Examining the Conceptual Overlap between Social, Performance, and Test Anxiety among Chinese Adolescents

by

Qingqing Zhu
Ed.S., University of Kansas, 2017
M.S., Indiana University, Bloomington, 2012
B.Ec., Guangdong University of Foreign Studies, 2011

Submitted to the graduate degree program in the Department of Educational Psychology and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

_____

Chair: Patricia A. Lowe, Ph.D.

_____

Kristen N. Hensley, Ph.D.

_____

Amy N. Mendenhall, PhD.

_____

Christopher R. Niileksela, Ph.D.

_____

Matthew R. Reynolds, Ph.D

Date Defended: January, 23, 2020

The dissertation committee for Qingqing Zhu
certifies that this is the approved version of the following dissertation:

Examining the Conceptual Overlap between Social, Performance, and Test Anxiety among Chinese Adolescents

Chair: Patricia A. Lowe, Ph.D.

Date Approved: January, 23, 2020

Abstract

This study examined the conceptual overlap between social, performance, and test anxiety among 859 Chinese students, ages 12 to 19 years. Factor analyses were performed on the Chinese version of the Revised Children's Manifest Anxiety Scale-Second Edition (RCMAS-2-C) Performance Anxiety cluster and Social Anxiety scale items, as well as the Chinese version of the Test Anxiety Measure for Adolescents (TAMA-C) items. Results supported a three-factor structure (i.e. public speaking anxiety, performance anxiety-general, and social anxiety) when the RCMAS-2-C Performance Anxiety cluster and Social anxiety scale items were analyzed together. When each of the TAMA-C scale items were added to the public speaking, performance anxiety-general, and social anxiety items and factor analyzed in separate analyses, four-factor models were supported with test anxiety as a separate factor in each one of the models. Internal consistency reliability for the social, performance, public speaking, and test anxiety factor scores were at or above acceptable levels. Latent profile analysis of these different types of anxiety suggested nine latent classes. Classes with similar levels of social/performance/public speaking anxiety but different levels of test anxiety were identified, supporting the conceptual distinctiveness between social and test anxiety. Social and performance anxiety were at similar levels (i.e. low-low, high-high, medium-high) in the majority of the classes. However, one class (16% of the population) with low social anxiety but high levels of performance anxiety was found. Overall, the conceptualization of performance anxiety as a subtype of social anxiety was supported. Females were found to have a higher likelihood of being in the higher test anxiety classes as well as the classes with medium to high (but not the highest) social and performance anxiety. Public speaking anxiety may be a unique

construct for Chinese students. Practical implications and limitations of the current study as well as future research directions are discussed.

Acknowledgements

This study would not have been possible without the ongoing support of many. I owe my deepest thanks, first, to my advisor and committee chair, Trissy. Since the beginning of my graduate career, you have been an inspiration and mentor for my scholarly development. You have guided me when I needed your expertise, challenged me when I hesitated at the chance for further growth, and supported me with confidence and patience when I chose to explore realms of uncertainty. Your continuous support and collaboration from data collection to the conception of research questions to the numerous revisions of the manuscript is without doubt a major driving force behind the completion of this project.

I would also like to thank the other committee members, Matt, and Chris, for your valuable input on data analysis and interpretation. This process would not have been as smooth if not impossible at all, without your expertise on research methodology and your experience in operating the data analysis software. I also owe my thanks to Dr. Hensley and Dr. Mendenhall, for examining my work from the perspective of your respective areas.

The participation of the many Chinese students as well as the support from the school staff and the local education bureau was also central to this project. In this regard, I also have to thank my parents, for they not only have always stood behind me as strong emotional support, but also have assisted in this project in many practical ways, including coordinating communication with the local schools and gathering and transporting the data files. I am also grateful for my friends, who generously lent their time and expertise in adapting the measures used in this study. Qianqian, in particular, we have worked together in classes and conferences, in gyms and kitchens. I am fortunate to have you, among many others who came together in a land thousands of miles away from home, to learn and grow and find our own respective paths.

I cannot give enough thanks to my husband, Chaohui. You have been with me through the good times, hard times (and maybe bad times). You share my laughter, see my ambitions, and read my silence. Your love and unrelenting faith is what has and will continue to lift me up. You are my partner in life. Finally, Addie, my daughter, without whom, this study would have lacked layers of meaning but would have been so much faster…thank you for coming into my life and showing me the love that I never knew I was capable of, and the sacrifice I never knew I was willing to make.

List of Tables

List of Figures

TABLE OF CONTENTS

Chapter I

Introduction

Social, Performance, and Test Anxiety

Anxiety is one of the oldest human emotions (McReynolds, 1985). It can be one's natural response to external threats; however, when out of proportion to the actual threats and exceeding a certain level, it can lead to impaired functioning (Freud, 1924; Yerkes & Dodson, 1908). Anxiety has been studied as a clinical disorder since the first edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-I, APA, 1952), with its conceptualization gradually expanding in the following editions, and different types of anxiety being better differentiated.

Social anxiety disorder, as defined in the latest version of the DSM (DSM-5, APA, 2013) refers to discomfort in or avoidance of social situations where an individual could possibly be scrutinized. Underlying the discomfort or avoidance is a fear of being negatively evaluated by others. Research has shown that individuals can develop social anxiety due to genetic predispositions (Beatty, Heisel, Hall, Levine, & La France, 2002; Hayward et al., 1998; Mineka & Zinbarg, 2006) or experiencing or witnessing socially traumatic events (Stemberger, Turner, Beidel, & Calhoun, 1995). Recent estimations of prevalence rates of social anxiety among children and adolescents are between 7% and 9% (Kessler, Petukhova, Sampson, Zaslavsky & Wittchen, 2012) with higher prevalence rates in females than males (Kessler et al., 2012; Ruscio et al., 2008). Large scale epidemiological studies have also found lower social anxiety prevalence rates in Asian versus Western countries (Hofmann, Anu Asnaani, & Hinton, 2010; Nagata, Suzuki, & Teo, 2015). Heightened social anxiety has been found to be associated with poor social relationships (Beidel, Turner, & Morris, 1999; Spence, Donovan, & Brechman-

Toussaint, 1999; Tillfors, Persson, Willén, & Burk, 2012), other anxieties (Fehm, Beesdo, Jacobi, & Fiedler, 2008), depression (Beesdo et al., 2007; Beesdo-Baum et al., 2012), substance use problems (Black et al., 2015; Buckner et al., 2008) and poor educational outcomes (Fisher, Masia-Warner, & Klein, 2004; Stein & Kean, 2000).

The DSM-5 (APA, 2013) includes a performance only subtype of social anxiety, describing social anxiety only in public speaking or performing situations. However, studies of performance anxiety date before the publication of the DSM-5, and researchers often have used the term loosely in reference to anxiety in a range of performance or evaluative contexts, such as sports, music, public speaking, or tests (Merritt, Richards, & Davis, 2001; Elliott & McGregor, 1999; Kenny & Osborne, 2006; Smith, Smoll, Cumming, & Grossbard, 2006). Similar to the development of social anxiety, individuals with a high genetic predisposition for trait anxiety, and individuals who had negative experiences in previous evaluative situations are more prone to develop performance anxiety (Bitran & Barlow, 2004; Kenny, Davis, & Oates, 2004). However, compared to social anxiety, performance anxiety has been found to have different genetic and biological underpinnings. It has been less associated with behavioral inhibition and neuroticism, and personalities traits predictive of other social anxieties (Bögels et al., 2010; Norton et al., 1997). Individuals with performance anxiety have also had different reactions to certain pharmacological treatments than those with more pervasive social anxiety (Davidson, 2003). Furthermore, performance anxiety appears to be associated with fewer childhood adversities, such as abuse and parental conflicts (Chartier, Walker, & Stein, 2001; Mannuzza et al., 1995) and is reported to have a later onset (Fuentes-Rodriguez, Garcia-Lopez, & Garcia-Trujillo, 2018).

Prevalence rates of performance anxiety have varied significantly across studies depending on how the author has operationally defined the construct. High estimates of the prevalence rates among children and adolescents have ranged between 4% to 7% (Knappe et al., 2010; Marmorstein; 2006) and the low estimates lower than 1% (Burstein et al., 2011; Crome et al., 2015; Kessler & Üstün, 2004). However, gender differences were consistently found across studies, with females reporting higher levels of performance anxiety than males (McGovern, 2016; Osborne & Kenny, 2005). Elevated performance anxiety has also been found among Chinese students in the contexts of music and sport performance (Chan, 2011; Cheng, Hardy, & Markland, 2011; Liu, 2016). High performance anxiety has been found to have a debilitating effect on one's performance (Hardy and Parfitt, 1991; Krane, 1993), and comorbid with other anxieties (Powell, 2004) as well as depression and other externalizing behavior problems (Marmorstein, 2005).

Test anxiety is not an established DSM diagnosis; however, it has been widely acknowledged as a clinical phenomenon. Test anxiety refers to the worries over poor test performance that are manifested in cognitive, physiological, and behavioral terms (Zeidner, 1998). Early conceptualization of test anxiety was primarily concerned with its cognitive and physiological dimensions, named the worry and emotionality components by Liebert and Morris (1967). Later researchers further delineated the test anxiety construct and described social concerns (Friedman & Bendas-Jacob, 1997) and task irrelevant behaviors (Nottlemann & Hill, 1997) as additional dimensions. Cognitive obstruction, the difficulties with attention, memory, and problem solving in testing situations, was also differentiated from the worrisome thoughts and described as an additional dimension of test anxiety (Wine, 1972). Various within-person factors such as trait anxiety and deficits in study and test taking skills (Desiderator & Koskinen,

1969; Spielberger & Vagg, 1995; Lowe et al., 2008), as well as environmental and contextual factors such as the larger economical context and culture norms (Lowe et al., 2008), can all play a role in the development of test anxiety. Prevalence rates of test anxiety have been estimated between 10% and 41% (Hill & Wigfield, 1984; King & Ollendick, 1989), with higher rates among females than males (Lowe, 2015; Putwain, 2007). Some studies have reported higher test anxiety among Chinese students than their Western counterparts (Dion & Toner, 1988; Xing et al., 2002). Students with high test anxiety tend to perform poorly on tests and are more likely to repeat a class or drop out of school (Cizek & Burg, 2006) and experience other mental health concerns (Beidel & Turner, 1988; King, Mietz, Tinney, & Ollendick, 1995).

As can be seen from the definitions of social, performance, and test anxiety, there is significant overlap between the constructs; performance anxiety is currently viewed as a subtype of social anxiety according to the DSM-5 (APA, 2013) and tests are often considered performance situations (Elliott & McGregor, 1999). Empirical studies have also been conducted to investigate the conceptual overlap between these constructs. Regarding social and performance anxiety, factor analysis on fears in various social situations consistently indicated fears in performance situations emerged as a distinct factor and therefore supports a distinct performance-only anxiety (Blöte et al., 2009; Knappe et al., 2010; Kodal et al., 2017). However, other researchers have argued against the distinctiveness of performance anxiety by citing the extremely low prevalence rates of this condition in some studies (Burstein et al., 2011; Crome et al., 2015; Kern et al., 2013; Kodal et al., 2017). They contend that even if performance anxiety emerged as a separate condition, there are so few people that experience this condition that making it a diagnostic entity of its own bear little clinical value (Chou et al., 2014).

Regarding social and test anxiety, some researchers have arbitrarily included test anxiety items on social anxiety measures (Knappe et al., 2010) while other researchers have pointed out the nonsocial aspects of test anxiety, such as fears of having to retake tests, repeat classes, as well as dropping out of school or not being able to advance in one's education or career (Bögels et al., 2010). Results from factor analytic studies have also been inconclusive, with some researchers reporting test anxiety items loading onto the performance anxiety scale (Cox et al., 2008; Oakman, Ameringen, Mancici, & Farvolden, 2003) and other researchers reporting nonsignificant loadings of these items (Kodal, et al., 2017) on social anxiety measures.

In these discussions, several important gaps have not been addressed. First, previous studies comparing social, performance, and test anxiety were conducted using fears in a specific set of social situations as measures of anxiety. These situations were initially written to encompass a broad range of social contexts. Although several specific situations referred to performing or taking tests; these items were relatively few in number, and they were not meant to be measures of performance or test anxiety (Kessler & Üstün, 2004; Shaffer et al., 1996; Silverman & Albano, 1997; Wittchen & Pfister; 1997). In other words, performance and test anxiety were not studied with an instrument designed to measure the respective constructs. To date, no study has investigated the conceptual overlap between these constructs using separate social, performance, and anxiety measures. Second, in the prevalence studies, performance-only anxiety was defined as fears in only performance situations but none of the other social situations (Kern et al., 2013). This definition had the potential to overlook individuals whose fears primarily centered in performance situations but also experienced some other subclinical social fears. Furthermore, the conceptual overlap between these constructs has only been examined in the United States but no other cultures, including China.

Anxiety Measures

In the current study, two self-report measures of anxiety: the Chinese version of the Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2-C; Reynolds & Richmond, 2008b) and the Chinese version of the Test Anxiety Measure for Adolescents (TAMA-C; Lowe, 2014b), were used. Specially, the Social Anxiety scale and the Performance Anxiety cluster on the RCMAS-2-C were utilized. The English versions of the RCMAS-2 and TAMA have demonstrated adequate reliability in the United States; validity evidence has also been reported (Lowe, 2014a, 2014b, 2015; Lowe, Goldenberg, & Wheeler, 2014; Reynolds & Richmond, 2008a). The RCMAS-2 scores also demonstrated adequate reliability and validity in Asian samples (Ang, Lowe, & Yusof, 2011). It has been adapted into Mandarin Chinese, and preliminary findings have also indicated adequate reliability and validity (Zhu & Lowe, 2018). The TAMA has also been adapted into Chinese, and the same factor structure was found (Lowe & Zhu, 2017). However, reliability evidence has not been reported.

Categorical Omega as Internal Consistency Reliability

Internal consistency reliability was estimated for the scale scores in the current study. Historically, Cronbach's alpha (Cronbach, 1951) has been the widely used reliability coefficient. However, this method has the flaw of assuming tau-equivalence, or homogeneity among test items (Tavakol & Dennick, 2011). Such assumption can be difficult to meet in practice. To overcome this limitation, Yang and Green (2015) proposed a nonlinear structural equation modeling (SEM) method to estimate the internal consistency reliability of measures with ordered categorical items. This reliability coefficient, named categorical omega (Kelley & Pornprasertmanit, 2016), was used in the current study to describe reliability of the RCMAS-2-C and TAMA-C scale scores.

Latent Variable Models to Assess Conceptual Overlap

Factor analysis is a latent variable model that aims at detecting one or more underlying latent constructs that explains the relationship between the observed variables (Everitt, 1984). The current study used factor analysis to examine if the social, performance, and test anxiety items loaded on one factor, supporting conceptual overlap, or separate factors, supporting conceptual distinctiveness.

Latent profile analysis (LPA) is also a latent variable model, where the latent factor is categorical, representing different classes (Bartholomew, Knott, & Moustaki, 2011). It is often used to detect heterogeneity of the latent construct within the overall population. Researchers manipulate the number of classes for the categorical latent variable and select the best fitting model based on fit indices. In the current study, LPA was performed to examine if there were subgroups in the population with different levels of social, performance, and test anxiety. Specifically, attention was paid to whether there were subgroups with, say, low social anxiety, but high performance anxiety, or low social anxiety, but high test anxiety, as well as the prevalence rates of such groups.

Statement of Purpose

Researchers have shown interest in the conceptual overlap or distinctiveness between social, performance, and test anxiety. However, current findings from empirical studies are not conclusive due to methodological limitations. Such studies are also lacking in the Chinese culture. The present study aimed at exploring the conceptual overlap between social, performance, and test anxiety among Chinese middle and high school students. Using half of the data, exploratory factor analysis was performed on the RCMAS-2-C (Reynolds & Richmond, 2008b; Zhu & Lowe, 2018) social and performance anxiety items due to the overlapping items

found on these scales/clusters. The suggested factor structure, say an *N*-factor model, was validated using the other half of the data. Based on these results, confirmatory factor analysis was conducted on the RCMAS-2-C social/performance anxiety items and the items on each of the TAMA-C scales to investigate if a *N*+1-factor model provided adequate fit to the data, or in other words, if the test anxiety construct can be distinguished from social/performance anxiety. Additionally, LPA were utilized to investigate the heterogeneity of the factor structures in the population, or in other words, to investigate if there were subgroups of individuals who experienced different levels of different types of anxiety. It was also investigated, through logistic regression, if males and females had a different likelihood of belonging to each specific subgroup.

