance Anxiety cluster, but no psychometric information was provided in the manual regarding this new cluster (C. R. Reynolds & Richmond, 2008b).

Some differences in the levels of performance anxiety between genders and age groups have been suggested in the extant literature. Girls generally report more symptoms of performance anxiety than boys (e.g. Marmorstein, 2006; Storch et al., 2004). However, Schwartz and colleagues' (1999) interview and observational methods revealed no gender differences in performance anxiety among 13-year-olds. Research is still needed to fully explore age differences with regards to performance anxiety, but some research demonstrates an early-adolescent peak in social and performance anxiety symptoms (Inderbitzen-Nolan & Waters, 2000; Marmorstein, 2006; Storch et al., 2004).

Test bias is important to investigate because bias, or systematic error in test scores that is due to group membership, can result in misleading scores that do not accurately reflect the construct of interest. Both factor analytic and reliability methods can be employed to investigate construct bias (C. R. Reynolds & Lowe, 2009). When CFA methods are used to assess construct bias, the results can also be employed to determine if there are differences in the latent means of the groups of focus. Reliability methods for assessing construct bias include the use of the Feldt technique and a simple examination for overlap in the 95% confidence intervals of the groups' internal consistency reliability coefficients.

It is also important to explore other evidence for the validity of test scores. Calculating correlations between scores on the cluster with scores on similar measures can help provide convergent evidence for the validity of a test's scores. Literature suggests that the constructs of test anxiety and performance anxiety should be related, and that it is appropriate to investigate

the convergent evidence for validity of performance anxiety using measures of test anxiety (e.g. Huberty & Dick, 2006; Kenny, 2005).

CHAPTER III

Method

This chapter contains details regarding the study's participants, measures, and procedures. It concludes with an outline of the data analytic techniques that were used to answer the research questions.

Participants

The data used for this study are archival. The data were collected from 1,003 students; however, one student had missing data, so this student's data were deleted before analyses. The participants were enrolled in regular education classrooms in twenty-four public schools in the Midwest. The sample was 45.7% male ($n = 458$) and 54.3% female ($n = 544$). The participants ranged in age from 7 to 19, with a mean age of 12.02 ($SD = 2.67$). The students were enrolled in grades 2 through 12, with a mean grade level of 6.51 ($SD = 2.61$). The racial/ethnic makeup of the total sample was 79.6% ($n = 798$) White/Caucasian, 10.8% ($n = 108$) Other Race/Ethnicity, 3.7% ($n = 37$) Native American/American Indian, 3.2% ($n = 32$) Hispanic/Latino, 2.2% ($n = 22$) Black/African American, and .5% ($n = 5$) Asian American. The demographic composition of the participants mirrored that of their school districts. Information about each participant's socioeconomic status was not collected. At the schools that participated in the study, the average percentage of students receiving free or reduced lunch was 40.4%.

Gender Groups. The male subsample ($n = 458$) ranged in age from 7 to 19, with a mean age of 11.84 ($SD = 2.64$). The male students were enrolled in grades 2 through 12, with a mean grade level of 6.29 ($SD = 2.59$). The racial/ethnic makeup of the male subsample was 80.8% ($n = 370$) White/Caucasian, 12.0% ($n = 55$) Other Race/Ethnicity, 2.4% ($n = 11$) Native American/American Indian, 2.2% ($n = 10$) Hispanic/Latino, 2.0% ($n = 9$) Black/African

American, and 0.7% ($n = 3$) Asian American.

The female subsample ($n = 544$) ranged in age from 7 to 19, with a mean age of 12.17 ($SD = 2.70$). The female students were enrolled in grades 2 through 12, with a mean grade level of 6.71 ($SD = 2.62$). The racial/ethnic makeup of the female subsample was 78.7% ($n = 428$) White/Caucasian, 9.7% ($n = 53$) Other Race/Ethnicity, 4.8% ($n = 26$) Native American/American Indian, 4.0% ($n = 22$) Hispanic/Latino, 2.4% ($n = 13$) Black/African American, and 0.4% ($n = 2$) Asian American.

Age Groups. The subsample of younger students ($n = 441$) was 49.2% male and 50.8% female. The younger subsample ranged in age from 7 to 11 years of age, with a mean age of 9.66 ($SD = 1.27$). The younger students were enrolled in grades 2 through 7, with a mean grade level of 4.23 ($SD = 1.33$). The racial/ethnic makeup of the younger subsample was 81.6% ($n = 360$) White/Caucasian, 12.2% ($n = 54$) Other Race/Ethnicity, 3.2% ($n = 14$) Native American/American Indian, 1.6% ($n = 7$) Hispanic/Latino, 0.9% ($n = 4$) Black/African American, and 0.5% ($n = 2$) Asian American.

The subsample of older students ($n = 561$) was 43.0% male and 57.0% female. The older subsample ranged in age from 12 to 19 years, with a mean age of 13.87 ($SD = 1.92$). The older students were enrolled in grades 5-12, with a mean grade level of 8.31 ($SD = 1.87$). The racial/ethnic makeup of the older subsample was 78.1% ($n = 438$) White/Caucasian, 9.6% ($n = 54$) Other Race/Ethnicity, 4.1% ($n = 23$) Native American/American Indian, 4.5% ($n = 25$) Hispanic/Latino, 3.2% ($n = 18$) Black/African American, and 0.5% ($n = 3$) Asian American.

Measures

This study employed data collected with three self-report measures, the Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2; C. R. Reynolds & Richmond,

2008a), the Test Anxiety Scale for Elementary Students (TAS-E; Lowe, Grumbein, et al., 2011), and the Test Anxiety Measure for Adolescents (TAMA; Lowe, 2014b). Participants' RCMAS-2 Performance Anxiety cluster scores were the primary focus of most of the research questions, and the TAS-E scores (for elementary-aged students) or the TAMA scores (for middle school and high school students) were employed to investigate the convergent evidence of validity for the RCMAS-2 Performance Anxiety cluster's scores.

Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2). The RCMAS-2 is written for children from 6 to 19 years of age and its subscale scores measure a student's self-reported levels of Physiological Anxiety, Worry, and Social Anxiety. As mentioned above, the RCMAS-2 also has a 10-item cluster designed to measure performance anxiety. A higher score on a particular RCMAS-2 subscale indicates more symptoms or problems in that area. The norms for the RCMAS-2 were developed using a sample of 2,368 students whose demographic characteristics approximated the representation found in the 2000 U.S. Census. C. R. Reynolds and Richmond (2008b) reported coefficient alphas, temporal stability estimates, and convergent and discriminant evidence of validity for the three RCMAS-2 subscale scores, but no reliability or validity information for the scores of the Performance Anxiety cluster. Ang and colleagues (2011) reported an internal consistency reliability estimate for the RCMAS-2 Performance Anxiety cluster scores of $\alpha = .77$ and a 2-week temporal stability estimate of $r = .63$.