Research Questions

1. What is the factor structure for the RCMAS-2-C Social Anxiety and Performance Anxiety items?
2. Does a one-factor structure provide adequate fit to the data for the RCMAS-2-C Performance Anxiety Cluster items?
3. Given a *N*-factor structure on the RCMAS-2-C Social Anxiety and Performance Anxiety items, does a *N*+1-factor structure provide adequate fit to the social/performance anxiety and each of the TAMA-C scale items?
4. Do the RCMAS-2-C Social Anxiety scale scores have adequate internal consistency reliability?
5. Do the RCMAS-2-C Performance Anxiety scores have adequate internal consistency reliability?

6. Do the TAMA-C scales (i.e. Physiological Hyperarousal, Worry, Cognitive Interference, Task Irrelevant Behaviors, and Social Concerns) scores have adequate internal consistency reliability?
7. Are there multiple latent classes (i.e. heterogeneity) of social, performance, and test anxiety in the overall population?
8. If there are multiple latent classes of social, performance, and test anxiety, can gender predict membership in specific latent classes?

Significance of the Study

The current study was the first to investigate the conceptual overlap between social, performance, and test anxiety by conducting factor analysis on separate measures of the constructs. The results will further the discussion in the current literature regarding the clinical utility of the performance-only specifier of the DSM-5 Social Anxiety Disorder (APA, 2013) and regarding the possibility of incorporating test anxiety into the DSM as one type or subtype of anxiety disorder. The better diagnostic clarity, in turn, would have implications on treatment planning and access for the clinical population. This study is also the first to investigate these topics among Chinese adolescents. It will facilitate evidenced-based conceptualization of social, performance, and test anxiety in the Chinese culture. The information is valuable particularly considering performance anxiety still appears to be understudied in China at this time.

The current study was also the first to utilize latent profile analysis in investigating different individuals' differential experiences of different types of anxiety. This method has the potential to capture individuals with predominantly one type of anxiety but some symptoms of other anxieties (e.g. high performance anxiety and low social anxiety), which, given the high comorbidity rates between anxiety disorders (Beidel and Turner, 1988; Powell, 2004), likely

represent a substantial subgroup in the overall population. Therefore, there is a higher chance for valid comparisons of prevalence rates between anxieties through this method than the strictly circumscribed method (i.e. fears only in performance situations) reported in previous studies. Furthermore, the current study was the first to investigate gender as a predictor of class membership regarding differential experiences of different types of anxiety. The results will further our understanding of gender differences in prevalence rates of social, performance, and test anxiety.

Relevance of the Study to School Psychologists

School psychologists work with students whose anxiety symptoms interfere with their school functioning. Research has shown that social, performance, and test anxiety all have a negative impact on students' educational outcomes (Cizek & Burg, 2006; Fisher et al., 2004; Stein & Kean, 2000). Therefore, it is of interest to school psychologists to better understand the conceptualization of these conditions in order to effectively recognize and treat their students' symptoms. School psychologists also need to keep in mind cultural differences in order to provide competent assessment and intervention to individuals from diverse backgrounds (NASP, 2010). The current study contributes important empirical knowledge regarding anxiety disorders in a Chinese culture. Such knowledge will contribute to the multicultural competence of school psychologists.

Summary

Social, performance, and test anxiety have been studied as types of anxiety, whose constructs significantly overlap. Social anxiety refers to the anxious responses in social situations (Marks & Gelder, 1966). Performance situations are often viewed as one specific type of social situation (APA, 2013), and yet, testing is often viewed as a specific performance

demand (Elliott & McGregor, 1999). Empirical studies investigating the cnceptual overlap between these concepts have yielded mixed results (Burstein et al., 2011; Cox et al., 2008; Crome et al., 2015; Kern et al., 2013; Knappe et al., 2010; Kodal et al., 2017; Oakman et al., 2003) due to methodological limitations. The current study aimed to investigate the overlap between these constructs among Chinese adolescents by performing factor analysis on separate self-report measures of the constructs: the RCMAS-2-C (Reynolds & Richmond, 2008b; Zhu & Lowe, 2018) Social Anxiety scale and Performance Anxiety cluster and the TAMA-C (Lowe, 2014b; Lowe & Zhu, 2017) scales. The one-factor structure on the RCMAS-2-C Performance Anxiety cluster was also reexamined in the current sample. After the factor analysis, the internal consistency reliability of these scale/factor scores were calculated. LPA was also used to explore subgroups in the population where individuals might have differential experiences of different types of anxiety; gender was used as a predictor of latent class membership. Results of the current study will aid in further clarification regarding the conceptual overlap between social, performance, and test anxiety among Chinese adolescents. Better diagnostic clarity and treatment planning will be the clinical implications.

CHAPTER II

Review of the Literature

The purpose of this chapter is to review the literature on anxiety, including social, performance, and test anxiety. The literature in the Chinese culture and the conceptual overlap between the three types of anxiety are also reviewed. Latent variable models including factor analysis and latent profile analysis (LPA) are described. First, social, performance, and test anxiety are defined, and the historical views of these types of anxiety are reviewed. The prevalence rates and impact of these conditions are also discussed. Then the two measures used in the current study to assess these constructs, the Revised Children's Manifest Anxiety Scale—Second Edition (RCMAS-2-C; Reynolds & Richmond, 2008b), and the Test Anxiety Measure for Adolescents (TAMA-C; Lowe, 2014b) are reviewed. Subsequently, means of assessing test reliability are discussed. Finally, a brief description of factor analysis and LPA, the statistical approaches that were used in the current study is offered.

Anxiety

Freud first discussed the term anxiety neurosis in the late 1800s and separated it from neurasthenia, a term previous used to broadly describe a body of psychosomatic illnesses (Crocq, 2015; Wessely, 1990). Freud (1924) differentiated neurotic anxiety from realistic anxiety such that the latter referred to anxious reactions to actual external threats whereas the former described similar anxious reactions but out of proportion to the actual threats. McReynolds (1985) reviewed the concept of anxiety in a historical context. He proposed and integrated two theoretical approaches of anxiety research, namely the cognitive approach and the conditioning approach. The cognitive approach viewed anxiety as a result of a dissonant state among one's thoughts, feelings, and memories. The conditioning approach viewed anxiety as conditioned

responses to neutral stimuli after the neutral stimuli were paired with other mentally traumatic events. McReynolds (1985) contended that these two approaches complemented rather than refuted each other. He pointed out that the two approaches addressed different phases of anxiety arousal; the cognitive approach pertained to the initial cause of anxiety while the conditioning approach pertained to the spread of anxiety across settings and situations.

The first edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-I, APA, 1952) viewed anxiety as a main characteristic of psychoneurotic disorders where it was considered a danger signal sent by the conscious personality when facing a threat situation. When the anxious reactions were diffuse, the individual may have received a diagnosis of Anxiety Reaction. In other cases, diagnoses of Phobic Reaction or Obsessive-Compulsive Reaction may have been applicable if the anxiety pertained to specific objects, situations, or ideas. Similarly, in the DSM-II (APA, 1968), anxiety was considered a core characteristic of an overarching category of conditions named Neuroses. A specific type, Anxiety Neurosis, was described as anxious over-concern associated with physiological symptoms, including panic reactions. Phobic Neurosis and Obsessive-Compulsive Neurosis, again, described more circumscribed anxious reactions. Other subtypes of anxiety such as social, performance, and test anxiety were not studied until later times.

Social, Performance, and Test Anxiety

Social Anxiety. Marks and Gelder (1966) first brought up the concept of "social anxieties" in academic research and described the term as fears of various social situations (i.e., eating in restaurants, meeting others, dancing at parties), and/or fears of blushing or shaking when in public. The authors investigated the age of onset for these fears and fears of other specific objects and non-social situations among a group of psychiatric patients. They found that

social anxieties mostly started after puberty, whereas specific animal phobias mostly started in childhood and phobias of specific situations started anywhere from childhood to adulthood. It appeared that the authors treated social anxiety similarly to other phobias in this study, although this likening was not directly made.

A formal diagnosis of social phobia was not introduced until the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III, APA, 1980), in which social phobia was categorized as a type of specific phobia. Various social situations were given as examples (e.g., speaking or performing in public, using public lavatories, eating and writing in public), and it was contended that "generally an individual has only one social phobia" (p. 227). Individuals with generalized fears of social situations were diagnosed with an avoidance personality disorder (AVPD), which was considered mutually exclusive from social phobia. In the DSM-III, children and adolescents with social anxiety were diagnosed with an avoidant disorder, which was defined as "a persistent and excessive shrinking from contact with strangers, sufficiently severe to interfere with social functioning in peer relationships" (p. 54). A subsequent revision of the DSM (DSM-III-R, Williams & APA, 1987) introduced the generalized subtype of social phobia to account for individuals who experience fears across different social situations. Moreover, social phobia and AVPD now could co-occur. The DSM-IV (APA, 1994) formally introduced the term social anxiety disorder in parenthesis after social phobia to indicate the growing recognition that this condition may be conceptually different from other specific phobias. Additionally, an overarching fear of social rejection was discussed as the underlying reason why individuals feared any specific social situation. Other diagnostic criteria; however, remained largely the same, viewing social anxiety as fears of circumscribed social situations with the exception of the generalized subtype when pervasive social fears occur.

This circumscribed view of social anxiety has been challenged as lacking empirical support. Using a nationally representative sample of 9,828 individuals, Ruscio and colleagues (2008) performed exploratory factor analysis on fears of 14 social situations and found these fears loaded onto one underlying factor, indicating that, instead of conceptualizing social anxiety as fears of specific social situations, a unidimensional conceptualization of social anxiety was more appropriate. Moreover, findings suggested very few social phobia cases involved fears of two or fewer specific situations. Latent class analysis, a statistical approach used to explore the existence of subgroups within a larger population in multivariate analysis, revealed four classes of individuals, with increasing numbers of feared situations in each class. It was also found that individuals in the more-fears classes had higher probability of fearing any social situation, suggesting the different classes described different severity levels of social anxiety on a single dimension. Several other studies also indicated the level of functional impairment increased with the number of feared situations (Cox et al., 2008; Stein et al., 2000). In other words, research supports that social anxiety exits on a continuum instead of categories based on the number or type of feared social situations.

Liebowitz and colleagues (1985) pointed out that even in Marks and Gelder's (1966) original description of social phobia, an underlying fear of appearing ridiculous to others across social situations emerged. Over the years, the term social phobia has also been replaced by social anxiety to reflect a broader conceptualization. Most recently, the DSM-5 (APA, 2013) defined social anxiety disorder as fear or anxiety in social situations where the individual is exposed to possible scrutiny. The individual is concerned that he or she may display anxiety symptoms in these situations and consequently is negatively evaluated by others; as a result, they either avoid these situations or endure them with significant stress. To meet diagnostic criteria,

the social fears also need to be out of proportion to the actual threat, to have persisted for six months or more, to cause clinically significant impairment in one's important areas of functioning, and to not be better explained by another medical or mental health condition. A performance only specifier was also included in the DSM-5 to account for individuals whose fear "is restricted to speaking or performing in public" (p. 203, APA, 2013).

Etiology of Social Anxiety. Several developmental pathways of social anxiety have been presented in the literature. First, development of social anxiety has been linked to aversive or humiliating social experiences. For example, using a group of 68 adults with a diagnosis of social phobia and a comparison group of 25 adults without any DSM-III diagnoses, Stemberger and colleagues (1995) found those with specific social phobia were significantly more likely to recall specific social "traumatic episodes" as conditioning events for their social fears than those in the control group (56% vs 20%). McCabe and colleagues (2003) studied a group of 72 adults with diagnoses of social phobia, panic disorder, or obsessive-compulsives disorder. They found that a history of severe teasing in childhood were reported significantly more frequently by individuals in the social phobia group (92%) than by those in the panic disorder (50%) or obsessive-compulsive disorder (35%) group. Another study found that 56% of those with specific social phobias recalled direct traumatic conditioning experiences as having played a role in the origins of their social phobia (Stemberger et al., 1995).

Another pathway in the development of social anxiety is through vicarious conditioning, that is, individuals can develop anxious responses in social situations by observing and learning the anxious responses of others in similar situations (Mineka & Zinbarg, 2006). Öst and Hughdahl (1981) studied 38 individuals with social phobia and found that 12.9% reported vicarious learning experiences as part of the origin of their social fears. In a sample of 35

treatment seeking adults with social-evaluative fears and another 20 nonclinical control participants, Bruch and Heimberg (1994) found those with social fears were more likely to recall socially avoidant or anxious behaviors of their parents, indicating that observing and learning of such behaviors may have played a role in their development of social anxiety.

Genetic predispositions may also play a role in the development of social anxiety. In a meta-analysis of 40 twin studies, Beatty and colleagues (2002) calculated the heritability estimate of social anxiety to be .65. In other words, genetic factors accounted for 65% of the variation in social anxiety. Behavioral inhibition, a temperament characteristic of fearfulness and avoidance in the face of unfamiliar people or situations (Hirshfeld-Becker et al., 2008), was also often cited as a predictor of social fears in adolescence (Mineka & Zinbarg, 2006). In a 4-year longitudinal study consisting of 2,242 high school students, Hayward and colleagues (1998) found one component of behavioral inhibition, social avoidance, predicted the onset of social phobia in older adolescence. They also found that those who endorsed both fearfulness and avoidance components of behavioral inhibition were four times more likely to develop social anxiety later than those who did not endorse either of these two components.

Prevalence rates of social anxiety. Prevalence rates of social anxiety have varied across different studies, possibly due to methodological differences, such as varying sampling methods, assessment protocols, and professionals who conduct the assessments (Bandelow & Michaelis, 2015). Changing diagnostic criteria across the different versions of the DSM also added to the varying prevalence rates of social anxiety disorders in studies conducted over the years. Costello and colleagues (2005) reviewed 26 epidemiological studies from across the world published between 1992 and 2004 and found the 3-month, 6-month, 12-month, and life-time prevalence rates of social phobia among children and adolescents ranged between 0.3%-2.5%, 2.0%-9.2%,

2.6%-12.4%, and 3.5%-13.1%, respectively. Wittchen and Jacobi (2005) reviewed 11 European epidemiological studies published from 1980 to 2003 covering individuals aged 18 to 65. They found the 12-month prevalence rate of social phobia ranged from 0.6% to 7.9%, with a median of 2.3%.

Researchers have argued that the prevalence rate estimates have been more stable in recent years, with the improved quality of anxiety measures (Costello et al., 2005). Recent prevalence rates of mental disorders were estimated using the National Comorbidity Survey Replication (NCS-R) and its Adolescent Supplement (NCS-A), as well as the Great Smoky Mountains Study (GSMS). The NSC-R (for individuals aged 18 and above) and NSC-A (for individuals aged 13 to 18) were conducted between 2001 and 2003 and included 9,282 adults and 904 adolescents who were interviewed in person with the Composite International Diagnostic Interview (CIDI), Version 3.0 (Kessler & Üstün, 2004). Using this dataset, Kessler and colleagues (2012) estimated the 12-month prevalence rate of social phobia to be 7.4% (7.9% in the 13-17 age group, 8.0% in the 18-64 age group, and 2.7% in the 65 and older age group). They estimated its life-time prevalence rate to be 8.9% (8.6% in the 13-17 age group, 13.0% in the 18-64 age group, and 6.3% in the 65 and older age group). The GSMS was conducted between 1993 and 2010 and included 1,420 individuals who were interviewed annually using the Child and Adolescent Psychiatric Assessment (Angold & Costello, 2000) and were between the ages of 9 and 16, and at ages 19, 21, 24, and 26, they were interviewed using the Young Adult Psychiatric Assessment (Angold & Costello, 2000). At each point of the assessment, the 3-month prevalence rate of anxiety disorders were estimated. Using this data set, Copeland and colleagues (2014) found the cumulative 3-month prevalence rate of social anxiety to be 4.2%.

Gender differences in social anxiety. Across studies, higher prevalence rates of social anxiety disorder have been consistently reported in females than males (Bandelow & Michaelis, 2015; Copeland et al., 2014; Costello et al., 2005; Kessler et al., 2012; Ruscio et al., 2008). In their review of three large epidemiological studies conducted both in the United States and in Europe, Bandelow and Michaelis (2015) found that the female to male ratios varied between 1.2 and 1.5 for the life-time prevalence rates of social anxiety and between 1.6 to 2.1 for the 12-month prevalence rates among older adolescents and adults. Similarly, significantly higher prevalence rates of social phobia among females were also found in the 13 to 17 age group (11.2% vs 6.2%; Kessler et al., 2012). Researchers have cited genetic factors, greater vulnerability to psychosocial stressors (e.g. childhood sexual trauma), as well as higher likelihood to report psychopathologies among females as reasons that contribute to the higher prevalence rates of social anxiety disorder in this population.

Negative impact of social anxiety. Peer relationships play an important role in child development and adjustment (Parker et al., 2006). Children and adolescents who are socially anxious tend to have lower social skills and experience disrupted interpersonal interactions (Beidel et al., 1999; Spence et al., 1999), which have both short- and long-term negative ramifications on their social and emotional functioning. Particularly, children and adolescents with social anxiety are less likely to receive social support and more likely to experience bullying (Tillfors et al., 2012) and develop other types of anxieties (i.e. generalized anxiety, agoraphobia, specific phobia, panic attacks; Fehm et al., 2008). Social anxiety in adolescence was also found to precede depression (Beesdo et al., 2007; Beesdo-Baum et al., 2012) and alcohol and cannabis use and dependence in early adulthood (Black et al., 2015; Buckner et al.,

2008). Students who are socially anxious are also more at risk for poor academic performance and school dropout (Fisher et al., 2004; Stein & Kean, 2000).

Performance anxiety. Performance anxiety is defined differently by different researchers. Some researchers have investigated anxiety in specific types of performance situations, including testing (Elliott & McGregor, 1999), public speaking (Merritt et al., 2001), sports (Smith et al., 2006), and performing art forms, such as dancing and music (Kenny & Osborne, 2006; Tamborrino, 2001). Others took a global perspective and considered performance anxiety as an overarching fear of any performance situation where one is observed and possibly scrutinized (Huberty & Dick, 2006; Kenny, 2005b). Yet others have considered performance anxiety as a subtype of social anxiety. Early researchers investigated three possible subtypes of social anxiety: interaction (fears of interacting with others), observation (fears of being observed by others), and performance anxiety (fears of performing tasks in front of others; Cox, Clara, Sareen, & Stein, 2008; Mattick & Clarke, 1998). The DSM-5 also included a performance only specifier for social anxiety disorder, recognizing individuals who experience social anxiety but only specifically in performance situations. This last view is of most interest in the current study and will be discussed in more detail hereafter.

Researchers have also examined the dimensionality of performance anxiety. Initially, researchers have studied a unidimensional concept of stress or arousal and its effect on performance (Gould & Krane, 1992; Spielberger, 1989). It was argued that the relationship between stress/arousal and performance follows a pattern of an inverted-U shape as described by the Yerkes-Dodson law (Yerkes & Dodson, 1908) with mice. Other researchers, however, have proposed a multidimensional framework in assessing anxiety in competitions. Martens and colleagues (1990) developed the Competitive State Anxiety Inventory-2. The measure consisted

of three subscales: cognitive anxiety, somatic anxiety, and self-confidence; the last subscale was not considered a subcomponent of anxiety. Using this measure, Burton (1988) found different relationships between cognitive anxiety, somatic anxiety, and performance level among 98 college swimmers, thus supporting the multidimensionality of sports performance anxiety. This bi-dimensional conceptualization was widely adopted among subsequent studies of performance anxiety (Hardy & Parfitt, 1991; Kenny, 2011; Miller & Chesky, 2004).

Etiology of Performance Anxiety. Similar to the development of social anxiety, the development of performance anxiety has been linked to biological, psychological, and environmental vulnerabilities (Bitran & Barlow, 2004; Kenny et al., 2004). Kenny and colleagues (2004) discussed a genetic predisposition that makes individuals more likely to experience high levels of trait anxiety. This genetic vulnerability when combined with adverse early life experiences may lead to the development of anxiety disorders. In the context of performance anxiety specifically, the exposure to high expectations of achievement but low support, as well as early and frequent evaluations of one's performance in competitive environments may be sufficient to trigger the cognitive, physiological, and behavioral responses associated with performance anxiety. After repeated exposure, individuals may internalize these responses and exhibit similar reactions in future performance situations.

Prevalence rates of performance anxiety. The prevalence rates of performance anxiety are relatively less often investigated, possibly due to its late introduction as a diagnostic entity in the DSM-5. However, the prevalence rates have relevance to the conceptualization of performance anxiety, as some extremely low rates have been cited as evidence that perhaps the performance only subtype of social anxiety disorder bares little clinical utility. Therefore, this topic is hereby reviewed in greater detail.

Using the CIDI, Version 2.1 (World Health Organization, 1997) and in a sample of 1,956 individuals ages 18 and above, Stein and colleagues (2000) found approximately 8.7% of the social anxiety population (2.3% of the total sample) had performance fears only (i.e. speaking in public or in class, walking in a room where people were already seated, using a toilet away from home, writing/eating/drinking when observed). Marmorstein (2006) analyzed data from the Methods for the Epidemiology of Child and Adolescent Mental Disorders (MECA) study, in which social phobia was measured by using the Diagnostic Interview Schedule for Children (DISC), Version 2.3 (Shaffer et al., 1996). Performance-focused social phobia was defined as speaking to strangers or in class or reading out loud/writing/eating in front of others, and its prevalence rate was estimated at 4.5% among children and adolescents aged 9 to 17. Knappe and colleagues (2010) interviewed a community sample of 3,021 individuals aged 14 to 24 years old, using the Munich-CIDI (Wittchen& Pfister, 1997). They found performance-focused fears (i.e., "fear of eating/drinking, writing, tests/exams, speaking in front of others") in 27.4% of the total population and 35.3% of the population with a DSM-IV diagnosis of social phobia; the clinically impaired performance anxiety constituted 6.6% of the total sample (p. 115).

By contrast, much lower estimates of prevalence rates were reported by other researchers. Using the CIDI, Version 3.0 (Kessler & Üstün, 2004) and in a community sample of 8,841 Australian individuals aged 16-85, Crome and colleagues (2015) estimated life-time prevalence rate of performance subtype of social anxiety disorder ("singular fear of public performance") at .3% (p. 229). In a nationally representative sample of 10,123 adolescents aged 13-18, Burstein and colleagues (2011) found only .7% of adolescents that met criteria for any social phobia (0.063% of the total sample) reported performance only anxiety (i.e., "acting/performing/giving a talk in front of a group of people"; p. 4). Interestingly, fear of test taking, and doing

homework/writing/eating/drinking while others are watching were not categorized as performance only social anxiety in Burstein et al.'s study, but was so categorized in the study by Knappe and colleagues (2010). These different conceptualizations of performance anxiety would unsurprisingly contribute to the different estimated prevalence rates and reflect a need for more theoretical clarification of the construct. Kern and colleagues (2013) interviewed 204 treatment seeking youth aged 6 to 19 using the Anxiety Disorders Interview Schedule for Children and Parents for DSM-IV (ADIS-C/P; Silverman & Albano, 1997). They did not find any patient endorsing performance only social anxiety (answering questions/asking the teacher for help/giving a report/reading in class, writing on the chalkboard, speaking to adults, inviting a friend, performing music/sports). Also using the ADIS-C/P, Kodal and colleagues (2017) found 2 out of 131 (1.5%) adolescents aged 8-15 reported performance only fears. Overall, methodological differences including different definitions of performance anxiety and small sample sizes of the clinical studies made it difficult to synthesize results in the current literature. Some researchers have also pointed out part of the variability may be explained by age differences, such that children and younger adolescents may be less likely to experience circumscribed performance anxiety than older individuals (Bögels et al., 2010; Kern et al., 2013). Results pointed to the need for more studies with an updated definition of performance anxiety in order to better understand its current prevalence rates.

Gender differences in performance anxiety. Higher levels of performance anxiety have also been reported in females than males (Abrahamsen, Roberts, & Pensgaard, 2008; Marmorstein, 2006; McGovern, 2016; Osborne & Kenny, 2005). In a sample of 1,295 adolescents aged 9 to 17, Marmorstein (2006) found that females met the criteria for performance-focused social anxiety more often than males did (4.8% vs 3.9%). Females also

scored higher on self-reports of anxiety regarding music and sport performance as well as public speaking. Specially, Abrahamsen and colleagues (2008) found, in a sample of 190 Norwegian national elite athletes, that females reported greater worrisome thoughts regarding their performance accompanied by more physiological complaints and concentration disruption. Osborne and Kenny (2005) found higher music performance anxiety in two samples of 84 U.S. children aged 11 to 13 and 381 Australian adolescents aged 12 to 19. Behnke and Sawyer (2002) reported higher anxiety regarding public speaking among females than males in a group of 72 undergraduate students. Of most interest to the current study, McGovern (2016) found females scored significantly higher than males on the Performance Anxiety cluster of the RCMAS-2 in a sample of U.S. children and adolescents.

Negative impact of performance anxiety. It is generally argued that the relationship between anxious arousal and task performance presents in an inverted-U shape, such that a moderate level of arousal facilitates performance while exceeding a certain level, the arousal becomes debilitating (Anderson, 1990; Yerkes & Dodson, 1908). This phenomenon was first studied by Yerkes and Dodson (1908) in mice. The authors found that the mice's performance on a difficult task initially increased as their arousal level increased; however, it decreased after the arousal level exceeded a certain point. This inverted U-shaped relationship between arousal and performance levels was subsequently termed the Yerkes-Dodson law and replicated in human subjects (Dickman, 2002; Green, 1984; Stennett, 1957), and the maximum arousal level before performance drops was found to vary across individuals. Specifically, the optimal arousal level was found to be lower for individuals with an introverted personality than for those who were more extroverted (Green, 1984).

In the field of sports psychology particularly, researchers have proposed new models, based on the Yerkes-Dodson law, to explain the relationship between anxiety and performance. Hanin (1980) discussed a zone of optimal functioning model which states that an athlete's performance is at the optimal level when his/her anxiety falls in a certain zone. When the anxiety is either below or above this zone, performance level decreases. Empirical studies have provided some support for this model. Krane (1993) found, among 16 college athletes, those who performed poorest exhibited anxiety levels above the optimal zone, while those whose anxiety levels were below or within the optimal zone did not differ in their performance. While it could be argued that individuals with lower anxiety levels were not included in the sample, the results at least indicated that, an inverted-U shape relationship between anxiety and performance, if it did exist, was not symmetrical, with the slope on the right side more likely to be steeper.

Hardy and Parfitt (1991) proposed a catastrophe model and contend that athletes' performance, once their anxiety exceeded the optimal level, would drop drastically. Their model also discussed the interactional effect of cognitive and physiological anxiety. More specifically, it was argued that when the cognitive anxiety level was high, exceeding the optimal physiological arousal level, a catastrophic effect on performance would occur. However, when the cognitive anxiety level was low, physiological anxiety would have a linear positive effect on performance. Overall, the consensus in the literature was that high levels of performance anxiety, especially with a cognitive component, caused impairment on one's task performance. This is seen in students and professionals (i.e. actors/actresses, musicians, athletes) who avoid performance situations and whose careers are negatively impacted by the substandard performance resulting from anxiety.

Performance anxiety is found to be comorbid with other types of anxiety as well, including agoraphobia, generalized anxiety, and social anxiety (Powell, 2004). In a sample of 1,295 children and adolescents aged 9 to 17, Marmorstein (2005) also found performance anxiety was strongly correlated with dysthymia, oppositional defiant disorder, and conduct disorder, even more so than the generalized type of social anxiety.

Test anxiety. Test anxiety has been defined as the phenomenological, physiological, and behavioral responses that may accompany worries over poor test performance (Zeidner, 1998). Researchers have explored different dimensions of test anxiety. Liebert and Morris (1967) first proposed two dimensions of debilitating test anxiety, namely worry and emotionality, with worry referring to the cognitive expression of test anxiety and emotionality to the accompanying automatic reactions. In a sample of school-aged children, Wren and Benson (2004) further found three dimensions of test anxiety: thoughts, automatic reactions, and off-task behaviors, with the last dimension capturing children's nervous habits or distracted behaviors in testing situations. Nottlemann and Hill (1997) found in a group of fourth and fifth grade students that those who were highly test-anxious more frequently engaged in off-task glancing during testing. It was proposed that high test-anxious students exhibited more off-task behaviors because they likely relied more on external evaluation than on their own resources in problem-solving during tests, given their past failures in similar situations.

Friedman and Bendas-Jacob (1997) discussed another three-dimensional model, namely, cognitive obstruction (difficulty with attention, memory, and problem-solving), tenseness (emotional and physiological discomfort), and social derogation (concerns about being belittled by significant others following poor test performance). Introducing the social concerns as a dimension has implications for the overall conceptualization of test anxiety. As mentioned

before, some researchers have considered test anxiety as equivalent to or a subtype of performance anxiety, which may be in turn nested under social anxiety. In a meta-analysis of 562 studies, Hembree (1988) found that test anxiety was directly related to one's fear of negative evaluation, which is at the core of social anxiety. The conceptual overlap between test anxiety and performance and social anxiety is, again, of particular interest in the current study and will be discussed in more detail hereafter.

Etiology of test anxiety. In discussing the development of test anxiety, researchers have discussed different models. In his review article, Tobias (1985) compared the deficit model and the interference model. He argued that the two models were not mutually exclusive and complemented each other in the conceptualization of test anxiety. The deficit model argued that some individuals lacked study and test preparation skills and therefore, often performed poorly on tests. Their poor test performance in the past caused apprehension in future testing situations (i.e., high levels of test anxiety). This model was supported by studies that found high test-anxious students exhibited less effective study and test-taking skills than low test-anxious students (Bruch, 1981; Desiderator & Koskinen, 1969; Mitchell & Ng, 1972; Wittmaier, 1972).

The interference model, on the other hand, suggested that test anxiety interfered with one's concentration and recall of learned materials during tests (Hembree, 1988). In their early studies, Sarason and Mandler (1952) contended that test situations evoke two types of psychological drives: the task-directed drives, which stimulate task-relevant behaviors in order to complete the test and reduce anxiety, and anxiety drives, which stimulate both task-relevant and task-irrelevant responses such as "feelings of inadequacy, helplessness, heightened somatic reaction, anticipation of punishment or loss of status and esteem, and implicit attempts to leave the testing situation" (Mandler & Sarason,1952, p. 166). These task irrelevant responses tend to

inhibit one's test performance and are seen more frequently in high test-anxious individuals. Similarly, Wine (1971) proposed in their review article an attentional interpretation of test anxiety, such that high test-anxious individuals direct part of their attention to the self, or in other words, become self-preoccupied with deprecatory thoughts during tests, while low test-anxious individuals direct their attention more fully to the task (i.e., the test). The self-directed attention negatively affects one's test performance.

Several other models of test anxiety have integrated the deficit and interference model. Carver and Scheier (1988) proposed a self-regulation model. They described that in an effort to reach a certain goal, individuals evaluate both the challenges involved and their abilities to overcome the challenges. If they perceived the likelihood of obtaining a goal as high, they would experience more goal-directed drive, which facilitates engagement and problem solving. On the other hand, if they perceived the likelihood of goal attainment being low, either due to high challenges or low abilities, they would likely experience obstructions in exerting effort, manifesting as behavioral or mental disengagement. The authors discussed test anxiety within this framework such that debilitating test anxiety occurs when individuals perceive that the difficulty of a test exceeds their ability levels. Similarly, Spielberger and his colleagues (1995) proposed a transactional process model, in which test anxiety was viewed as a form of trait anxiety that is activated in test situations. More specifically, the authors considered the nature of a testing situation, an individual's predisposition to perceive the testing situation as threatening, as well as the individuals' study and test taking skills as interplaying factors, whose interaction results in different levels of apprehension for tests (i.e. test anxiety). Test anxiety would manifest itself in different forms, including worries and task irrelevant behaviors that negatively affects one's ability to engage in problem-solving in testing situations.