Test Anxiety Scale for Elementary Students. The TAS-E, developed by Lowe, Grumbein, and Raad (2011), is a 30-item self-report measure of test anxiety. The TAS-E is written for children in elementary school in grades 2-6 and it allows for the calculation of a Total Test Anxiety score, as well as four test anxiety subscales: Physiological Hyperarousal, Social

Concerns, Task Irrelevant Behavior, and Worry. Factor analytical evidence supports the TAS-E structure of four factors with one overarching, higher-order factor (Lowe, Grumbein, et al., 2011). The authors reported internal consistency reliability coefficients of $\alpha = .81$ to $.94$ and temporal stability estimates of $r = .83$ to $.91$ over a 1- to 5-week test-retest interval for the TAS-E scores. Convergent evidence for the validity of the TAS-E scores was found in the form of moderate to strong correlations between the TAS-E Total Test Anxiety scores and the Total scores of the TASC and the RCMAS-2, as well as small to moderate correlations between the scores of the various subscales of the TAS-E and the TASC and the subscale scores of the RCMAS-2 (Lowe, Grumbein, et al., 2011). Likewise, these researchers found very small correlations between the TAS-E scores and the RCMAS-2 Defensiveness scale scores, supporting discriminant evidence of validity for the TAS-E scores. Scores on this measure were used to provide convergent evidence of validity for the RCMAS-2 Performance Anxiety cluster scores, because they purport to measure similar constructs.

Test Anxiety Measure for Adolescents. The TAMA, developed by Lowe (2014b), is a 44-item self-report measure of test anxiety. The TAMA is written for adolescents, grades 6 through 12 and consists of five test anxiety scales: Cognitive Interference, Physiological Hyperarousal, Social Concerns, Task Irrelevant Behavior, and Worry. Factor analytical evidence supports the TAMA's five-factor structure (Lowe, 2014b). Lowe reported convergent evidence of validity for the TAMA scores in the form of moderate to strong correlations between the TAMA scores and the BASC-2-SRP Test Anxiety scores and the scores of similar dimensions on RCMAS-2. In addition, Lowe found very small correlations between the TAMA scores and the RCMAS-2 Defensiveness scale scores, supporting discriminant evidence of validity for the TAMA scores. Scores on this measure were used to examine convergent evidence of validity for

the RCMAS-2 Performance Anxiety cluster scores, because they purport to measure similar constructs.

Procedures

The data collection procedures are described below. Approval to analyze the archival data was secured from the University of Kansas Human Subjects Committee at Lawrence (HSC-L; see Appendix A).

After HSC-L approval was secured, research requests were submitted to public school districts in the surrounding area. With the permission of the districts and building principals, a testing date was scheduled at each school. Teachers were asked to send each student home with a packet containing a parent information letter explaining the purpose and anticipated benefits of the study, and two copies of the informed consent form. If parents agreed to have their student participate, they kept one copy of the consent form for their records, and returned a signed copy to the school.

On the day of the testing appointment after student assent was obtained, a demographic information sheet and the measures were distributed to children whose parents consented to their participation. The researchers administered the measures in small group settings or on an individual basis and the standardized test administration was followed for each measure. Each student completed age-appropriate measures, with 40.98% ($n = 411$) of the participants completing the TAS-E and 59.02% ($n = 592$) completing the TAMA in the present study. The researchers counterbalanced the measures to help avoid order effects.

Data Analysis

This portion of the chapter details the plans for analyzing the data. First, procedures are described for examining the data for missing entries. Next, information is provided regarding the

analyses used to test for construct bias via factor analytical methods and make latent mean comparisons across gender and age groups. Then reliability methods of testing for construct bias are discussed. Finally, there is a description of the procedures used for calculating estimates for convergent evidence of validity. SPSS (Version 23.0; IBM Corp., 2015) was used to screen the data, calculate validity estimates, and calculate internal consistency reliability estimates. Hand calculation was used for the Feldt technique. Microsoft Excel was used to create the 95% CIs for the coefficient alphas. Mplus, Version 7.11 (Muthén & Muthén, 1998-2015) was employed for the CFAs, the tests of invariance, and the latent mean comparisons.

Data Screening. Descriptive analyses were performed to identify any missing data points. One Performance Anxiety cluster item was missing for one participant. The participant was a male in the older sub-group. Because the amount of missing data was less than 5% of the total data, listwise deletion was used to trim the data set (Allison, 2009). This single participant's data were deleted from the file, resulting in a total sample size of 1,002.

Full Sample Confirmatory Factor Analysis. As a precursory step to the construct bias analyses, a CFA was performed with the total sample to validate the one-factor solution for the Performance Anxiety cluster that was found via EFA methods by Lowe and Reynolds (2011). The weighted least squares (WLSMV) estimator served as the parameter estimator. The following fit indices were used to evaluate the fit of the one-factor model for these different groups: a chi-square test, the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root mean square error of approximation (RMSEA). In accordance with Hu and Bentler's (1999) guidelines, values of close to .95 for both the CFI and TLI, and less than .06 for the RMSEA were used to indicate a good model fit in addition to a non-significant chi-square. CFI and TLI values of .90 (Bentler & Bonett, 1980) coupled with an RMSEA value of .08 or less (Browne &

Cudeck, 1992) indicated an adequate model fit.

Construct Bias Analyses. Several different analyses were performed to investigate whether gender and age bias exists on the RCMAS-2 Performance Anxiety cluster. These analyses included both factor analytical methods and reliability methods.

Factor Analytical Methods. Tests of measurement invariance were conducted to determine whether the RCMAS-2 performance anxiety construct is equivalent across gender and age. Before conducting these tests of measurement invariance where a series of nested models were tested, single group CFAs were performed for males, females, younger students (ages 7-11), and older students (ages 12-19) using the robust weighted least squares (WLSMV) estimator as the parameter estimator. The fit indices and guidelines noted above were also used to evaluate the fit of the one-factor model for these different groups.

Next, tests of measurement invariance were conducted as described in M. R. Reynolds and Keith (2013). Configural invariance were tested across the groups of interest (i.e., males versus females and 7-11 year olds versus 12-19 year olds) to determine if a multi-group model fits the groups of interest adequately. In order to accomplish this, a multi-group model was estimated and its fit was tested. Where the fit indices indicated an adequate model fit, then configural invariance was considered supported (M. R. Reynolds & Keith, 2013).

After this step, weak factorial invariance was tested to explore whether factor loadings were relatively equal across groups (M. R. Reynolds & Keith, 2013). This was accomplished by constraining the factor loadings for both groups to be equal. When the new model with constrained factor loadings did not have a significantly worse fit than the configural model, then weak invariance was considered supported.

Finally, strong factorial invariance was tested to determine whether the corresponding

indicator means (i.e., intercepts or in this study, thresholds) were relatively equal between groups. This was tested by holding the thresholds of the different groups equal to each other, in addition to leaving in place the constraints of the previous model (M. R. Reynolds & Keith, 2013). When the fit of the model was not significantly worse than that of the weak invariance model, then strong factorial invariance was supported. If strong factorial invariance was supported this meant that any differences in the groups' means were being accounted for by actual differences in the groups' levels of the construct of interest (M. R. Reynolds & Keith, 2013).

Several different criteria can be used to test for measurement invariance. Large sample sizes may cause the χ^2 change test to be inappropriately sensitive and rigorous (Cheung & Rensvold, 2002). So, rather than using this metric, Cheung and Rensvold recommend looking for a less than .01 decrease in the CFI. Similar to Cheung and Rensvold's recommendations, Chen (2007) recommends looking for an increase of less than .015 in the RMSEA value. Finally, Little (1997) recommends investigating whether the RMSEA value of the more restricted model is within the 90% CI of the less restricted model.