More recently, Zeidner and Matthews (2005) proposed a self-referent executive processing (S-REF) model that provided more elaborations on the "black box" of interactions between one's abilities and perceived threat of tests in the transactional process model. They explained that testing, or situational threat, activates an executive regulatory process in which individuals reflect on themselves and process the significance of the threat both cognitively (i.e. estimating likelihood of success, planning) and emotionally (i.e. emotional reactions to success or failure). Test anxiety may be evoked when individuals focus on negative self-beliefs and maladaptive coping mechanisms (i.e. avoidance) in this process. In the long-term, if individuals continue to cope in maladaptive ways in the testing situation, test anxiety will likely be maintained. Further still, Lowe and colleagues (2008) proposed a biopsychosocial model of test anxiety, where within-person characteristics such as intelligence, social-emotional functioning, trait anxiety, study skills and habits, as well as academic ability and self-efficacy influence the perceived threat of a testing situation, which in turn influences the level of test anxiety. When test anxiety occurs, it is manifested in cognitive (worry, cognitive obstruction, fear of social humiliation), physiological hyperarousal (automatic nervous system arousal), and behavioral (task irrelevant behaviors) terms and affects individuals' test performance in two ways: their immediate appraisal of item response and their final test score. When the immediate response on a test item is perceived as incorrect, test anxiety will be further heightened. This model furthered the understanding of test anxiety by introducing social and contextual factors to the interplay. Proximal factors such as family values and parent expectations, and distal factors such as the larger economic and political context, religious beliefs, and educational system, are all embedded in an individual's social environment and could influence the level of test anxiety experienced.

Prevalence rates of test anxiety. Test anxiety is not an established disorder in the DSM-5; therefore, large scale epidemiological studies regarding its prevalence rates have not been conducted. There is also no consensus in the available prevalence rate studies regarding the method to measure test anxiety, including the instrument and the cut-point (McDonald, 2001; Segool et al., 2013). As a result, percentage of school-aged children who experience some test anxiety are estimated to range between 10% and 41% (Hill & Wigfield,1984; King & Ollendick, 1989; Putwain & Daly, 2014; Turner, Beidel, Hughes, & Turner, 1993) with those who experience more clinically significant impairment at the lower end of the range (Segool et al., 2013). Specifically, a few studies done in recent years were considered to have sound methodological designs (Putwain & Pescod, 2018). Putwain and Daly (2014) found, in a sample of 2,345 English school age children, that 16.4% scored in the upper 33rd percentile on a self-report measure of test anxiety, consisting of worry, tension, and social derogation scales (Benson et al., 1992; Friedman & Bendas-Jacob, 1997). von der Embse and colleagues (2014) utilized latent profile analysis and found, among 1,133 11th grade students, three latent classes of test anxiety at low, medium, and high levels. The high anxiety class consisted of 30.4% of the population. Thomas et al. (2018) utilized similar approach in a sample of 807 college students and again found three classes of test anxiety, with the high anxiety class consisting of 25% of the sample.

Gender differences in test anxiety. Gender differences are a robust finding in the test anxiety literature with higher prevalence rates consistently reported in females than males (Lowe, 2015; Putwain, 2007; Putwain & Daly, 2014; Segool et al., 2013). In a sample of 1,348 English school age children, Putwain (2007) found females scored higher than males on the Test Anxiety Inventory (Spielberger, 1980) on both the Emotionality and the Worry subscales; the

difference was more pronounced for the Emotionality scale scores. Similarly, Segool and colleagues found, in a sample of 617 US children from grades 3 to 5, that females scored higher on the Children's Test Anxiety Scale (Wren & Benson, 2004) and the Test Anxiety scale on the Behavior Assessment System for Children, Second Edition, Self-Report Form (BASC-2 SRP, Reynolds & Kamphaus, 2004). Lowe (2015) also found females scored higher than males on all five subscales of the TAMA (Cognitive Interference Physiological, Hyperarousal, Social Concerns, Task Irrelevant Behaviors, and Worry) in a sample of U.S. adolescents (Lowe, 2014b).

Negative impact of test anxiety. As mentioned before, test anxiety was often discussed as a type of performance anxiety. Therefore, similarly, when exceeding a certain level, it tends to negatively impact one's test performance (Hembree, 1988; Sarason & Mandler, 1952). Children and adolescents with high test anxiety tend to perform poorer on standardized tests and have lower grades (Segool, Carlson, Goforth, von der Embse & Barterian, 2013). They are also more likely to repeat a grade or drop out of school (Cizek & Burg, 2006; von der Embse & Hasson, 2012). Researchers have also found the debilitating effect of test anxiety was more salient when the evaluative nature of tests was highlighted. In a college sample, Sarason and colleagues (1952) found that high test-anxious students performed significantly lower than their low test-anxious counterparts only when told that the test results would be used to evaluate their aptitude. When told that their scores would not be individually examined, the high and low test-anxious students performed similarly.

Most recently in a meta-analysis of 238 studies from 1988 to 2018, von der Embse and colleagues (2018) found small negative correlations between test anxiety and students' performance on achievement tests (elementary r = -.22, middle school r = -.25, high school r =

-.16, post-secondary r = -.24), and intelligence tests (cognitive proficiency r = -.21, verbal r = -.24, nonverbal reasoning abilities r = -.10), standardized exams (SAT/ACT/entrance exams r = -.31, state exams primary grades r = -.16, intermediate grades r = -.40, secondary grades r = -.23), as well as their grade point averages (r = -.17). As indicated by the correlations, test anxiety appeared to have a stronger negative impact on performance in middle school and post-secondary grades than elementary and high school grades.

Individuals with high test anxiety were also found to be more at risk for other mental health difficulties. In a sample of 83 elementary students, Beidel and Turner (1988) found those who reported greater test anxiety also reported more general worries, social anxiety, specific phobia, and separation anxiety. Similarly, using a sample of 600 9th and 10th grade students, King and colleagues (1995) found that their test-anxious subsample was more likely to meet diagnostic criteria for an anxiety disorder. They also found these students reported greater depression, hopelessness, and suicidality.

Conceptual Overlap between Social, Performance, and Test Anxiety

Social and performance anxiety. The addition of performance anxiety as a subtype of social anxiety was discussed in length by the DSM-5 Anxiety, OC Spectrum, Posttraumatic, and Dissociative Disorder Work Group (Bögels et al., 2010). Based on the review of available factorial and epidemiological studies, the workgroup contended that performance anxiety differed from other types of social anxiety in its etiology, development, symptomology, and treatment response. Specifically, factor analytic studies consistently found performance-related fear emerging as a distinct factor on social anxiety measures (Blöte et al., 2009; Knappe et al., 2010; Kodal et al., 2017). It was also found that individuals with speaking fears only had lower rates of family anxiety disorders and less severe impairment. Reviewed studies also supported

that individuals with performance anxiety demonstrate greater accompanying physiological responses (Norton, Cox, Hewitt, & McLeod, 1997; Turner, Beidel, & Townsley, 1992) whereas those with interaction anxiety more often reported negative emotionality (Hughes et al., 2006). Comparing to more generalized social anxiety, performance anxiety was also associated with fewer negative childhood factors, such as parental conflicts and abuse history (Chartier et al., 2001; Mannuzza et al., 1995) as well as later onset (Fuentes-Rodriguez et al., 2018). It was also less associated with personality characteristics, such as behavioral inhibition and neuroticism (Bögels et al., 2010; Norton et al., 1997). In regard to treatment, individuals with performance anxiety were also shown to respond to beta-blockers while those with more generalized social anxiety did not, suggesting the former may be distinct from other social fears with unique underlying physiological or neurological underpinnings (Davidson, 2003; Kenny, 2005a).

Other researchers reported inconsistent support of the utility of this specifier (Chou et al., 2014). As mentioned before, the most often raised critique was that too few individuals experience clinically impairing performance-only anxiety to make this a meaningful diagnostic entity (Burstein et al., 2011; Crome et al., 2015; Kern et al., 2013; Kodal et al., 2017). However, methodological problems with these studies have also been discussed, particularly regarding the different definitions of performance anxiety across studies. These studies evaluated individuals' fears of several specific social situations. However, the decision of which situations should be categorized as performance related was often made arbitrarily. To date, only one study categorized these situations based on results from exploratory factor analysis (Kodal et al., 2017). Researchers have also pointed out that individuals at different developmental stages possibly have different kinds of performance pressures; and therefore, the measurement of performance anxiety may need to be crafted to suite different age groups (Crome et al., 2015).

Some researchers also pointed out that a substantial number of people experience some level of performance only anxiety but do not meet diagnostic criteria for a mental disorder (Crome et al., 2015). This would support the qualitative distinctiveness of performance anxiety and also explain the low prevalence rates found in some studies.

Moreover, in the aforementioned studies, performance-only anxiety was defined as clinically impairing anxiety in only performance-related situations, excluding cases where fears of any other social situations was indicated. The criteria of not fearing any non-performance social situation is particularly harsh. Considering the high comorbidity rates between anxiety disorders (Powell, 2004), it would not be surprising if individuals whose anxiety predominantly surrounds a performance-related situation also experience some subthreshold levels of generalized social anxiety. This simple definition of performance anxiety has the limitation of overlooking this population who could potentially meet diagnostic criteria of the performance-only subtype of social anxiety. In fact, researchers have acknowledged that although they found substantial amount of people reporting performance related fears, the requirement that they did not endorse anxiety in any other social situations prevented the classification of these cases as performance-only anxiety (Kern et al., 2013). To conclude, the concept of social and performance anxiety demonstrates significant overlap. Factor analysis consistently support that performance fears appear qualitatively different from other types of social fears. Whether or not there exists a sizable subgroup within the social anxiety community, particularly among children and adolescents, who experience performance-only anxiety needs further investigation.

Social and test anxiety. Both the DSM-IV and DSM-5 workgroups considered incorporating test anxiety as a form of social anxiety disorder (Bögels et al., 2010). On one hand, test and social anxiety, particularly the performance subtype, bare resemblance at face

value. Tests were often discussed as one type of performance situation (Elliott & McGregor, 1999; Knappe et al., 2010; Powell, 2004). In factor analysis, fears of test taking also loaded strongest onto the performance or observation fears on social anxiety measures (Cox et al., 2008; Oakman et al., 2003). Conceptually, as it was discussed before, fear of social humiliation is an important aspect of test anxiety, according to some researchers (Friedman & Bendas-Jacob; 1997; Hembree; 1988; Lowe et al., 2008). In some studies, the social humiliation component was found to explain the most variance of test anxiety among all the factors (Bögels et al., 2010; Lowe & Lee, 2008).

However, in other factor analytic studies, the item regarding test taking did not load strongly onto any factors of social anxiety (Kodal, et al., 2017) or even correlated negatively with the other types of social fears (Knappe et al., 2010). The DSM-5 workgroup also pointed out that the etiology of test anxiety could be multifaceted. Although fear of negative social consequences may be the main cause of test anxiety for some people, others could experience fear of testing situations for nonsocial reasons, such as failing, having to repeat a class, dropping out of school, not meeting admission criteria for college, or loss of licensure or employment opportunities. The workgroup suggested that clinically impairing test anxiety due to these nonsocial consequences of poor test performance should be considered more along the lines of a generalized anxiety disorder. Furthermore, as discussed before, some people experience test anxiety due to deficits in study or test taking skills (Tobias, 1985) or as a result of high parental pressure (Chen, 2012). These individuals may exhibit different anxiety symptoms from those with a social anxiety disorder, which centers on a fear of negative evaluation. Overall, although conceptual overlap between test and social anxiety was found in the literature, the DSM-5

workgroup did not propose merging test anxiety with a social anxiety disorder. The argument was that there may be heterogeneity in the test-anxious population regarding its etiology.

Social, Performance, and Test Anxiety in China

Social anxiety. The concept of social anxiety is construed largely the same in China as in Western society, as clinicians also rely on the DSM to examine related symptoms. However, researchers have found different prevalence rates and treatment seeking tendencies in the Chinese population. Specifically, in a meta-analysis of 13 studies of social phobia published between 2000 and 2015, Guo and colleagues (2016) calculated the pooled current and lifetime prevalence rates among Chinese individuals to be .07% and .41%, respectively. The current prevalence rates across studies ranged from 0% to .48%, and the life time prevalence rates ranged from .03% to 1.49%. Prevalence rates were found to be higher in females than males, but no differences were found between rural and urban areas. Using the NCS and NCS-R database, Shen and colleagues (2006) estimated the 12-month prevalence rate of social phobia in Chinese metropolitan cities to be .2%. Different prevalence rates of social anxiety were reported in Asian versus Western Countries. Comparisons between epidemiological studies in Asian (i.e., Korea, Japan) and European countries (i.e. Belgium, France, Germany, Italy, Romania, Ukraine) revealed higher prevalence rates of social anxiety disorder in the latter (Hofmann et al., 2010; Nagata et al., 2015). However, in North America, a recent meta-analysis of 32 studies (Krieg & Xu, 2014) found higher prevalence rates of social anxiety among individuals of Asian heritage than those of European heritage (d = 36).

Hypotheses to explain the different prevalence rates have been proposed. First, methodological differences, such as the use of different assessment instruments and cut points and loss of diagnostic sensitivity in translations could have contributed to different findings (Guo

et al., 2016; Hofmann et al., 2010). Of more interest, cultural differences may have played a role in the individuals' expression of symptoms. Angel and Thoits (1987) argued that individuals go through stages of symptom recognition and evaluation when labeling their own illnesses. After noticing certain symptoms, people first decide if the symptoms are normal and can be ignored or abnormal and require attention. If the latter, they further evaluate the symptoms for their severity and decide if they are physical or psychological in nature. Then they make the decision if treatment is needed, and based on any feedback from professionals, they may reevaluate and relabel their illness. In this process, there are multiple opportunities for cultural values to exert influence. For example, a general level of attention to one's internal states could determine if symptoms are noticed in the first place. Reference norms could affect if individuals consider certain symptoms as problematic or not. Social desirability, beliefs, and knowledge influence both how individuals categorize the symptoms and their treatment seeking tendencies. Whether or not they receive professional evaluations, then in turn affect their final conceptualization of the illness. Consistent with this framework, researchers have pointed out that stigma of having a mental health disorder in the Chinese society may continue to prohibit Chinese individuals from reporting related symptoms or causing them to somatize these symptoms (Guo et al., 2016).

Another hypothesis to account for higher social anxiety levels in Asian versus European Americans has to do with how the individuals view themselves in relation to others. It is generally argued that Asian individuals exhibit stronger interpersonal self-construal, meaning their self-view is strongly related to their relationship with others, while European Americans have more of an independent self-construal, meaning they see themselves as independent from other people. Studies have found positive relationship between interdependent self-construal and social anxiety as well as negative relationship between independent self-construal and social

anxiety (Ho & Lau, 2011). In several mediation studies, independent self-construal was found to fully mediate the differences of social anxiety levels between Asians and European Americans (Ho & Lau, 2011; Hong & Woody, 2007; Krieg & Xu, 2014); interdependent self-construal was also found to fully or partially mediate the ethnic differences.

Performance anxiety. Prevalence rates of performance and test anxiety in China have been relatively less investigated, possibly due to a lack of such epidemiological surveys in the Chinese society. Researchers have, however, documented the presence of performance anxiety in the area of sports and music among Chinese students and professionals (Chan, 2011; Cheng et al., 2011; Liu, 2016). Cheng and colleagues (2009) proposed a three-dimensional conceptualization of performance anxiety in sports players, namely the cognitive, physiological, and regulatory dimensions. The first two dimensions resembles Liebert and Morris's (1967) worry and emotionality components while the regulatory dimension refers to one's perceived control and coping capacity in an anxiety-provoking situation. They validated this three-dimensional conceptualization among a group of 203 Taiwanese college athletes and found a good fit (χ^2 (6) = 4.1, p = .57; RMSEA = .00, CFI = 1.0, SRMR = .02; Cheng, Hardy, & Markland, 2011). Using the state anxiety measure on the State-Trait Anxiety Inventory for Children (STAI-C; Spielberger, 1973) and in a sample of 174 Chinese music students, aged 7 to 18, Chan (2011) found elevated anxiety among participants when they were scheduled to perform in front of an audience. The music performance anxiety among Chinese students was found to be related to personal (e.g. self-esteem, self-efficacy, perfectionism, confidence), environmental (e.g. critical audience), and societal characteristics (e.g. pressure from teachers or parents; Chan, 2011; Liu 2016).

Test anxiety. The academic stress among Chinese students has long been discussed in the literature (Dion & Toner, 1988; Leung, Yeung, & Wong, 2010; Lou & Chi, 2000; Stankov, 2010). It was argued that Asian individuals, under the influence of Confucius teaching, are relatively unforgiving of failures. They also have a firm belief that effort rather than ability leads to academic success. The combination of these attitudes and beliefs leads to high levels of anxiety regarding academic performance among Chinese students, as they are always expected to exert great effort for fear of failure and disappointment of their social connections (Stankov, 2010). Statistically, in a sample of 312 college students, Dion and Toner (1988) found Chinese students experience higher levels of test anxiety than their Northern, Southern, Western, and Eastern European counterparts. In a cross-culture study of 1,215 middle school students aged 14 to 15, Xing and colleagues (2002) found that Chinese students reported significantly more worries of the social consequences of poor test performance (i.e. annoying their parents), while American students reported greater concerns of the nonsocial consequences (i.e. not meeting admission criteria of universities). This possible cultural influence on the etiology of test anxiety has relevance to the present study, as the social vs. nonsocial concerns of poor test results are a main issue to address in the conceptual overlap between test and social anxiety. Nevertheless, to date, the relationship between social, performance, and test anxiety in the Chinese population have not been directly examined.

Measures in the Current Study

Chinese version of the Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2-C). The English version of the RCMAS-2 was developed by Reynolds and Richmond in 2008. It is an update of the original RCMAS (Reynolds & Richmond, 1978), which was developed originally from Janet Taylor's Manifest Anxiety Scale (MAS, 1951). The

MAS was created by selecting items from the Minnesota Multiphasic Personality Inventory (Hathaway & McKinley, 1943) that might be indicative of chronic anxiety. Castaneda and colleagues (1956) then reworded items on the MAS to make them more suitable for children; they named the new measure Children's Manifest Anxiety Scale (CMAS). They also added new items reflecting common imperfections in order to detect subjects that may be responding untruthfully. Subsequent factor analysis revealed a five-factor structure: three anxiety factors (Worry/Oversensitivity, Physiological Anxiety, and Concentration) and two lie factors (Finch, Kendall, & Montgomery, 1974). Reynolds and Richmond (1978) revised the CMAS to improve its psychometric properties and to further reduce item difficulty for children. The revised measure was named the Revised Children's Manifest Anxiety Scale (RCMAS).

Originally, the RCMAS consisted of 36 items and was validated among students in grades 1-12. Five factors were found on the measures: Social Concerns/Concentration, Worry/Oversensitivity, Physiological Anxiety, and two Lie factors, the latter two were combined for scoring purposes. The authors updated the measure in 2008 (RCMAS-2) with new items and norms. It was argued that the new measure covered broader content and had improved psychometric properties (Reynolds & Richmond, 2008a). The RCMAS-2 includes 49 items in a yes/no format (Reynolds & Richmond, 2008b). The authors conducted an EFA and determined a five-factor model: Social Anxiety (anxiety in social and performance situations), Worry (obsessive concerns and worrisome thoughts), and Physiological Anxiety (physical symptoms accompanying anxiety), and two Defensiveness (willingness to admit to common imperfections) factors was the best fit; the latter two were combined for scoring (Reynolds & Richmond, 2008a). This factor structure was later confirmed with CFA (Lowe, 2014a).

The RCMAS-2 Social Anxiety scale, in particular, consists of 12 items. The authors reported alpha coefficient for the RCMAS-2 Social Anxiety scale scores of .80 (Reynolds & Richmond, 2008a), although this estimate was somewhat lower in studies of Asian populations (α = .73; Ang et al., 2011; α = .77; Wu et al., 2016). The Social Anxiety scale scores were found to correlate in the moderate to high range with the other RCMAS-2 anxiety scale scores (r = .58 – .91) and the Children's Depression Inventory scores (r = .60; Kovacs, 1992), and in the low range with the RCMAS-2 Defensiveness scale scores (r = -.10) and scores of various scales assessing externalizing behaviors (e.g. oppositional, hyperactivity) on the Conner's Rating Scales (r = .04 – .23; Conners, 1990; Reynolds & Richmond, 2008a). These results support the validity of the Social Anxiety scale scores.

The RCMAS-2 has been validated in Asian cultures as well. Ang and colleagues (2011) conducted an EFA on the RCMAS-2 item scores in a sample of 1,618 Singapore school-age children and adolescents; the five-factor structure was supported and found to be similar across gender and cultural (i.e. Chinese, Malay, Indian) groups. Correlations ranged from .47 to .82 between the RCMAS-2 anxiety scale scores; from .59 to .77 between the RCMAS-2 and the BASC-2 SRP (Reynolds & Kamphaus, 2004) anxiety scale scores, and from .37 to .55 between the RCMAS-2 anxiety scale scores and the Academic Expectations Stress Inventory (Ang & Huan, 2006) scale scores. The moderate to high correlations between the RCMAS-2 scale scores and scores on other measures of similar constructs supported the convergent validity of the RCMAS-2 in the Asian sample. On the other hand, the RCMAS-2 anxiety scale scores were found to correlate low with scores on the Narcissistic Personality Questionnaire for Children-Revised (Ang & Raine, 2009), a measure of a different construct. Discriminant validity of the RCMAS-2 was also supported.

In addition to the anxiety and Defensiveness scales, the RCMAS-2 includes a Performance Anxiety cluster, consisting of 10 items. However, the authors did not describe psychometric properties of this cluster (Reynolds & Richmond, 2008a). In a sample of 1,003 U.S. students aged 7 to 19, McGovern (2016) estimated the internal consistency reliability of the Performance Anxiety cluster scores to be .82. In an Asian sample, Ang and colleagues (2011) reported the internal consistency of the cluster scores to be .77 and the 2-week test-retest reliability to be .63. The Performance Anxiety cluster was also found to be invariant across gender and age groups, and the scores correlated in the moderate to high range (r = .48 – .60) with scores on the Test Anxiety Scale for Elementary Students (Lowe & Ang, 2012; McGovern, 2016).

Zhu and Lowe (2018) adapted the RCMAS-2 into a Chinese version (RCMAS-2-C) and validated the scores of the measure in a sample of 480 students, aged 12 to 19. In the adaptation study, the authors found the same five factors as on the RCMAS-2. However, the Social Anxiety and Worry factors demonstrated a high correlation (.95). This was possibly due to several items on the worry scale also alluding to social contexts (Reynolds & Richmond, 2008a). Therefore, the four-factor model combining the social anxiety and worry items was retained. Nevertheless, in the current study, the construct of social anxiety is of most interest. Therefore, to exclude possible influence from items that might measure general anxiety on the Worry scale, only items from the social anxiety factor were used. Categorical omega for the RCMAS-2-C Social Anxiety/Worry scale scores was reported at .90 (Zhu & Lowe, 2018). However, reliability of just the Social Anxiety scale scores have not be examined. Furthermore, the Performance Anxiety cluster on the RCMAS-2-C has not been validated.

Chinese version of the Test Anxiety Measure for Adolescents (TAMA-C). The TAMA-C is adapted from the TAMA, a 44-item self-report measure of test anxiety developed in the United States (Lowe, 2014b). The TAMA is designed for students in grades 6 to 12 and assesses test anxiety before, during, and after tests. It consists of five scales: Physiological Hyperarousal (physical symptoms associated with test anxiety, 10 items), Worry (worrisome thoughts related to tests, 10 items), Cognitive Interference (the distracting thoughts we experience in testing situations, 8 items), Task Irrelevant Behaviors (restless, fidgety, distracted, and avoidant behaviors associated with test taking, 7 items), and Social Concerns (concerns about the perceptions of peers, teachers, and parents when performing poorly on a test, 9 items). Students respond to the items on a four-point scale: never, sometimes, often, and almost always.

Lowe (2014a) validated the five-factor structure of the TAMA among 688 students, aged 11 to 19 and in grades 6 through 12; CFA results indicated an adequate fit ($\chi^2 = 1193.25$, $p < .0001$, CFI = .97, TLI = .96, RMSEA = .04). Internal consistency reliability coefficients (Cronbach's alpha) for the five scale scores ranged from .78 to .93. Additionally, partial invariance for the TAMA factor structure was found across gender, indicating similar scoring procedures could be used for males and females (Lowe, Goldenberg, & Wheeler, 2014). Consistent with the literature, females were found to score higher on the TAMA than males. Furthermore, correlation coefficients between the TAMA scale scores and the Behavior Assessment System for Children, Second Edition—Self-Report of Personality (BASC-2-SRP, Reynolds & Kamphaus, 2004) Test Anxiety scale scores were between .57 and .80. The correlation coefficients between the TAMA and the RCMAS-2 anxiety scale scores were between .44 and .70, with similar scales (e.g. TAMA Worry and RCMAS-2- Worry) exhibiting higher correlations. On the other hand, the correlations between the TAMA scale scores and the

RCMAS-2 Defensiveness scale scores were low (-.0.13 to -.04). These results provide validity evidence for the TAMA scores.

The TAMA-C was adapted and validated in a sample of 289 Chinese middle and high school students (Lowe & Zhu, 2017). Results indicated that a modified five-factor structure provided adequate fit to the data ($\chi 2 = 1663.521$, $p < .0001$, CFI = .906, RMSEA = .049). Other validity and reliability evidence for the TAMA-C scores have not been reported.

It is worth pointing out that the RCMAS-2 is considered a manifest or general anxiety measure. Manifest anxiety, derived from drive theory, is sometimes argued to be equivalent to test anxiety, which also has its roots in drive theory (Sarason & Mandler, 1952; Taylor, 1956). Therefore, it can be hypothesized that the RCMAS-2-C and the TAMA-C items may not be differentiable because they assess the same underlying construct. This hypothesis, however, is not supported by empirical data. Previous studies found the correlations ranged from .44 to .61. between the RCMAS-2 Social Anxiety and TAMA scale scores (Lowe, 2014b), and from .26 to .60 between the RCMAS-2-C Worry/Social Anxiety and the TAMA-C scale scores (Zhu & Lowe, 2018). These low to moderate correlations suggest the measures assess similar but also distinguishable constructs.

Characteristics of Quality Measures

To accurately understand psychological phenomena, it is important to have psychometrically sound measures to assess the phenomena. The quality of psychological measures is usually discussed in terms of the reliability of their scores and validity of any conclusions that could be derived from the scores.

Reliability. The reliability of test scores is related to its consistency: consistency over time (test-retest reliability), across similar measures (parallel forms reliability) and different

raters (inter-rater reliability), and within the same measure (internal consistency reliability; Drost, 2011). Accordingly, there are different statistical approaches to evaluate test reliability. Of most interest to the current study is the evaluation of internal consistent reliability. The most widely used coefficient in the literature is Cronbach's alpha (Cronbach, 1951), which is an indicator of interrelatedness of the items on a measure.

However, some researchers have cautioned against using Cronbach's alpha irrespective of the characteristics of the measure (Graham, 2006; Tavakol & Dennick, 2011). They have pointed out that derivation of alpha is based on a tau-equivalent model, which assumes homogeneity among test items. That is to say all the items measure the same latent variable with the same precision. In practice, this prerequisite is hard to satisfy even when the multidimensionality of a measure is taken into account and items are discussed on their respective dimensions. Consequently, Cronbach's alpha is often a low-bound estimate of reliability (Tavakol & Dennick, 2011).

Alternatively, Yang and Green (2015) proposed to evaluate the internal consistency of a measure using a nonlinear structural equation modeling (SEM) method. This method applies to measures with ordered categorical items, and the derived coefficient was subsequently termed categorical omega (Kelley & Pornprasertmanit, 2016). In this new method, items were not assumed to be homogeneous, or in other words, to measure the latent construct equally well. Instead, this hypothesis can be tested. In testing the model, the authors designed scales with different levels of item homogeneity, and they did so by manipulating the threshold levels for each item. In a homogeneous scale, all items had a balanced threshold of 0. When items were moderately heterogeneous, half of the items had a balanced threshold, whereas the other half had either primarily positive or primarily negative thresholds, with the positive and negative

thresholds balancing at 0. When items were highly heterogeneous, half of the items had positive thresholds and the other half had negative thresholds, with all thresholds again balancing at 0. At last, when items were extremely heterogeneous, half of the items had positive thresholds and the other half had negative thresholds; however, the thresholds did not balance at 0. The authors found adequate model fit when items were homogeneous, moderately heterogeneous, or highly heterogeneous. However, model fit deteriorated when items were extremely heterogeneous. The authors advised against reporting the reliability when data does not fit the model. Another advantage of the categorical omega over coefficient alpha is particularly in regard to ordered categorical variables. Unlike alpha, which examines the reliability of the continuous variables underlying the categorical variables, categorical omega estimates the reliability of the observed categorical item scores (Yang & Green, 2014).

Latent Variable Models

A latent variable model aims to explore the relationship between a set of observed variables and a set of underlying latent variables. The assumption is that the observed variables correlate with each other because they all reflect the latent variables in some way; the observed variables should not have any commonalities with each other once the effect of the latent variables are removed (Everitt, 1984). Factor analysis is a common latent variable model. Factor analysis aims to investigate the underlying factors that explain the observed variables: how many there are, how they are related to the observed variables, and how to interpret them. EFA is conducted when the researchers do not have a theoretical hypothesis regarding the factor structure and rely on model fit statistics in extracting the factors. On the other hand, CFA is conducted when researchers want to test the model fit given a fixed factor structure. Both EFA

and CFA treat the overall population as homogeneous such that individuals experience the latent construct in the same way.

Latent Profile Analysis. Latent profile analysis (LPA) is also a latent variable model. Different from factor analysis, where the latent variable(s) are continuous, in LPA, the latent variable(s) are categorical, representing different classes (Bartholomew, Knott, & Moustaki, 2011). Individuals differ from each other through their different class memberships. LPA is often used to understand heterogeneity of certain constructs among an overall population. To conduct LPA, a latent categorical variable is modeled on the observed variables. Based on theoretical appropriateness, the researcher manipulates the number of classes for the categorical variable and compares model fit indices to select a best-fitting model. This process is exploratory and usually starts from two classes and increases the class number until the best fitting model is found. Once the number of classes is determined, the researcher also has the option of using external variables not included in the model as covariates to predict membership to any class. This allows for comparison and further understanding of the characteristics of individuals in different classes. Introducing the covariates after the besting fitting model has been selected was recommended by Lubke and Muthén (2007), as the covariates may potentially explain part of the variances in the data and thus interfere with model estimation.

Summary

Anxiety disorders were defined as a more diffuse condition in earlier editions of the DSM with the exception of phobias and obsessive-compulsive reactions (APA, 1952; APA, 1968). Social anxiety was not introduced until the publication of the DSM-III (APA, 1980), at which time, it was conceptualized as a type of specific phobia and fears of different social situations which were deemed qualitatively different. Subsequent researchers have revised this

conceptualization and moved towards a unidimensional concept of social anxiety (Liebowitz et al, 1985; Ruscio et al., 2008). The most recent definition of a social anxiety disorder in the DSM-5 (APA, 2013) is a pervasive fear and avoidance of social situations with a core feature being the fear of negative social evaluation. Genetic predisposition as well as direct and vicarious trauma conditioning have been all found to be associated with the development of social anxiety (Beatty et al., 2002; Bruch and Heimberg, 1994; Hirshfeld-Becker et al., 2008; McCabe et al., 2003; Mineka & Zinbarg, 2006; Stemberger et al., 1995). Prevalence rates of social anxiety have varied between .3% (3-month) to 13.1 (life-time; Copeland et al., 2014; Kessler & Üstün, 2004; Wittchen & Jacobi, 2005), with higher prevalence rates reported in females than in males (Bandelow & Michaelis, 2015; Copeland et al., 2014; Costello et al., 2005; Kessler et al., 2012; Ruscio et al., 2008). High social anxiety has been found to be related to underdeveloped social skills, poor social connections, other anxiety and depressive symptoms, as well as poor educational outcomes (Beidel et al., 1999; Beesdo et al., 2007; Fehm et al., 2008; Stein & Kean, 2000).