Latent Means Analyses. Latent means analyses were performed to determine whether different groups of interest possessed different levels of performance anxiety as measured by the RCMAS-2. Before latent means were compared, strong factorial invariance was established using the methods outlined above (Meredith, 1993). After this condition was satisfied, the latent means analyses proceeded using the output from the strong factorial invariance model. In this model, the latent mean of the reference group (males in the gender analysis, and 7-11 year olds in the age analysis) was constrained, while that of the other group (females and 12-19 year olds) was allowed to vary. If the difference between the groups was positive and significant, then the

other group's latent mean was interpreted to be significantly higher than the latent mean of the reference group. If there was a negative and significant difference, then this meant that the reference group's latent mean was significantly higher than the other group's.

Reliability Methods. Reliability methods help determine if the internal consistency reliability estimates are similar across groups. First, Cronbach's alpha was calculated for the RCMAS-2 Performance Anxiety cluster scores of the full sample and the gender and age subsamples. Following the guidelines of Cicchetti and Sparrow (1990), a coefficient alpha of .70 or higher was considered an "adequate" level of internal consistency reliability. Once the internal consistency reliability estimates were calculated, the Feldt technique (1969) was used to test whether there were statistically significant differences between the different reliability estimates of the different groups. The resulting observed F values were compared to the appropriate critical F values. If the observed F exceeded the critical F , then this indicated that the internal consistency reliability estimates for those two groups were different from one another and that construct bias may be present. Conversely, if the observed F did not exceed the critical F , then this indicated that the internal consistency reliability estimates for those groups were not different from one another. Effect sizes for the differences between the internal consistency reliability estimates for the different gender and age groups were also calculated. In accordance with Cohen's (1992) guidelines, an effect size of .20 was considered small, an effect size of .50 was considered medium, and an effect size of .80 was considered large. Examining the effect sizes enables greater understanding of the size and meaningfulness of the difference between the groups, rather than only drawing conclusions from the results of statistical significance testing.

The second reliability method involved the calculation of the 95% CIs around the internal

consistency reliability estimates for the different groups' RCMAS-2 Performance Anxiety cluster scores. Lowe (2014a) noted that if there is overlap of the confidence intervals for the different groups, then this implies that the internal consistency reliability coefficients are similar across groups; however, if there is no overlap between the 95% CIs of the groups, then this suggests the presence of construct bias.

Convergent Evidence of Validity. Convergent evidence of validity for the RCMAS-2 Performance Anxiety cluster scores was investigated via Pearson r correlations with the TAS-E and TAMA scores (depending on whether students are in elementary or secondary school). Although there are not hard and fast rules, Cohen's (1988) guidelines regarding the interpretation of correlation size were used: a correlation of .10 was considered small, a correlation of .30 was considered moderate, and correlation of .50 was considered large.

Summary

Archival data collected from 1,003 7 to 19 year olds enrolled in regular education was screened for missing data, and one participant was removed from the data set. CFAs were conducted to determine the structure of the Performance Anxiety cluster for the total sample and the different gender and age groups. The factor analytical method for investigating construct bias was used to test for factorial invariance across gender and age groups. Configural, weak, and strong factorial invariance were investigated sequentially by conducting tests of measurement invariance, and recommendations from Cheung and Rensvold (2002), Chen (2007), and Little (1997) were used to determine if there were significant changes in model fit from a less to a more restrictive model. Where strong factorial invariance was established, as recommended by Meredith (1993), the latent means of different gender and age groups were compared. The internal consistency reliability of the cluster was also examined with the calculation of

Cronbach's alpha coefficient for the full sample, as well as the gender and age subsamples, and then reliability methods were used to assess the RCMAS-2 Performance Anxiety cluster for construct bias. Within the reliability methods, the Feldt technique was employed to determine whether there was a significant difference between the internal consistency reliability coefficients across gender and age groups. The second reliability method involved the calculation of the 95% CIs for the sub-groups' internal consistency reliability estimates, and an examination for any overlap. Finally, the convergent evidence of validity for the RCMAS-2 Performance Anxiety cluster scores was investigated using Pearson r correlations with the TAS-E and the TAMA.

SPSS (version 23, IBM Corp., 2013) was used for data screening, and the calculation of coefficient alphas and Pearson r correlations. The Feldt technique was calculated by hand. The construction of the 95% CIs for the coefficient alphas was performed in Microsoft Excel. Mplus, Version 7.31 (Muthén & Muthén, 1998-2015) was employed for all research questions requiring factor analyses and the latent means analyses.

CHAPTER IV

Results

The following chapter describes the results of the analyses. First, CFAs were performed to determine whether a one-factor model could be supported for the RCMAS-2 Performance Anxiety cluster. Next, the possibility of construct bias across gender and age groups was examined via multi-group CFAs. Then latent means comparisons were performed to determine whether there were gender or age differences in the level of performance anxiety reported on the cluster. Subsequently, the internal consistency reliability of the Performance Anxiety cluster scores was examined. Next, the possibility of construct bias across gender and age groups was examined via reliability methods. Finally, the RCMAS-2 Performance Anxiety cluster scores were correlated with those from the TAS-E and TAMA to determine if they provided convergent evidence of validity. The results are organized by the research questions posed.

Research Question 1

To answer the first research question, of whether the single factor structure of the Performance Anxiety cluster would be supported via CFA, a CFA was performed on the responses of the total sample first using the WLSMV estimator. The fit was considered “good” if the CFI and TLI were close to .95, the RMSEA was less than .06, and the chi-square was not significant (Hu & Bentler, 1999). Significant chi-square results were considered less telling in the context of this research because the sample sizes of these analyses were large, and as Brown (2015) notes, large sample sizes are known to unduly inflate the value of the chi-square statistic. The fit of the model was considered to be “adequate” if the CFI and TLI values were .90 or greater and the RMSEA was less than .08 (Bentler & Bonett, 1980; Browne & Cudeck, 1992). Results from the total sample CFAs are displayed in Table 3.

Table 3

Fit Indices for the Confirmatory Factor Analyses of the Revised Children's Manifest Anxiety Scale -Second Edition Performance Anxiety Cluster for the Total Sample (n = 1,002)

Model	WLSMV χ^2	df	CFI	TLI	RMSEA [90%CI]
1 factor (unmodified)	481.554***	35	.920	.897	.113 [.104, .122]
1 factor (with one correlated error)	297.771***	34	.953	.938	.088 [.079, .097]
1 factor (with two correlated errors)	173.399***	33	.975	.966	.065 [.056, .075]
2 factor (unmodified)	446.996***	34	.926	.902	.110 [.101, .119]
2 factor (with one correlated error)	292.276***	33	.954	.937	.089 [.079, .098]
2 factor (with two correlated errors)	174.491***	32	.975	.964	.067 [.057, .077]

Note. WLSMV χ^2 = Means- and Variance-adjusted Weighted Least Squares Chi-square; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; *** $p < .001$

The unmodified one-factor model provided a poor model fit to the data (see Table 3). Standardized coefficients ranged from .60 to .86, which are adequate according to Brown's (2015) recommendation of .30 or greater for adequate factor loadings (see Table 4). After examining the modification indices, a large modification index value (i.e. 203.76) was identified

Table 4
Standardized Factor Coefficients for the Unmodified and Modified 1 and 2-factor Models for the Revised Children's Manifest Anxiety Scale-Second Edition Performance Anxiety Cluster for the Total Sample