Performance anxiety has often been used to describe anxiety in specific performance situations, such as music (Kenny & Osborne, 2006; Tamborrino, 2001), sports (Smith et al., 2006), and public speaking (Merritt et al., 2011). It has also been conceptualized as a subtype of social anxiety in the latest version of the DSM (DSM-5; APA, 2013). Two dimensions of performance anxiety, cognitive anxiety and somatic anxiety, were discussed in the literature (Hardy & Parfitt, 1991; Kenny, 2011; Miller & Chesky, 2004). Development of performance anxiety was found to be related to an individual's genetic, psychological, and environmental vulnerabilities (Bitran & Barlow, 2004; Kenny et al., 2004). Prevalence rates of performance anxiety have varied significantly across studies, from lower than 1% in some epidemiological

studies (Burstein et al., 2011; Crome et al., 2015) to 6.6% in a community sample (Knappe et al., 2010). Gender differences have also been found with females reporting higher levels of performance anxiety than males (Abrahamsen, Roberts, & Pensgaard, 2008; Marmorstein, 2006; McGovern, 2016; Osborne & Kenny, 2005). High performance anxiety was found to have debilitating effects on one's performance as well as positive correlations with other mood and behavioral disorders.

Test anxiety was described as anxiety reactions in testing situations (Zeidner, 1998). Its dimensionality has been expanded from the original worry and emotionality (Liebert & Morris, 1967) to include social derogation (Friedman & Bendas-Jacob, 1997), off-task behaviors (Nottlemann & Hill, 1997), and cognitive interference (Lowe et al, 2008). Development of test anxiety has been discussed from both a deficit model (Bruch, 1981; Desiderator & Koskinen, 1969; Mitchell & Ng, 1972; Wittmaier, 1972), where test anxiety is caused by poor study and test taking skills, and an interference model (Hembree, 1988; Sarason & Mandler; 1952; Wine; 1971), where high test anxiety interferes with one's test performance. More comprehensive models were also discussed with social and contextual factors integrated (Carver & Scheier; 1988; Lowe et al., 2008; Spielberger et al., 1995; Zeidner & Matthews, 2005). Recent estimates of test anxiety prevalence have ranged approximately between 16% and 30% (Putwain & Daly, 2014; von der Embse et al., 2014). Females have consistently reported higher levels of test anxiety than males (Lowe, 2015; Putwain, 2007; Putwain & Daly, 2014; Segool et al., 2013). High test anxiety was found to be related to poor test results, lower grades, higher drop-out rates, and higher risk of other mental health challenges (Beidel & Turner, 1988; Cizek & Burg, 2006; King et al., 1995; Segool et al., 2013).

Conceptual overlap and differences between social, performance, and test anxiety were discussed. Between social and performance anxieties, studies have identified the differences in their etiology, symptomology, and treatment response (Blöte et al., 2009; Chartier et al., 2001; Fuentes-Rodriguez et al., 2018; Kenny, 2005a; Knappe et al., 2010; Kodal et al., 2017; Norton et al., 1997; Turner et al., 1992). Although extremely low prevalence rates were cited as lack of support for the distinctiveness of the performance-only social anxiety (Burstein et al., 2011; Chou et al., 2014; Crome et al., 2015; Kern et al., 2013; Kodal et al., 2017), methodological problems in these studies were pointed out, including inconsistent and overly narrow definition of performance-only social anxiety. Moreover, test anxiety has been considered different from social or performance anxiety as it may be induced by nonsocial reasons such as skill deficits or fears regarding having to retake a test or repeat a class (Bögels et al., 2010; Chen, 2012; Tobias, 1985).

Social, performance, and test anxiety were also reviewed in the Chinese or Asian culture. Lower prevalence rates of social anxiety were found in Asian countries versus their Western counterparts (Guo et al., 2016; Hofmann et al., 2010; Nagata et al., 2015; Shen et al., 2006); however, in North America, higher prevalence rates of social anxiety were found among individuals with an Asian heritage than those with European heritage (Krieg & Xu, 2014). Chinese students also reported higher levels of test anxiety than European students (Xing et al., 2002). Culture differences such as attention to one's internal state, normalizing of symptoms, psychological versus physiological interpretations of symptoms, as well as an independent versus interpersonal self-construal could also contribute to the differences in the experienced or reported anxiety levels across cultures (Ho & Lau, 2011; Hong & Woody, 2007; Krieg & Xu, 2014).

The measures used in the current study, the RCMAS-2-C Performance Anxiety cluster and Social Anxiety scale (Reynolds & Richmond, 2008b; Zhu & Lowe, 2018) as well as the TAMA-C (Lowe, 2014b; Zhu & Lowe, 2018) were reviewed. The original measures in English and their developmental history were described; reliability and validity evidence were reported. The process used to adapt the original measure into the Chinese versions was also described. The RCMAS-2-C Performance Anxiety cluster consist of 10 items, and the Social Anxiety scale, 12 items; all written in a yes/no format. The TAMA-C consists of 44 items on five scales: Physiological Hyperarousal, Worry, Cognitive Interference, Task Irrelevant Behaviors, and Social Concerns. Moderate correlations between the RCMAS-2-C and the TAMA-C scores were reported (Zhu & Lowe, 2018), suggesting the two measures assessed related but distinct constructs.

Yang and Green's (2015) categorical omega was reviewed as a method to measure internal consistency reliability for instruments with ordered categorical items. This method was deemed superior to Cronbach's alpha (Cronbach, 1951) when tau-equivalence cannot be assumed. Factor analysis was reviewed as methods to examine factor structure on a certain measure. LPA was reviewed as a method to investigate heterogeneity of a construct in a total sample (Lubke & Muthén, 2005).

Chapter III

Method

The Method section describes the participants included in the current study. Instruments, procedures, and data analyses are also described below.

Participants

Data were collected from 1000 students, aged 12 to 21, from two middle and high schools in Central China. Since the RCMAS-2 was designed for children and adolescents aged 6 to 19, participants aged 20 (N = 17) and above were excluded from the present study. Moreover, researchers have argued that, due to potential careless responding, quality of the data collected from anonymous surveys can be a concern (Meade & Craig, 2012). Different methods have been proposed to detect cases of careless responding, one of them is to examine the consistency of the participant's response pattern. The RCMAS-2 was designed with an Inconsistent Responding Index (IRI), which consists of 10 pairs of items that should elicit the same responses; one of the items is reverse scored (Reynolds & Richmond, 2008b). According to the manual, higher IRI scores indicate greater likelihood of careless responding. When the IRI score is 6, the likelihood is as high as 81%. Therefore, in the current study, participants with an IRI score of 6 or above (N = 103) were excluded.

The resulting sample consisted of 859 students aged 12 to 19 (M = 15.99, SD = 1.57) in grades 7-12. Mean grade level was 9.18 (SD = 1.63). Four hundred and forty-six (51.9%) were males and 407 (47.4) were females; 7 (.7%) did not report their gender. The majority (93.9%) of the students' ethnicity was Han, with only two students (.2%) reporting their ethnicity as Hui and one student (.1%) reporting his/her ethnicity as Man.

Instruments

Two measures were used in the current study: the RCMAS-2-C and the TAMA-C. These two measures were adapted to Mandarin Chinese through a backward translation procedure by six bilingual (Chinese-English) individuals: four native Chinese speakers with graduate degrees in education or psychology and two native English speakers with at least a bachelor's degree in Chinese (Zhu & Lowe, 2018). The measures were first translated from English to Chinese by the native Chinese speakers in a group setting. The translated measures were subsequently translated backward into English by the two native English speakers independently. The forward translators then reviewed the backward translations against the original English versions and decided if there were any discrepancies; if there were, changes were made on the forward translations. Then revised forward translations were sent to the English speakers again for backward translation. This process was repeated until the forward translators determined there were no significant discrepancies between the backward translations and the original measures. The forward translations were sent to the author or the publishing company of the measures for final review and final changes were made based on their feedback.

Chinese version of the Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2-C). The RCMAS-2-C (Reynolds & Richmond, 2008b; Zhu & Lowe, 2018) is a 49-item self-report measure of manifest anxiety. The item responses are binary, using a yes/no format. The original version in English, the RCMAS-2 was designed for children and adolescents aged 6 to 19 (Reynolds & Richmond, 2008a) and standardized in the United States. The RCMAS-2 consists of three anxiety subscales: Worry, Social Anxiety, and Physiological Anxiety and one Defensiveness scale where certain items are worded either positively or negatively. The RCMAS-2-C was validated in a group of Chinese adolescents aged 14 to 19.

CFA confirmed three anxiety factors and two defensiveness factors (positively and negatively worded); however, the Worry and Social Anxiety scale scores correlated highly with each other. A four-factor structure with these two factors combined also fitted the data equally well. Therefore, the four-factor structure was adopted due to parsimony. Internal consistency reliability of the RCMAS-2-C Worry/Social Anxiety scale scores were estimated at .90 using categorical omega. Correlations between the Worry/Social Anxiety scale scores and the TAMA-C scale scores ranged from .26 to .60 (Zhu & Lowe, 2018).

In the current study, the construct of social anxiety is of interest. Although the RCMAS-2-C Worry and Social Anxiety items loaded onto one factor in the validation study, it was suspected this was due to certain items on the Worry scale, particularly the new items when the RCMAS-2 was developed, also alluding to the social context. In other words, not all items on the Worry scale were believed to assess worries in social situations. Therefore, to ensure all items assess anxiety in social situations, only the Social Anxiety items on the RCMAS-2-C were used in the current study. This scale consists of 12 items. Reliability and validity evidence for the scale scores have not been reported.

The original RCMAS-2 contains a Performance Anxiety cluster that assesses anxiety in performance situations. This cluster contains 10 items that can be found on the Worry and Social Anxiety scales. A one-factor structure was established and found invariant across gender and age groups (McGovern, 2016). Internal reliability was estimated between .77 and .83 across studies (Ang et al., 2011; McGovern, 2016), and convergent validity evidence was reported with moderate to high correlations between the Performance Anxiety Cluster and another test anxiety measure scores (McGovern, 2016). The Performance Anxiety Cluster on the RCMAS-2-C has not been validated.

Chinese version of the Test Anxiety Measure for Adolescents (TAMA-C). The TAMA-C (Lowe, 2014b; Lowe & Zhu, 2017) is a 44-item self-report measure of test anxiety before, during, and after tests. Individuals respond to the items on a four-point scale: never, sometimes, often, and almost always. The original English version, the TAMA (Lowe, 2014b) is designed for students in grades 6 to 12. It consists of five scales: Physiological Hyperarousal, Worry, Cognitive Interference, Task Irrelevant Behaviors, and Social Concerns. The five-factor structure was validated in the U.S. and Chinese samples (Lowe, 2014b; Lowe & Zhu, 2017). Internal consistency reliability coefficients (α = .78 to .93) as well as evidence for convergent and discriminant validity were reported for the TAMA scale scores in a U.S. sample (Lowe, 2014b). However, this information (i.e., internal consistency reliability and convergent and discriminant validity) has not been reported for the TAMA-C scale scores. All the TAMA-C items would be used in the current study.

Procedures

This study was approved by the Human Research Protection Program (HRPP), formerly known as the Human Subjects Committee – Lawrence (HSCL) at the University of Kansas. Ethical guidelines were followed with adaptation to the customs and practices in Chinese schools. After the study was approved by HRPP, a letter explaining the purpose and procedures of the study was sent to the local Bureau of Education, and authorization was obtained to conduct the study in local schools. Subsequently, participating schools were identified through personal contacts with the author, and invitations to participate in the study were sent to the principals. Written informed consents were returned. In Chinese society, it is not a common practice to obtain parental consent for minors to participate in research studies. In lieu of, if these studies occur on school campus, principal consent is required.

Data collection was completed on one day at each school. Students completed all measures in one sitting in their classrooms. Sequence effect was counterbalanced by printing the RCMAS-2-C first in half of the questionnaires and the TAMA-C first in the other half. Prior to distributing the measures, teachers read the instructions, which detailed the purpose of the study and the steps to complete the measures. Students were provided the opportunity to leave the setting if they did not wish to participate. Measures were then distributed, and participating students were then instructed to read the instructions again and fill in their demographic information before answering the questions.

Data Analyses

Data Screening and Missing Data Analyses. Descriptive analyses of the complete dataset were first performed using SPSS, Version 25 (IBM Corp, 2017) to detect missing data. For the RCMAS-2-C performance anxiety and social anxiety items, approximately .2% of the data were missing. In a listwise deletion approach, which is to drop a case where there is a missing value on any variable, a total of 20 students (2.3%) neglected to provide responses on some items. Researchers have suggested omitting less than 5% of the total sample by listwise deletion is likely to be inconsequential in affecting the results (Schafer; 1999). Therefore, missing values on the RCMAS-2-C performance and social anxiety item responses were handled with the listwise deletion method.

For the TAMA-C items, approximately 1.2% of the dataset was missing. However, when considering listwise deletion, a total of 221 students (25.7%) demonstrated missing responses on some items. Research has shown when having to omit more than 10% of the data, listwise deletion may lead to biased results (Bennett, 2001). In this case, researchers need to consider the pattern of missing data, whether it is missing completely at random (MCAR), missing at random

(MAR), or missing not at random (MNAR). The first two missing patterns assume that the probability of missing does not depend on the missing values. In other words, students did not omit a response to an item because of the way they would have answered the item. In contrast, MNAR assumes that the missing value itself affects the probability of missing. In practice, it is difficult to determine whether data are missing at random unless the researchers follow up with the participants for more clarification. However, Little's (1988) MCAR test on the TAMA-C dataset yielded a nonsignificant result (Chi-Square = 1.440, p = .230), indicating missing in the current dataset more likely occurred randomly. Furthermore, there is no clear evidence that any of the TAMA-C item content would influence one's probability of responding (i.e. items eliciting sensitive personal information may be avoided by some participants). Therefore, missing data in the present study are assumed to be at least MAR.

A popular way of dealing with missing data is through multiple imputation (MI, Harel & Zhou, 2005). MI is a simulation-based approach that estimates missing values based on the observed data distribution. It assumes data are MAR. Several steps are included in the analysis using imputed data. First, multiple datasets are imputed to account for the uncertainty of single imputation. Then, statistical analysis is performed using each imputed dataset. Last, model estimates from each analysis are pooled together to obtain the final results.

One commonly used MI method to estimate missing values on multiple variables is the multiple imputation by chained equations (MICE), also known as a fully conditional specification (FCS) approach (van Buuren & Groothuis-Oudshoorn, 2011). MICE specifies a unique imputation model for each variable with a missing value. For the first variable with missing values, X_1, the observed X_1 values are regressed on all other variables. The missing values of X_1 are then estimated by drawing from the posterior predictive distribution of X_1.

Then, a similar step is followed for the next variable with missing values, X_2, where the observed X_2 values are regressed on all other variables, including the imputed X_1. This process is repeated until the missing values for all variables are filled in and one imputed dataset is complete. Multiple datasets are then imputed following the same steps (White, Royston, & Wood, 2011). Research has shown the precision of analysis results increases with the number of imputed datasets (van Buuren & Groothuis-Oudshoorn, 2011). However, data imputing is also time-consuming. Therefore, a balanced rule of thumb is that the number of imputed datasets should match the percentage of missing values in the data (i.e. 30 datasets for 30% missing values, Bodner, 2008; White et al., 2011). In the current study, a total of 100 datasets were imputed to maximize precision of results. Imputation is performed using the 'mice' package (van Buuren & Groothuis-Oudshoorn, 2011) in R (version 3.5.3, R Development Core Team, 2019). Proportional odds model (i.e. ordinal logistic regression) was used to accommodate for the ordered categorical variables.