Item No.	1-factor (unmodified)	1-factor (with 1 correlated error	1-factor (with 2 correlated errors)	2-factor (unmodified)	2-factor (with 1 correlated error)	2-factor (with 2 correlated errors)
3	.86	.70	.71	.87	.62	.71
1	.82	.64	.65	.83	.65	.65
7	.80	.82	.83	.84	.83	.83
10	.76	.78	.79	.79	.80	.79
5	.72	.74	.64	.74	.75	.64
6	.72	.75	.76	.76	.76	.76
9	.71	.73	.74	.72	.74	.74
8	.70	.72	.62	.72	.73	.62
2	.63	.64	.65	.65	.65	.65
4	.60	.62	.63	.61	.62	.63

for Item 1 with Item 3. In addition to having a very large modification index, these two items have very similar meanings (to paraphrase: I'm scared of students laughing at me at school, and I'm scared of others laughing at me). As Byrne (1994) notes, re-specification of a CFA model may proceed if the change to the model is supported by both statistical evidence (i.e. modification indices) and substantive evidence (i.e. logical relations between items and/or scales). In this case, both statistical and substantive evidence for model re-specification were present, so the errors for Items 1 and 3 were allowed to correlate in the subsequent model. The modified one-factor model with one correlated error also had a poor fit (see Table 3). Standardized coefficients for this model were adequate and ranged from .62 to .82 (see Table 4). After examining the modification indices of the modified one-factor model with one correlated error, another large modification index value (132.30) was identified for Item 5 with Item 8. These items also have very similar meanings (to paraphrase: I fear presenting to others, and I fear making statements to groups), so their errors were allowed to correlate, in accordance with Byrne's criteria noted above. The modified one-factor model with two correlated errors had an adequate fit (see Table 3). Standardized coefficients for this model were adequate and ranged from .62 to .83 (see Table 4). The modified one-factor model with two correlated errors is displayed in Figure 1.

Next, a two-factor model was examined, with the six items from the RCMAS-2 Social Anxiety subscale on one factor and the four items from the RCMAS-2 Worry subscale on a second factor. The unmodified two-factor model fit poorly (see Table 3). Standardized coefficients for this model were adequate and ranged from .61 to .87 (see Table 4). Moreover, the standardized coefficient between the two factors was large (.89), which suggests that a one-factor model may be a better fit. After examining the modification indices, again the index for

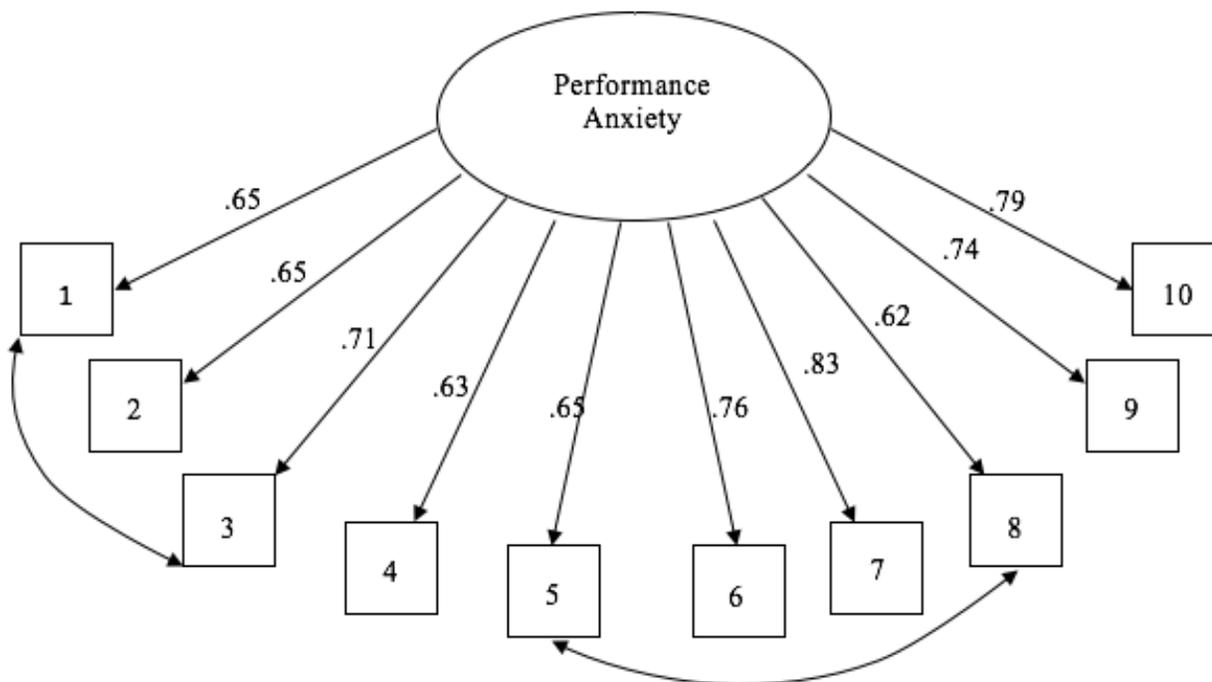


Figure 1. Modified 1-factor confirmatory factor measurement model for the 10-item Revised Children's Manifest Anxiety Scale-Second Edition Performance Anxiety Cluster

Item 1 with Item 3 was identified as large (180.35), so these errors were allowed to correlate, because Byrne's (1994) aforementioned stipulations were met. The modified two-factor model with one correlated error had a poor fit (see Table 3). Standardized coefficients for this model were adequate and ranged from .62 to .83 (see Table 4). The standardized coefficient between the two factors was large (.95). After examining the modification indices, the index for Item 5 with Item 8 was identified as large (125.99), just as in the one-factor model. Due to the fact that Byrne's requirement for both statistical and substantive evidence could be met, the errors of those items were allowed to correlate. The modified two-factor model with two correlated errors had an adequate fit (see Table 3). Standardized coefficients for this model were adequate and ranged from .62 to .83 (see Table 4). The standardized coefficient between the two factors was large (1.00).

In order to compare the fit of the unmodified one-factor and two-factor models and the modified one-factor model with two correlated errors and the modified two-factor model with two correlated errors, chi-square difference tests were performed. First, the fit of the unmodified two-factor model was compared to that of the unmodified one-factor model, and results showed that the unmodified one-factor model fit worse ($\Delta \text{WLSMV}\chi^2 (1) = 32.85, p < .001$). Then the fit of modified two-factor model was compared to that of the modified one-factor model, and results showed that the modified one-factor model did not fit worse ($\Delta \text{WLSMV}\chi^2 (1) = 0.00, p = .99$).

Multiple pieces of evidence support the selection of the modified one-factor model with two correlated errors as the best model for these data. First, the two correlated errors added to the model could have been predicted a priori due to the similar wording of Items 1 and 3 and Items 5 and 8. Second, high standardized coefficients were observed between the two factors in all three of the two-factor models tested. Third, the modified one-factor model with two correlated errors is the more parsimonious model for these data.

Research Question 2

Question 2a. In order to begin testing for construct bias across gender groups using CFA methods, the fit of the one-factor model with two correlated errors was tested with males and females. Fit indices for the one-factor model with two correlated errors for the male and female groups are shown in Table 5. An adequate model fit for the modified one-factor model with two correlated errors was found for males and females (see Table 3). Standardized coefficients were adequate for males and females, and they ranged from .54 to .80 for males and .61 to .85 for females (see Table 6).

Table 5

Fit Indices for the Modified One-Factor Model with Two Correlated Errors of the Revised Children's Manifest Anxiety Scale-Second Edition Performance Anxiety Cluster for Males and Females

Group	WLSMV χ^2	df	CFI	TLI	RMSEA [90% CI]
Males ($n=458$)	90.895***	33	.977	.968	.062 [.047, .077]
Females ($n=544$)	109.814***	33	.972	.962	.065 [.052, .079]

Note. WLSMV χ^2 = Means- and Variance- adjusted Weighted Least Squares Chi-square; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; *** $p < .001$

Because acceptable model fit was found for both males and females, tests of measurement invariance were performed across gender. As noted above, a non-significant change in the chi square, a less than .01 decrease in the CFI, a less than .015 increase in the RMSEA, and an RMSEA value for the more restricted model falling within the 90% CI of the less restricted model were determined to support measurement invariance (Chen, 2007; Cheung & Rensvold, 2002; Little, 1997). In cases where these indices conflicted, the preponderance of the evidence was used to determine whether measurement invariance was supported. Table 7 shows the results of tests of configural, weak, and strong invariance across gender groups. Configural invariance, which suggests that the same items load onto the same factors for the two different groups, seemed tenable across gender (see Table 7). Weak measurement invariance across males and females also seemed tenable (Δ WLSMV χ^2 (9) = 17.527, $p = .04$; Δ CFI < -.01; Δ RMSEA < .015; RMSEA of .057 fell within the 90% CI of the null model), suggesting that the

factor loadings were relatively similar for males and females. Strong measurement invariance across gender appeared tenable ($\Delta\text{WLSMV } \chi^2(9) = 13.792, p = .13; \Delta\text{CFI} < -.01; \Delta\text{RMSEA} < .015; \text{RMSEA of } .055$ fell within the 90% CI of the null model), suggesting that the thresholds for each item were relatively similar across gender groups.

Table 6

Standardized Factor Coefficients for the Modified One-factor Model with Two Correlated Errors for Males (n = 458) and Females (n = 544) on the Revised Children's Manifest Anxiety Scale-Second Edition Performance Anxiety Cluster

Item No.	Males	Females
6	.80	.71
7	.79	.85
3	.79	.64
10	.77	.80
9	.74	.73
1	.69	.61
2	.66	.61
5	.65	.62
8	.60	.61
4	.54	.68

Table 7

*Results of Tests of Measurement Invariance Across Gender on the Revised Children's Manifest Anxiety Scale-Second Edition**Performance Anxiety Cluster*

Model	WLSMV χ^2	df	Δ WLSMV χ^2	Δ df	p	CFI	Δ CFI	TLI	RMSEA [90%CI]	Δ RMSEA
Configural Invariance	200.360***	66	-	-	-	.974	-	.965	.064 [.054, .074]	-
Weak Invariance	195.597***	75	17.527	9	.04	.977	.003	.972	.057 [.047, .066]	-.007
Strong Invariance	209.907***	84	13.792	9	.13	.976	-.001	.974	.055 [.045, .064]	-.002

Note. WLSMV χ^2 = Means- and Variance-adjusted Weighted Least Squares Chi-square; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; *** $p < .001$

Table 8

Fit Indices for the Modified One-Factor Model with Two Correlated Errors of the Revised Children's Manifest Anxiety Scale-Second Edition Performance Anxiety Cluster for Younger and Older Students

Group	WLSMV χ^2	df	CFI	TLI	RMSEA [90% CI]
Younger ($n=441$)	68.717***	33	.980	.973	.050 [.033, .066]
Older ($n=561$)	153.646***	33	.969	.958	.081 [.068, .094]

Note. WLSMV χ^2 = Means- and Variance- adjusted Weighted Least Squares Chi-square; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; *** $p < .001$

Question 2b. In order to begin testing for construct bias across age groups using CFA methods, the fit of the one-factor model with two correlated errors was tested with the younger (ages 7 to 11) and older (ages 12 to 19) subgroups. Fit indices for the one-factor model with two correlated errors for the younger and older subgroups are shown in Table 8. A good model fit for the modified one-factor model was found for younger students and an adequate model fit was found for older students (see Table 8). Standardized coefficients were adequate for the younger and older students, and they ranged from .60 to .78 for the younger group and .60 to .88 for the older group (see Table 9).

Next, tests of measurement invariance were performed across age groups. The same criteria noted in the previous section were used to determine whether measurement invariance was supported. Table 10 shows the results of tests of configural, weak, and strong invariance across age groups.

Configural invariance between younger and older students appeared tenable, suggesting that the same items loaded onto the same factor for older and younger students (see Table 10). Next, weak measurement invariance was tested. Despite the RMSEA value of .057 not falling within the 90% CI of the null model, weak measurement invariance across the younger and older age groups appeared tenable based on the preponderance of the evidence ($\Delta\text{WLSMV } \chi^2(9) = 9.483, p = .39; \Delta\text{CFI} < -.01; \Delta\text{RMSEA} < .015$), which suggested that the factor loadings are relatively equivalent for younger and older students. Strong measurement invariance across age groups was also supported ($\Delta\text{WLSMV } \chi^2(9) = 8.686, p = .47; \Delta\text{CFI} < -.01; \Delta\text{RMSEA} < .015$; RMSEA of .054 within 90% CI of null model), suggesting that the thresholds for each item were similar across age groups.

Table 9

Standardized Factor Coefficients for the Modified One-factor Model with Two Correlated Errors for Younger (n =441) and Older (n =561) Age Groups on the Revised Children's Manifest Anxiety Scale-Second Edition Performance Anxiety Cluster

Item No.	Younger	Older
7	.78	.88
10	.74	.82
6	.71	.79
9	.69	.76
5	.66	.63
2	.66	.64
3	.65	.76
8	.64	.60
4	.63	.62
1	.60	.68

Table 9. Standardized Factor Coefficients for the Modified One-factor Model with Two Correlated Errors for Younger (n =441) and Older (n =561) Age Groups on the Revised Children's Manifest Anxiety

Research Question 3

Question 3a. Due to the fact that strong measurement invariance across gender groups was supported, latent means were examined within the output for the strong measurement invariance model. The latent mean of the reference group (females) was greater than that of the comparison group (males; see Table 11). This finding is in agreement with the results of

Table 10

*Results of Tests for Measurement Invariance Across Age on the Revised Children's Manifest Anxiety Scale-Second Edition**Performance Anxiety Cluster*

Model	WLSMV χ^2	df	Δ WLSMV χ^2	Δ df	p	CFI	Δ CFI	TLI	RMSEA	RMSEA [90%CI]	Δ RMSEA
Configural Invariance	221.354***	66	-	-	-	.973	-	.963	.069	[.059, .079]	-
Weak Invariance	197.132***	75	9.483	9	.39	.979	.006	.975	.057	[.047, .067]	-.012
Strong Invariance	207.671***	84	8.686	9	.47	.979	.000	.977	.054	[.045, .064]	-.003

Note. WLSMV χ^2 = Means- and Variance-adjusted Weighted Least Squares Chi-square; CFI = Comparative Fit Index; TLI = Tucker-

Lewis Index; RMSEA = Root Mean Square Error of Approximation; *** $p < .001$

Marmorstein (2006) and Storch and colleagues (2004), who also found that girls reported higher levels of performance anxiety than boys.