Factor Analysis. To examine conceptual overlap between social and performance anxiety, first, the complete dataset was split into two random samples of approximately equal size. EFA was performed on the RCMAS-2-C performance anxiety and social anxiety items in one random sample using SPSS, Version 25 (IBM Corp, 2017). Considering there is significant overlap of items between these two clusters, a CFA would not be ideal. Rather, EFA would indicate whether subtypes of social anxiety would emerge. The factor model suggested by EFA results was validated with a CFA in the other random sample. To extract factors, the following rules or methods were applied: (a) the eigenvalues-greater-than one rule (Kaiser, 1960), (b) presence of a "natural break" in the scree plot (Cattell, 1966), (c) parallel analysis (Horn, 1965),

(d) Velicer's minimum average partial test (MAP; Velicer, 1976), and (e) examination of the interpretability of the factor solutions (Kaiser, 1960).

Eigenvalues represent the amount of variance explained by a specific factor in relation to the number of items included on the factors. An eigenvalue of 1.0 indicates that the amount of the variance explained by the factor equals the variance that can be explained by one item. Similarly, eigenvalues greater than 1.0 means that the variance explained by the factor equals the variance that is explained by more than one item (Tabachnick & Fidell, 2007; Zwick & Velicer, 1986). Because a factor should consist of at least one item, eigenvalues greater than one have been used as a general rule of factor extraction (Salkind, 2007).

The scree plot is a line plot of the eigenvalues of factors. It typically exhibits a declining trend with the eigenvalue of the first factor being the greatest and continuing to decrease for the subsequent extracted factors. In this declining trend, there is usually a break-point that separates a steeper slope (first half) from a more gradual slope (second half). The practical meaning of this break-point is that, after this point, adding more factors no longer results in significantly more explained variance as it does before. Therefore, the numbers of likely factors for a measure is often estimated as the number of factors at the break-point (Cattell, 1966, 1978; Tabachnick & Fidell, 2007). The determination of the break-point in this method; however, is subjective and relies on the judgement of the researcher. Therefore, the estimation is considered preliminary and needs corroboration from other more objective methods (Zwick & Velicer, 1986).

Parallel analysis (Horn, 1965) is one of these objective methods. Using this method, a simulated data set will be created using the Monte Carlo technique (Metropolis & Ulam, 1949), a computational algorithm that relies on repeated random sampling to generate data sets that are parallel to the actual data. Eigenvalues from the actual data will then be compared to those from

this simulated data set, and only those factors with greater eigenvalues in the actual data are retained factors (Horn, 1965; Tabachnick & Fidell, 2007). Horn (1965) initially developed this method due to concerns of the effect of sampling errors on the eigenvalues. By examining the eigenvalues in the simulated random data, researchers are able to determine the probability of extracting certain factors purely by chance. Retaining factors with higher eigenvalues in the actual data then ensures these factors have a higher likelihood of just occurring by chance. Zwick and Velicer (1986) indicated that parallel analysis was a fairly accurate method of extracting factors with a slight tendency to overestimate the number of factors when factor saturation was low (i.e. item loadings at .5).

Velicer's (1976) MAP test was also performed. The MAP test consists of a principal component analysis followed by a stepwise procedure partialling out the principal components. For a measure consisting of *k* number of items, this procedure has *k*-1 steps. In each step, after the principal component is partialed out, the average squared off-diagonal correlation of the correlation matrix is calculated, the partial correlation from all steps are compared, and the step number with the lowest partial correlation is the number of factors that are retained (Velicer, 1976). This method allows researchers to extract factors whose variance in the correlation matrix represents systematic rather than error variance (Courtney & Gordon, 2013). Zwick and Velicer (1986) discussed that when each factor consisted of fewer items ($N = 36$ vs 72) and when the factor saturation was low, the MAP test tended to underestimate the number of factors to be extracted. In the current study, SPSS syntax provided by O'Connor (2000) was used to perform the parallel analysis and MAP test. The parallel analysis eigenvalues by this syntax would be from principal component analysis.

Finally, the factors extracted by the previous methods were interpreted theoretically. How the extracted factors bore conceptual meaning relevant to the anxiety research among children and adolescents was examined. Specifically, attention was paid to whether the extracted factors represent distinct performance anxiety versus other types of social anxiety.

Single group CFAs were performed using R (version 3.5.3, R Development Core Team, 2019) to answer different research questions. The weighted least squares (WLSMV) parameter estimator was used to accommodate for the categorical data (Brown, 2006). Guidelines for a good and adequate model fit were a comparative fit index (CFI) and a Tucker Lewis index (TLI) value close to .95 (Hu & Bentler, 1999) or at or above .90 (Bentler, 1990), respectively, and a root mean square error of approximation (RMSEA) value of less than .06 (Browne & Cudeck, 1993) or at or below .08 (Hu & Bentler, 1999), respectively. The CFI and TLI are both incremental fit indices that compare the fitness of a target model to a baseline model with all variables uncorrelated (Hooper, Coughlan, & Mullen, 2008). The values range between 0 and 1, with larger values indicating better fit of the target model in comparison to the baseline model. RMSEA is an absolute fit index that examines how closely the target model's covariance matrix matches the observed covariance matrix derived from the data (Hooper et al., 2008). The value also ranges between 0 and 1, with lower values indicating better fit of the target model.

A single group CFA was performed to validate the factor structure suggested by the previously performed EFA (as mentioned above). The result would shed light on the conceptual overlap between social and performance anxiety. It would also contribute to our understanding of the factor structure of the performance anxiety cluster items and whether these items tend to fit on one or multiple factors. Since the factor structure of the performance anxiety cluster items have not been validated on the RCMAS-2-C, additional CFAs were performed on these items to

validate a one-factor model or other factor models suggested by the EFA result. Further CFAs were performed to investigate the conceptual overlap between performance/social anxiety and test anxiety. The RCMAS-2 performance anxiety and social anxiety as well as the TAMA-C items were examined together. Given the length of the TAMA-C, this measure was examined on a scale-by-scale basis. Each TAMA-C scale was examined with the performance/social anxiety items separately (e.g. TAMA-C Physiological Hyperarousal + RCMAS-2-C performance/social anxiety items; TAMA-C Worry + RCMAS-2-C performance/social anxiety items, etc.). Based on the best fitting model (i.e. *N*-factor model) found on the RCMAS-2-C performance/social anxiety items in the previous steps, the goal was to validate a *N*+1-factor structure for each item set, indicating conceptual distinctiveness between social/performance anxiety and test anxiety.

Categorical Omega. Researchers have advised to considered Likert-type items, particularly those with five response options or less, ordered categorical (Grace-Martin, 2008), as equal intervals between response options are difficult to justify. Following this advice, both the RCMAS-2-C and the TAMA-C items in the current study were considered ordered categorical. Therefore, internal consistency reliability of the performance anxiety item scores was examined with Yang and Green's (2014) categorical omega, as well as its 95% confidence interval. Data analysis was conducted using R (version 3.5.3, R Development Core Team, 2019). There is no clear consensus in the literature regarding the acceptable range for omega coefficients (Reise, Bonifay, & Haviland, 2013). Some researchers have proposed that coefficients above .50 are acceptable, although values closer to .75 would be preferred (Reise et al., 2013).

Latent Profile Analysis. After the *N*+1-factor structure was validated for the performance/social and test anxiety items, the next step was to examine if the experience of these types of anxiety was heterogeneous in the population. To answer this question, an LPA was

performed using Mplus, Version 8 (Muthén & Muthén, 1998-2017). Following common practice in mental health studies (e.g. Cloitre, Garvert, Brewin, Bryant, & Maercker, 2013; Lai, Kelley, Harrison, Thompson, & Self-Brown, 2015; von der Embse, Mata, Segool, & Scott, 2014), factor composite scores were computed and used as indicators. Based on previous studies that supported a unidimensionality of social anxiety (Burstein et al., 2011; Crome et al., 2015; Kerns et al., 2013), it was assumed that even if different factors emerged for the social anxiety items, correlations between the factor scores should be high across all individuals. In other words, individuals who experience high levels of one type of social anxiety should also experience high levels of the other types of social anxiety. On the other hand, if, as some researchers have suggested (Knappe et al., 2010), performance anxiety is a distinct subtype of social anxiety, this pattern should be different. Specifically, there should be subgroups of people who experience high levels of performance anxiety but lower levels of other types of social anxiety. Similarly, in the same model, heterogeneous experiences of test vs. social/performance anxiety can also be examined. Subgroups with relatively similar levels of test vs. social/performance anxiety (e.g. low-low, high-high) would support conceptual overlap between the constructs, whereas subgroups with different levels of test vs. social/performance anxiety (e.g. low-high, high-low) would support conceptual distinctiveness.

Several fit indices that are commonly used by researchers in comparing models and extracting the number of classes in LPAs were used. These include lower Bayesian information criterion (BIC; Schwartz, 1978), lower sample-size adjusted BIC (ABIC; Sclove, 1987), nonsignificant Lo-Mendell-Rubin (LMR) likelihood ratio test result (Lo, Mendell, & Rubin, 2001), and higher entropy. Both BIC and ABIC are based on the maximum likelihood function, which assesses the probability of drawing the observed sample given the model parameter

values. Because by this function, model fit may improve by simply increasing the number of estimated parameters, BIC and ABIC also include penalty terms that increase as the number of parameters increase. By doing so, they aim at selecting the best fitting and most parsimonious model, with ABIC also attempting to compensate for the limitation posed by small sample size (Giraud, 2015). LMR likelihood ratio test compares the fitness of two adjacent models (i.e. *n* class vs *n*+1 class), with significant values indicating better fit of the more complex model (Asparouhov & Muthén, 2012). Entropy is a measure of discriminability of the latent classes. After the latent classes are identified, each individual has a probability of being classified into each of the latent class. If individuals have similar probability of being in different classes, the classification certainty is low. The entropy reflects the overall classification certainty. The value ranges between 0 and 1, with higher values representing greater certainty (Tein, Coxe, & Cham, 2013). Following common practice (Bauer & Curran, 2003; Muthén, 2003; Nylund, Asparouhov, & Muthén, 2007), the author used a combination of the aforementioned criteria as well as considered the interpretability of the results in determining the final number of classes. For the best fitting model, the estimated parameters that are of most interest were the number of classes, the class prevalence (the percentages of the whole population that are in each class), and the mean levels of different types of anxiety in each class (e.g. high performance anxiety/high social anxiety/high test anxiety, high performance anxiety/high social anxiety/low test anxiety, etc.).

After the best fitting models are identified by following the previous steps, a covariate, gender, was introduced in the models to see if it would predict membership to any particular class. This was done by using logistic regression. Specifically, the grouping variable was regressed on gender. Significant regression coefficients would indicate males and females have

a different likelihood of belonging to certain latent classes (Collins & Lanza, 2010). For example, if females have a higher likelihood of belonging to a low-social-high-performance anxiety class, it may indicate greater prevalence rates of performance-only anxiety among females.

Summary

In summary, 859 students aged 12 to 19 and from grades 7 to 12 from China were included in the current study. Items from the RCMAS-2-C Performance Anxiety cluster and Social Anxiety scale as well as from the TAMA-C were used. Missing data in the current study were assumed to be at least MAR based on Little's (1988) MCAR test results and were handled with MICE. Categorical omegas were calculated as the internal consistency reliability for the item scores. EFAs were performed to investigate the conceptual overlap between social and performance anxiety. Single-group CFAs were performed to investigate possible conceptual overlap between social, performance, and test anxiety and to validate the factor structure on the RCMAS-2-C performance anxiety cluster items. LPA was utilized to investigate the heterogeneity of the prevalence rates of social, performance, and test anxiety in the overall population. Gender was examined as a possible predictor of membership to any latent class identified.

Chapter IV

Results

The results are presented in this chapter and are organized by the proposed research questions. The analysis methods are briefly mentioned again and were referenced in more detail in Chapter III. Detailed interpretation and discussion of the implications of the results are presented in Chapter V.

Research Question 1

To answer research question 1, what is the factor structure for the RCMAS-2-C Social Anxiety and Performance Anxiety items, an EFA was first performed using half of the sample. The eigenvalue-greater-than-one rule suggested three factors should be extracted. Results from the parallel analysis (Horn, 1965) also revealed that only three factors had eigenvalues greater in the real data than in the random data, meaning three factors should be retained (see Table 1). However, in the results from Velicer's MAP test (Velicer, 1976), the smallest squared partial correlation (.0162) was found in step two (see Table 1), meaning two factors should be retained. When examining the interpretability of the factor structures, both a two-factor and a three-factor structure were considered.

Originally, there were six overlapping items on the RCMAS-2-C Social Anxiety scale and Performance Anxiety cluster. When examining the factor loadings in the two-factor model, three of the overlapping items (i.e. items 23, 37, and 41) clearly loaded on one factor, while the rest of the items loaded on the other factor (see Table 2). The three items centered on fears of speaking in front of others. When examining the factor loadings in the three-factor model, the same three items, centering on fears of public speaking still loaded on one factor. The second factor consisted of items that were originally only found on the Performance Anxiety cluster with

two additional overlapping items. The third factor consisted of items that were originally only found on the Social Anxiety scale, with one additional overlapping item, and one item that was originally found on the Performance Anxiety scale (see Table 3). Further examination of the content of the last item revealed that it conveyed a general feeling of nervousness when in social situations, instead of more specific performance worries. Therefore, following the EFA results, this item was considered to load on the third factor, together with the other social anxiety items. Theoretically, both the two- and three-factor structures were interpretable; the former would suggest conceptual overlap between performance and social anxiety, and the latter would suggest conceptual distinctiveness. The decision between these two factor structures would now be the key to answering research question 2.

Table 1

Results from Exploratory Factor Analysis, Parallel Analysis, and Velicer's Minimum Average Partial (MAP) Test for the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items

Factors/Steps	EFA Eigenvalues	PCA Eigenvalues		Squared Partial Correlations
		Real Data	Random Data	
0		--	--	.0410
1	5.823	3.741	1.347	.0165
2	1.950	1.776	1.268	.0162
3	1.317	1.258	1.215	.0201
4	.961	1.054	1.167	.0264
5	.877	1.038	1.12	.0354
6	.822	0.894	1.083	.0484
7	.696	0.871	1.046	.0624
8	.675	0.799	1.008	.0788
9	.586	0.751	0.973	.1021
10	.508	0.692	0.936	.1441
11	.437	0.671	0.901	.1952
12	.374	0.571	0.863	.2691
13	.340	0.556	0.826	.3569
14	.277	0.523	0.793	.4707
15	.211	0.434	0.751	1.000
16	.146	0.372	0.702	--

EFA = Exploratory Factor Analysis, PCA = Principal Component Analysis

Table 2

Factor Pattern Coefficients for the Two-Factor Solution for the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items

Item No.	Factor Pattern Coefficients	
	I	II
37 [PA]	**.919**	-.005
23 [PA]	**.777**	.029
41 [PA]	**.620**	.255
10[PA]	.188	**.772**
22 [SA]	-.231	**.734**
26 [PA]	.008	**.687**
4 [PA]	.226	**.665**
32 [PA]	.186	**.664**
9 [SA]	-.224	**.642**
36 [SA]	-.058	**.589**
49 [PA]	.006	**.558**
13 [PA]	.058	**.554**
27 [SA]	-.266	**.542**
47 [SA]	-.079	**.425**
28 [SA]	.148	**.396**
8 [PA]	-.100	**.391**

Note. Highest factor loading coefficients are in bold font.

PA. Items were originally on the RCMAS-2-C Performance Anxiety cluster; SA. Items were originally on the RCMAS-2-C Social Anxiety scale.