Question 3b. Due to the fact that strong measurement invariance across age groups was supported, latent means between the younger and older age groups were also examined. The latent mean of the reference group (older students) was significantly greater than that of the comparison group (younger students; see Table 11). This finding appears to align with Marmorstein's (2006) results, which suggested that more 12 to 14-year-olds and 15 to 17-year-olds met criteria for performance-focused social anxiety than children ages 9-11.

Table 11

Standardized Latent Mean Estimates for the Reference Groups on the Revised Children's Manifest Anxiety Scale-Second Edition Performance Anxiety Cluster

	Estimate	Standard Error (SE)	Estimate/SE
Females	.55***	.08	6.89
Older Students	.23**	.07	3.27

Note. ** $p < .01$, *** $p < .001$

Research Question 4

Cronbach's coefficient alpha was calculated for the total sample ($r = .82$) and each of the sub-groups (i.e., males, females, younger age group, older age group). The coefficient alphas for the sub-groups ranged from .80 to .83 (see Table 12). All estimates of internal consistency reliability were greater than .70 for both the total sample and sub-groups, which is the threshold that Cicchetti and Sparrow (1990) note should be met for acceptable internal consistency

reliability for the scores of assessment instruments.

Table 12

Coefficient Alphas and the 95% Confidence Intervals (CI) for the Revised Children's Manifest Anxiety Scale-Second Edition Performance Anxiety Cluster for the Total Sample and Subgroups

Groups	Coefficient Alpha	95% CI
Total Sample	.82	[.81, .84]
Males	.81	[.77, .84]
Females	.81	[.79, .84]
Younger	.80	[.76, .83]
Older	.83	[.81, .85]

Research Question 5

Question 5a. Next, the possibility of gender bias on the RCMAS-2 Performance Anxiety cluster was explored using the Feldt technique and an examination of whether the 95% CIs around the internal consistency reliability estimates for males and females overlapped. The Feldt technique did not suggest the presence of bias $F(457, 543) = 1.02, p = .43, d = .06$. The critical value for F with 457 and 543 degrees of freedom is 1.16, which was not exceeded by the observed F value. Furthermore, the effect size was negligible. In addition, the CIs for males and females overlapped, indicating that the internal consistency reliability estimates for these two groups are fairly similar (see Table 12). Taken together, the non-significant Feldt technique results, its negligible effect size, and the overlapping CIs suggest that gender bias is not present on the RCMAS-2 Performance Anxiety cluster.

Question 5b. The possibility of age bias on the RCMAS-2 Performance Anxiety cluster was explored using the Feldt technique and an examination of whether the 95% CIs of the internal consistency reliability estimates for younger and older students overlapped. The Feldt technique suggested the presence of bias, $F(440, 560) = 1.98, p = .02$, which exceeded the critical F value (440, 560) of 1.16, but the effect size ($d = .07$) was negligible. An effect size of this magnitude suggested that the actual difference between the internal consistency reliability estimates was not meaningful. In addition, the CIs for younger and older students overlapped (see Table 12), suggesting a lack of age bias. In all, the findings of the reliability methods (Feldt technique and 95% CI overlap) suggest that age bias is not present on the RCMAS-2 Performance Anxiety cluster.

Research Question 6

The convergent evidence of validity for the RCMAS-2 Performance Anxiety cluster scores was examined by determining the relationship between the Performance Anxiety cluster scores and the scores of scales measuring test anxiety. Pearson's r correlation coefficients were calculated between the scores of the Performance Anxiety cluster and the scores of the TAS-E and TAMA scales. Cohen's (1988) guidelines were used to describe the magnitude of each correlation: a correlation of .10 was considered small, a correlation of .30 was considered moderate, and correlation of .50 was considered large.

With regards to the TAS-E scales, moderate correlations were found between the scores of the Performance Anxiety cluster and the scores of the TAS-E Social Concerns ($r = .41$), Task Irrelevant Behavior ($r = .45$), and Physiological Hyperarousal scales ($r = .48$). Large correlations were found between the scores of the Performance Anxiety cluster and the scores of the TAS-E Total ($r = .60$) and Worry scales ($r = .57$). The TAS-E Worry, Social Concerns, and

Total scores were predicted to have the highest correlations with the RCMAS-2 Performance Anxiety cluster. The results showed that the Worry and Total Test Anxiety scores were, in fact, the most closely related to the Performance Anxiety cluster scores, but that the scores of the Social Concerns scale actually had the weakest relationship with those of the Performance Anxiety cluster.

Regarding the TAMA scales, moderate correlations were found between the scores of the Performance Anxiety cluster and the scores of the TAMA Task Irrelevant Behavior scale ($r = .40$). Large correlations were found between the scores of the Performance Anxiety cluster and the scores of the TAMA Social Concerns ($r = .57$), Worry ($r = .57$), Physiological Hyperarousal ($r = .50$), and Cognitive Interference scales ($r = .51$). In accordance with hypotheses, the scores of the TAMA Social Concerns and Worry scales had the highest correlations with those of the RCMAS-2 Performance Anxiety cluster.

Summary

This chapter described the results of the analyses completed to answer the research questions posed. First, the results of CFAs and chi-square difference tests supported a modified one-factor model with two correlated errors for the RCMAS-2 Performance Anxiety cluster. Next, the results of multi-group CFAs suggested that the Performance Anxiety cluster does not demonstrate construct bias across gender or age groups. Due to the fact that strong measurement invariance was established across both gender and age, latent means were examined. The latent means of the females and the older students were found to be higher than those of the males and the younger students, respectively.

Subsequently, the internal consistency reliability coefficients for the Performance Anxiety cluster scores were calculated for the total sample and each of the sub-groups; these

coefficients indicated adequate internal consistency reliability according to Cicchetti and Sparrow (1990). Next, the possibility of construct bias across gender and age groups was examined via reliability methods. The Feldt technique, its effect size, and the 95% CI overlap technique suggested a lack of gender bias. With regards to age bias, the Feldt technique suggested bias, but its effect size and the 95% CI overlap technique suggested a lack of age bias. Therefore, the preponderance of the evidence suggests that age bias is not present on the Performance Anxiety cluster.

Finally, the RCMAS-2 Performance Anxiety cluster scores were found to correlate with the scores of the TAS-E and TAMA scales to a moderate or large degree, suggesting convergent evidence of validity. Contrary to expectations, the TAS-E Social Concerns scores had the lowest correlation with the RCMAS-2 Performance Anxiety cluster scores, in comparison to the correlations between the scores of the Performance Anxiety cluster and the other TAS-E scales. In line with the hypotheses, the TAS-E Worry and Total Test Anxiety scores as well as the TAMA Worry and Social Concerns scores had higher correlations with the Performance Anxiety cluster scores, in comparison to the correlations with the scores of other TAS-E and TAMA scales.

CHAPTER V

Discussion

In this chapter, the results of the study are discussed. Each research question is reviewed, answered, and connected to the extant literature, where possible. Limitations, research implications and future research directions, and practical implications are then considered.

Research Question 1

The first research question was whether a single-factor structure would be supported for the RCMAS-2 Performance Anxiety cluster. In order to answer this question, a series of CFAs were performed with the total sample. One-factor and two-factor unmodified and modified models were examined. Modifications made to the models consisted of statistically and logically supported correlated errors, as suggested by Byrne (1994). The two logically and statistically supported correlated errors, the high standardized coefficients between the two factors in the two-factor model, and the consideration of parsimony all supported a modified one-factor model with two correlated errors.

The finding of a one-factor structure for the RCMAS-2 Performance Anxiety cluster is in accordance with previous research. Although there are few studies that have included the Performance Anxiety cluster, Lowe and Reynolds (2011) found a single-factor structure for this cluster using EFA methods with the U.S. standardization sample for the RCMAS-2. It is promising that in the current study a one-factor model was again determined to provide the best fit, despite employing different methods and a different sample than Lowe and Reynolds. The present study adds to the evidence that a one-factor model is the best fit for the RCMAS-2 Performance Anxiety cluster.

Research Question 2

The second research question asked whether CFA methods would reveal evidence for construct bias across gender or age on the RCMAS-2 Performance Anxiety cluster. After determining that the one-factor model with two correlated errors provided an adequate fit for each of the sub-groups (males, females, younger students, older students), tests of measurement invariance were performed. Results showed that configural, weak, and strong invariance were supported across both gender groups and age groups. This suggests that for each of the groups the same items were loading onto the same factor, the factor loadings were relatively similar, and the thresholds for each of the items were comparable. In all, the results of the CFAs suggested no gender or age bias on the Performance Anxiety cluster.

Reynolds and Lowe (2011) studied the possibility of bias on this cluster, but they examined whether there was bias across ethnic groups, and they performed EFAs. Together these two studies suggest that factor analytical methods support a lack of gender, age, and ethnic bias on the Performance Anxiety cluster. In other words, the extant factor analytical findings suggest that this cluster is measuring the same construct in the same way across age, gender, and ethnic groups.

Research Question 3

The third research question was whether there would be differences in the latent means of the different gender and age groups. In order to answer this question, the output for the strong factorial invariance models was examined to determine if there were statistically significant differences between the latent means of the gender and age groups. The results showed that the latent mean of the females was greater than that of the males on the Performance Anxiety cluster, and that the latent mean of the older group (ages 12-19) was greater than that of the younger

group (ages 7-11) on the Performance Anxiety cluster. In other words, females possessed more of the latent construct measured on the Performance Anxiety cluster than males, and the same was true for older students in comparison to younger students.

With regards to gender, the present findings align with some of the published research using other measures and conceptualizations of performance anxiety. Marmorstein (2006) and Storch and colleagues (2004) also found higher levels of self-reported performance anxiety in females, as compared to males. However, the present study does not agree with the findings of Schwartz and colleagues (1999), who used interview and observational methods to measure 13-year-olds' generalized social anxiety, specific fears, separation anxiety, and performance anxiety. Schwartz and colleagues found no gender differences for levels of performance anxiety. Possible explanations for the difference between the findings of Schwartz and colleagues and those of the present study are the difference in assessment methods used and their use of a sample of 13-year-olds. The RCMAS-2 Performance Anxiety cluster may capture different elements of performance anxiety in comparison to the interviews and observations used by Schwartz and colleagues in their study. The lack of a gender difference found among 13-year-olds by Schwartz and colleagues may not extend to other age groups, such as those included in the present study. Furthermore, the present finding of females reporting higher levels of performance anxiety is also in alignment with broader research findings regarding anxiety in general. Many studies have found that females report higher levels of anxiety than males (e.g. Castaneda et al., 1956; Kirkcaldy, Furnham, & Siefen, 2009; Lowe, 2014a), beginning as early as age six (Reynolds, 1998).

With regards to the present finding of the older (12 to 19-year-old) group of students having higher levels of performance anxiety than the younger (7 to 11-year-old) group of

students, this finding adds to a murky area of the literature. The extant research is unclear regarding whether there are age differences on performance anxiety, and if so, where they lie. Marmorstein (2006) found that, in comparison to 9 to 11-year-olds and 15 to 17-year-olds, their 12 to 14-year-old age group had the highest percentage of children meeting criteria for performance-focused social phobia, and Storch and colleagues (2004) noted that in their sample, 9th graders had significantly higher scores than 10th graders on the SPAI-C Public Performance scale. Together, this previous research could suggest that there is an early-adolescent peak for performance anxiety, and the current research may not contribute to this topic due to its binary split of younger/older students. However, Marmorstein also showed that greater percentages of 12 to 14-year-olds and 15 to 17-year-olds met criteria for performance-focused social phobia, in comparison to 9 to 11-year-olds, which fits with the current research by suggesting that older students tend to experience more performance anxiety.

Research Question 4

The fourth research question asked whether the RCMAS-2 Performance Anxiety cluster scores would have adequate internal consistency reliability. Cronbach's coefficient alpha was calculated for the total sample and all sub-groups. All of the estimates obtained were greater than Chicchetti and Sparrow's (1990) .70 cutoff for acceptable internal consistency reliability ($r_s = .80$ to $.83$). The internal consistency reliability of the scores of the Performance Anxiety cluster was previously cited as .77 by Ang and colleagues (2011), who employed a sample of students from Singapore. Together, both of these studies provide evidence that the Performance Anxiety cluster's scores possess adequate internal consistency reliability.

Research Question 5

The fifth research question was whether reliability methods would reveal evidence for

construct bias across gender or age groups on the RCMAS-2 Performance Anxiety cluster. The Feldt technique, effect sizes, and 95% CIs were calculated to help answer this question. A non-significant Feldt statistic, a negligible effect size, and overlapping 95% CIs suggested a lack of bias. The preponderance of the evidence was used to determine the outcome when these indices did not all agree. The results suggested that neither gender nor age bias were present on the Performance Anxiety cluster. The present study is the first to investigate construct bias on the Performance Anxiety cluster using reliability methods; however, these findings align with the results of the multi-group CFAs discussed earlier, and they lend additional evidence toward the assertion that the cluster is measuring the same thing in the same way across gender and age groups.

Research Question 6

The sixth research question asked whether convergent evidence for the validity of the scores of the Performance Anxiety cluster could be supported. Correlation coefficients were calculated for the scores of the Performance Anxiety cluster and both the scores of the TAS-E and TAMA scales to determine the relationship of these scores to one another. It was hypothesized that the scores of the TAS-E Total scale and Worry and Social Concerns subscales and the scores of the TAMA Worry and Social Concerns subscales would have the highest correlations with the scores of the Performance Anxiety cluster. All of the scores of the TAS-E scale and subscales and the TAMA scales were at least positive and moderately correlated with those of the Performance Anxiety cluster. This can be seen as convergent evidence for the validity of the scores of the Performance Anxiety cluster.

In accordance with predictions, the scores of the TAS-E Total and Worry subscales, as well as the scores of the TAMA Social Concerns and Worry subscales showed the strongest

relationship with those of the Performance Anxiety cluster. This supports convergent evidence for the validity of the scores of the Performance Anxiety cluster.

Contrary to predictions, in comparison to the other TAS-E subscales, the scores of the TAS-E Social Concerns subscale had the lowest correlation with the scores of the Performance Anxiety cluster. This finding is intriguing because, theoretically, the Social Concerns element of test anxiety, as measured by the TAS-E, should align fairly closely with a measure that gauges the performance anxiety component of social anxiety. Even more puzzling is that the scores of the Social Concerns subscale on the adolescent measure, the TAMA, were highly related to those of the Performance Anxiety cluster. This could be taken to mean that performance anxiety may look slightly different across ages, with the performance anxiety of the more peer-concerned adolescents possessing a larger element of social concern; however, the results of CFA and reliability methods suggest that the Performance Anxiety cluster measures the same construct in the same way across younger and older age groups. This finding could also be due to the fact that the items on the TAS-E Social Concerns subscale and the TAMA Social Concerns subscale have different content. Relative to the Social Concerns subscale on the TAS-E, the Social Concerns subscale on the TAMA includes fewer items regarding students' concerns about what their parents will think or do if the student performs poorly on a test. Instead, the TAMA Social Concerns subscale items have more of a focus on students' concerns about what their *peers* will think or do if the student performs poorly on a test (P. Lowe, personal communication, February 27, 2016). The RCMAS-2 Performance Anxiety cluster also has items asking about students' concerns about their peers' reactions to their performance in the classroom or in front of groups, but no items addressing concerns about parental reactions. Therefore, it appears that the items of the TAMA Social Concerns subscale align more closely with the items on the Performance

Anxiety cluster, in comparison to the items of the TAS-E Social Concerns subscale.

Limitations

The present research has limitations. The sample, while large and representative of the schools from which it drew participants, is not nationally representative. This means that the current results may not generalize to other populations outside of the Midwest. Furthermore, the sample had relatively few participants at the older end of the age range. Ideally, the distribution of students would have allowed for the examination of age differences among a young, middle, and older age group. Future studies could use a nationally representative sample stratified by age and examine age differences in these three groups on the Performance Anxiety cluster.

In addition, the present study did not explore the possibility of gender and age bias in the RCMAS-2 Performance Anxiety cluster with all possible methods. Reynolds and Lowe (2009) describe several procedures for examining bias in content validity and predictive validity, in addition to construct validity. In the present study, CFA methods, the Feldt technique, and the overlap of 95% CIs of internal consistency reliability estimates were used to explore the possibility of gender and age bias in construct validity; however, some methods mentioned by Reynolds and Lowe, such as EFA and test-retest reliability were not employed. Future research could test the Performance Anxiety cluster for bias in content validity and predictive validity, as well as use additional techniques to explore bias in construct validity.

Future Research Directions

The results of this study point toward several avenues of future research. As mentioned, researchers may be interested in using additional methods to explore bias across age and gender on the RCMAS-2 Performance Anxiety cluster. Test-retest reliability methods may support the present findings, or they may suggest the presence of construct bias. In addition, future research

could explore content and/or predictive bias across gender and age groups on the Performance Anxiety cluster. For example, item response theory could be used to examine content bias on the Performance Anxiety cluster, and using the equivalence of validity coefficients method could be used to assess predictive bias on the Performance Anxiety cluster (Reynolds & Lowe, 2009). Along similar lines, future research should explore the possibility of content, construct, and predictive validity bias across ethnicity, socio-economic status, and nationality. Although Lowe and Reynolds (2011) already have found evidence for a lack of ethnic bias in construct validity for the RCMAS-2 Performance Anxiety cluster using EFA methods, research using additional techniques would provide even more confidence in a lack of bias on the cluster.

A second area for future research might be to replicate the current study using three age groups, rather than two. This study would help add to the literature surrounding performance anxiety's relationship to age. As previously noted, other research has suggested a peak of performance anxiety during early adolescence and then a decrease in performance anxiety (Marmorstein, 2006; Storch et al., 2004). Due to the constraints of the current sample, this question could not be probed in the present study.

A third research avenue would be to further explore the relationships of the RCMAS-2 Performance Anxiety cluster's scores with the scores of other measures. The present study compared the scores of the cluster and test anxiety self-reports. However, future research might seek to establish discriminant evidence of validity for the scores of the Performance Anxiety cluster. In order to explore this question, researchers might calculate correlations between the scores of the Performance Anxiety cluster and the scores of a theoretically unrelated construct, such as aggression. Additionally, it would be important to clarify how well the Performance Anxiety cluster can differentiate performance anxiety from other types of anxiety, such as the

broader constructs of social anxiety or general anxiety. To answer this question, researchers might correlate the scores of the cluster with scores of measures of multiple dimensions of anxiety, including performance anxiety. Theoretically, the scores of the RCMAS-2 Performance Anxiety cluster should be related to all of the dimensions of anxiety, but most strongly related to other performance anxiety measures. Researchers could also investigate whether the RCMAS-2 Performance Anxiety cluster can differentiate between different clinical groups, such as children and adolescents diagnosed with the performance-only subtype of social anxiety disorder versus children diagnosed with a generalized anxiety disorder.

Practical Implications

The research at hand has several practical implications. This research supplies much-needed information regarding the reliability and validity of the scores of the RCMAS-2 Performance Anxiety cluster. Previously, very little was known about the structure of this cluster or the properties of its scores. The present research supplies additional evidence for the one-factor structure of the cluster, internal reliability coefficient estimates for the scores of this cluster with a U.S. sample, evidence for a lack of gender and age bias on the cluster, and convergent evidence for the validity of the scores of the cluster. This information is vital to both researchers and practitioners seeking self-report measures of students' performance anxiety. The results of this study suggest that the RCMAS-2 Performance Anxiety cluster is a promising tool that practitioners can be more comfortable using in practice and research, because there is now evidence that the cluster measures the same, unitary construct in a similar way across age and gender groups, the internal consistency reliability of its scores is adequate, and its scores are positively related to the scores of measures of a similar construct.

Conclusion

The present study provides information about the RCMAS-2 Performance Anxiety cluster. Results of CFAs supported a modified one-factor model with two correlated errors for the Performance Anxiety cluster. Both multi-group CFAs and reliability methods supported a lack of construct bias across gender and age groups. Females and older students were found to have higher latent means on the Performance Anxiety cluster than males and younger students, respectively. Internal consistency reliability coefficients for the Performance Anxiety cluster scores were found to be adequate (see Cicchetti & Sparrow, 1990). Finally, the RCMAS-2 Performance Anxiety cluster scores were positively correlated to a moderate or large degree with the scores of the TAS-E and TAMA scales, supporting convergent evidence of validity. Despite limitations, the present research provides useful information about the RCMAS-2 Performance Anxiety cluster and its scores, and it suggests that practitioners and researchers may be able to employ the Performance Anxiety cluster in the future.

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APPENDIX A

HSC-L Letter of Approval



APPROVAL OF PROTOCOL

June 11, 2015

Jamie McGovern
jmcgover@ku.edu

Dear Jamie McGovern:

On 6/11/2015, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	A Closer Look at the RCMAS-2 Performance Anxiety Cluster
Investigator:	Jamie McGovern
IRB ID:	STUDY00002744
Funding:	None
Grant ID:	None
Documents Reviewed:	• HSC_L_Initial_Submission_Form_McGovern2.pdf,

The IRB approved the study on 6/11/2015.

1. Notify HSCL about any new investigators not named in the original application. Note that new investigators must take the online tutorial at https://rps.drupal.ku.edu/human_subjects_compliance_training.
2. Any injury to a subject because of the research procedure must be reported immediately.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity.

Continuing review is not required for this project, however you are required to report any significant changes to the protocol prior to altering the project.

Please note university data security and handling requirements for your project:
<https://documents.ku.edu/policies/IT/DataClassificationandHandlingProceduresGuide.htm>

You must use the final, watermarked version of the consent form, available under the "Documents" tab in eCompliance.

Sincerely,

Stephanie Dyson Elms, MPA
IRB Administrator, KU Lawrence Campus