Table 3

Factor Pattern Coefficients for the Three-Factor Solution for the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items

	Factor Pattern Coefficients		
Item No.	I	II	III
37 [PA,SA]	**0.972**	-.110	.013
23 [PA,SA]	**0.794**	.010	-.036
41 [PA,SA]	**0.664**	.015	.218
10[PA,SA]	.150	**.856**	.016
4 [PA,SA]	.202	**.749**	-.024
26 [PA]	-.008	**.589**	.206
32 [PA]	.201	**.477**	.262
49 [PA]	.019	**.360**	.274
13 [PA,SA]	.114	.138	**.466**
47 [SA]	.023	-.245	**.673**
36 [SA]	.021	-.006	**.649**
27 [SA]	-.207	-.018	**.626**
22 [SA]	-.176	.212	**.621**
28 [SA]	-.042	-.019	**.437**
9 [SA]	-.196	.307	**.431**
8 [PA]	.179	.160	**.269**

Note. Highest factor loading coefficients are in bold font.
PA: Items were originally on the RCMAS-2-C Performance Anxiety cluster; SA: Items were originally on the RCMAS-2-C Social Anxiety scale; PA,SA: Overlapping items on the RCMASC-2-C Performance Anxiety Cluster and Social Anxiety Scale

In the next step, single groups CFAs were performed using the other half of the sample to examine the goodness of fit of the two- and three-factor models. Results indicated that both models provided adequate fit to the data (see Table 4). Therefore, a chi-square difference test was performed to compare the two models. Chi-square difference tests are widely used to compare the fit of nested models (Mulaik, 2009). It was applicable in this case as the two-factor model could be considered nested within the three-factor model where the correlation between the performance and social anxiety factors was fixed to one, and their correlations with the third factor were fixed to be the same. Results from the chi-square difference test was significant

(ΔWLSMVχ^2 = 20.491, p = .0000), indicating the three-factor model provided a better fit than the two-factor model (Mulaik, 2009). Therefore, for future analyses, the three-factor model was retained. The factors were named public speaking, performance anxiety-general, and social anxiety, respectively. The factor scores correlated moderately with each other (see Table 5). Overall, similar to research findings in the Western culture, the constructs of performance and social anxiety appeared distinctive among Chinese adolescents despite considerable overlap. Also, speaking in front of others appeared to be a qualitatively distinct construct for Chinese adolescents.

Table 4
Fit Indices for the Two- and Three-factor Models on the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items

Model	WLSMVχ^2	*df*	CFI	TLI	RMSEA [90% CI]
Two-factor	232.968**	103	.948	.940	.054 [.045-.064]
Three-factor	186.871**	101	.966	.960	.045 [.034-.054]

WLSMVχ^2 = robust mean- and variance-adjusted weighted least squares chi-square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA= root mean square error of approximation, CI = Confidence Interval.
$^{**}p < .001$

Table 5

Standardized Factor Coefficients for the Three-factor Model on the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items

	Standardized Factor Coefficients		
Item No.	Public Speaking	Performance Anxiety-general	Social Anxiety
41	.889		
37	.810		
23	.716		
10		.906	
4		.842	
32		.842	
26		.736	
49		.506	
22			.691
13			.682
36			.656
9			.647
8			.564
47			.503
28			.441
27			.413
Public Speaking	--		
Performance Anxiety-General	.621	--	
Social Anxiety	.492	.780	--

Research Question 2

To answer research question 2, if a one-factor structure was found to provide an adequate fit to the data for the RCMAS-2-C Performance Anxiety cluster items, then single group CFAs would be performed. Because previous factor analysis revealed a possible two-factor instead of one-factor model for the performance anxiety items (i.e. the public speaking factor and the performance anxiety-general factor), both the one- and two-factor models were tested using the second half of the data. Results showed that the two-factor model provided good fit, while the one-factor model did not provide adequate fit (see Table 6). Chi-square difference test also

indicated that the two-factor model fitted significantly better than the one-factor model (ΔWLSMVχ^2 = 1911.864, p = .0000). Therefore, in the subsequent analysis of internal consistency reliability of scale scores, these two factors were examined separately.

Table 6
Fit Indices for the One- and Two-factor Models on the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Performance Anxiety Cluster Items

Model	WLSMVχ^2	*df*	CFI	TLI	RMSEA [90% CI]
One-factor	336.287**	36	.839	.799	.140 [.126-.153]
Two-factor	47.890	34	.993	.990	.031 [.000-.050]

WLSMVχ^2 = robust mean- and variance-adjusted weighted least squares chi-square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA= root mean square error of approximation, CI = Confidence Interval.
$^{**}p < .001$

Research Questions 3

To answer research question 3 regarding the factor structure with the RCMAS-2-C social and performance anxiety items and each of the TAMA-C scale items, single group CFAs were performed. Now that a three-factor structure was established for the RCMAS-2-C items, five four-factor models were tested, consisting of the public speaking, performance anxiety-general, and social anxiety items but also adding one of the five TAMA-C scale (i.e. Physiological Hyperarousal, Worry, Cognitive Interference, Task Irrelevant Behaviors, Social Concerns) items in separate analyses. Results indicated that the four-factor models provided adequate fit to the data when each of the TAMA-C scales items were added to the RCMAS-2-C items, suggesting that each of the test anxiety dimensions are distinguishable from the social and performance anxiety constructs (Table 7). The factor coefficients for each model were presented in Tables 8 to 12.

Table 7

Fit Indices for the Four-factor Models When Each Scale of the Test Anxiety Measure for Adolescents-Chinese Version Scales Items were Added to the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items

Added TAMA-C Scale	WLSMVχ^2	*df*	CFI	TLI	RMSEA [90% CI]
Physiological Hyperarousal	755.433**	293	.923	.914	.045 [.041-.049]
Worry	645.917**	293	.962	.958	.040 [.036-.044]
Cognitive Interference	593.508 **	246	.960	.955	.039 [.035-.044]
Task Irrelevant Behaviors	459.056**	224	.955	.949	.036 [.031-.040]
Social Concerns	677.154**	269	.953	.946	.036 [.032-.041]

WLSMVχ^2 = robust mean- and variance-adjusted weighted least squares chi-square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA= root mean square error of approximation, CI = Confidence Interval.

$^{**}p < .001$

Table 8

Standardized Factor Coefficients for the Four-factor Model on the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items and the Test Anxiety Measure for Adolescents-Chinese Version Physiological Hyperarousal Scale Items

	Standardized Factor Coefficients			
Item No.	Public Speaking	Performance Anxiety-general	Social Anxiety	Physiological Hyperarousal
R41	.868			
R37	.850			
R23	.763			
R10		.890		
R4		.827		
R32		.782		
R26		.705		
R49		.589		
R22			.665	
R13			.664	
R36			.625	
R9			.582	
R8			.531	
R27			.440	
R28			.394	
R47			.364	
T34				.684
T17				.637
T40				.633
T24				.620
T2				.594
T19				.565
T9				.552
T37				.548
T11				.528
T23				.496
Public Speaking	--			
Performance Anxiety-general	.550	--		
Social Anxiety	.412	.743	--	
Physiological Hyperarousal	.182	.401	.461	--

Table 9

Standardized Factor Coefficients for the Four-factor Model on the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items and the Test Anxiety Measure for Adolescents-Chinese Version Worry Scale Items

	Standardized Factor Coefficients			
Item No.	Public Speaking	Performance Anxiety-general	Social Anxiety	Worry
R41	.868			
R37	.850			
R23	.763			
R10		.906		
R4		.832		
R32		.768		
R26		.700		
R49		.591		
R13			.735	
R36			.636	
R22			.630	
R9			.580	
R8			.536	
R27			.403	
R47			.372	
R28			.351	
T38				.757
T16				.755
T26				.725
T43				.704
T44				.690
T12				.674
T4				.647
T7				.603
T21				.580
T25				.548
Public Speaking	--			
Performance Anxiety-general	.542	--		
Social Anxiety	.410	.754	--	
Worry	.345	.573	.544	--

Table 10

Standardized Factor Coefficients for the Four-factor Model on the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items and the Test Anxiety Measure for Adolescents-Chinese Version Cognitive Interference Scale Items

	Standardized Factor Coefficients			
Item No.	Public Speaking	Performance Anxiety-general	Social Anxiety	Cognitive Interference
R41	.888			
R37	.849			
R23	.767			
R10		.895		
R4		.840		
R32		.781		
R26		.689		
R49		.594		
R13			.711	
R22			.642	
R36			.637	
R9			.537	
R8			.528	
R27			.455	
R47			.410	
R28			.397	
T14				.753
T6				.734
T27				.697
T28				.684
T5				.681
T30				.596
T22				.595
T42				.538
Public Speaking	--			
Performance Anxiety-general	.558	--		
Social Anxiety	.410	.730	--	
Cognitive Interference	.252	.366	.509	--

Table 11

Standardized Factor Coefficients for the Four-factor Model on the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items and the Test Anxiety Measure for Adolescents-Chinese Version Task Irrelevant Behaviors Scale Items

	Standardized Factor Coefficients			
Item No.	Public Speaking	Performance Anxiety-general	Social Anxiety	Task Irrelevant Behaviors
R41	.883			
R37	.846			
R23	.767			
R10		.908		
R4		.821		
R32		.785		
R26		.691		
R49		.583		
R13			.678	
R22			.652	
R36			.637	
R9			.574	
R8			.529	
R27			.447	
R47			.400	
R28			.381	
T36				.698
T18				.554
T35				.538
T41				.536
T29				.513
T10				.445
T1				.278
Public Speaking	--			
Performance Anxiety-general	.571	--		
Social Anxiety	.415	.748	--	
Task Irrelevant Behaviors	.117	.313	.451	--

Table 12

Standardized Factor Coefficients for the Four-factor Model on the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Version Social and Performance Anxiety Items and the Test Anxiety Measure for Adolescents-Chinese Version Social Concerns Scale Items

	Standardized Factor Coefficients			
Item No.	Public Speaking	Performance Anxiety-general	Social Anxiety	Social Concerns
R41	.883			
R37	.846			
R23	.743			
R10		.888		
R4		.861		
R32		.790		
R26		.691		
R49		.546		
R13			.716	
R22			.650	
R36			.615	
R9			.551	
R8			.503	
R47			.431	
R27			.411	
R28			.389	
T31				.906
T32				.874
T13				.791
T33				.753
T15				.742
T3				.739
T39				.716
T8				.590
T20				.545
Public Speaking	--			
Performance Anxiety-general	.564	--		
Social Anxiety	.408	.756	--	
Social Concerns	.399	.710	.562	--

Research Questions 4, 5, 6

Research questions 4, 5, and 6 examined the internal consistency reliability of the RCMSC-2-C Social and Performance Anxiety scores as well as the TAMA-C scale scores. To

answer these questions, the categorical omega coefficients were computed for the RCMAS-2-C Social Anxiety scale, Performance Anxiety Cluster, and each of TAMA-C scale items. Additionally, as the CFA results in previous steps indicated a two- instead of one-factor structure on the RCMAS-2-C Performance Anxiety Cluster (i.e. public speaking and performance anxiety-general), categorical omega coefficients for these two factor scores were also computed. Results revealed the categorical omega coefficients for the RCMAS-2-C Social Anxiety Scale scores, the overall Performance Anxiety Cluster scores, the Performance Anxiety-general factor scores, as well as four of the five TAMA-C scale (i.e. Physiological Hyperarousal, Worry, Cognitive Interference, and Social Concerns) scores were at or above .75 (Table 13). The coefficients for the RCMAS-2-C public speaking factor and the TAMA-C Task Irrelevant Behaviors scale scores were below .75 but still above .50.

Table 13
Categorical Omega Coefficients for the Revised Children's Manifest Anxiety Scale-Second Edition-Chinese Social Anxiety, Performance Anxiety-general, and Public Speaking Factors and the Test Anxiety Measure for Adolescents-Chinese Scales Scores

Factor/Scale	Categorical Omega	95% CI
RCMAS-2-C, Social Anxiety Scale	.76	[.71-.80]
RCMAS-2-C, Performance Anxiety Cluster	.83	[.79-.85]
Performance Anxiety-general	*.75*	[*.71-.78*]
Public Speaking	*.65*	[*.60-.71*]
TAMA-C, Physiological Hyperarousal	.81	[.78-.84]
TAMA-C, Worry	.87	[.85-.88]
TAMA-C, Cognitive Interference	.83	[.80-.85]
TAMA-C, Task Irrelevant Behaviors	.65	[.61-.69]
TAMA-C, Social Concerns	.90	[.88-.91]

CI = Confidence Interval

Research Question 7

Research question 7 was whether there was population heterogeneity regarding the level of social/performance/test anxiety. This was examined by conducting an LPA using the

RCMAS-2-C social anxiety, public speaking, and performance anxiety-general factor scores, as well as the TAMA-C scale scores as indicators. Two- to ten-class models were run and fit indices are presented in Table 14.

The LMR-LRT values were significant from the two- to four-class models and nonsignificant in the five-class model, suggesting adding the classes improved model fit until the four-class model, while the five-class model did not fit significantly better. From the five- to eight-class models, the LMR-LRT values remained non-significant; it was significant in the nine-class model and dropped to nonsignificant again at the ten-class model. This suggested the nine-class model fitted significantly better than the eight-class, while the ten-class model did not fit better than the nine-class. Overall, based on the LMR-LRT results, a nine-class model appeared to provide the best fit. Turning to the other guidelines, the nine-class model also had the lowest BIC, highest entropy, and second lowest ABIC. Therefore, taken together, the nine-class model was chosen as the best-fitting model.

Average latent class probabilities for the most likely latent class membership are presented in Table 15. For example, the first row included the probability of individuals who had the highest likelihood of being in class 1 belonging to each of the nine classes. As can be seen, an individual's highest likelihood of belonging to its own class was relatively high (above .80), while the likelihood of the same individual belonging to any other class was considerably lower (below .10). This indicated the nine classes were fairly distinguishable from each other. Means levels of each type of anxiety across the nine classes, as well as the prevalence rates of each class are presented in Figure 1. The means were standardized, with a variance of 1.00. To compare the mean levels of anxiety across classes, two tail independent *t*-

tests were performed; those not significantly different from each other (alpha = .05) were indicated inside the ovals. Demographics of each class are found in Table 16.

As can be seen in Figure 1, across the nine classes, means of public speaking anxiety and performance anxiety-general grouped into two levels, low and high, with all the low group means significantly different from all the high group means. For social anxiety and test anxiety, the mean levels spread out more evenly from low to high. The lower ovals in the figure included classes that were not statistically different from the lowest class mean; the highest ovals included classes that were not statistically different from the highest mean. For social and test anxiety, means only in the low ovals were considered at a low level; means only in the high ovals were considered at a high level; those in the overlapping area or between the high and low ovals were considered at a medium level. For ease of the discussion, the nine classes could be further grouped into four larger groups: low public speaking anxiety/low performance anxiety-general, low public speaking anxiety/high performance anxiety-general, high public speaking anxiety/high performance anxiety-general, high public speaking anxiety/low performance anxiety-general. Further description of the classes was based on these four groups.

In the low public speaking anxiety/low performance anxiety-general group, class 1 (16% of the overall population) was characterized with low levels of social and test anxiety, while class 7 (4% of the overall population) was characterized with low social anxiety but medium to high test anxiety.

In the low public speaking anxiety/high performance anxiety-general group, class 3 (16% of the overall population) was characterized with low social and test anxiety, while class 8 (9% of the overall population) had medium social anxiety and medium to high test anxiety.

Table 14

Fit Indices for the Two- to Ten-Class Latent Profile Analysis Models

Fit Indices	2-class	3-class	4-class	5-class	6-class	7-class	8-class	9-class	10-class
BIC	31716.24	31443.42	31291.73	31227.38	31198.75	31185.92	31143.18	31100.97	31101.70
ABIC	31636.85	31335.45	31155.18	31062.24	31005.03	30963.62	30892.30	30821.50	30793.66
LMR-LRT	1352.82*	328.22*	209.05*	123.13	87.98	72.44	77.580	89.09*	59.09
Entropy	0.82	0.76	0.81	0.78	0.77	0.82	0.83	0.84	0.83

BIC = Bayesian information criterion; ABIC = sample size adjusted BIC; LMR-LRT = Lo-Mendell-Rubin likelihood ratio test

*$p < .05$

Table 15
Average Latent Class Probabilities for the Most Likely Latent Class Membership (Row) by Latent Class (Column)

	1	2	3	4	5	6	7	8	9
1	.862	.022	.006	.000	.000	.037	.000	.000	.072
2	.016	.915	.055	.000	.000	.000	.011	.000	.002
3	.003	.068	.860	.001	.000	.004	.019	.043	.003
4	.000	.000	.000	.839	.057	.072	.000	.009	.022
5	.000	.000	.000	.096	.899	.002	.001	.001	.000
6	.012	.000	.007	.095	.000	.851	.000	.000	.035
7	.000	.034	.054	.001	.000	.000	.858	.035	.019
8	.000	.000	.042	.005	.006	.001	.023	.922	.000
9	.064	.002	.004	.026	.000	.062	.011	.001	.830

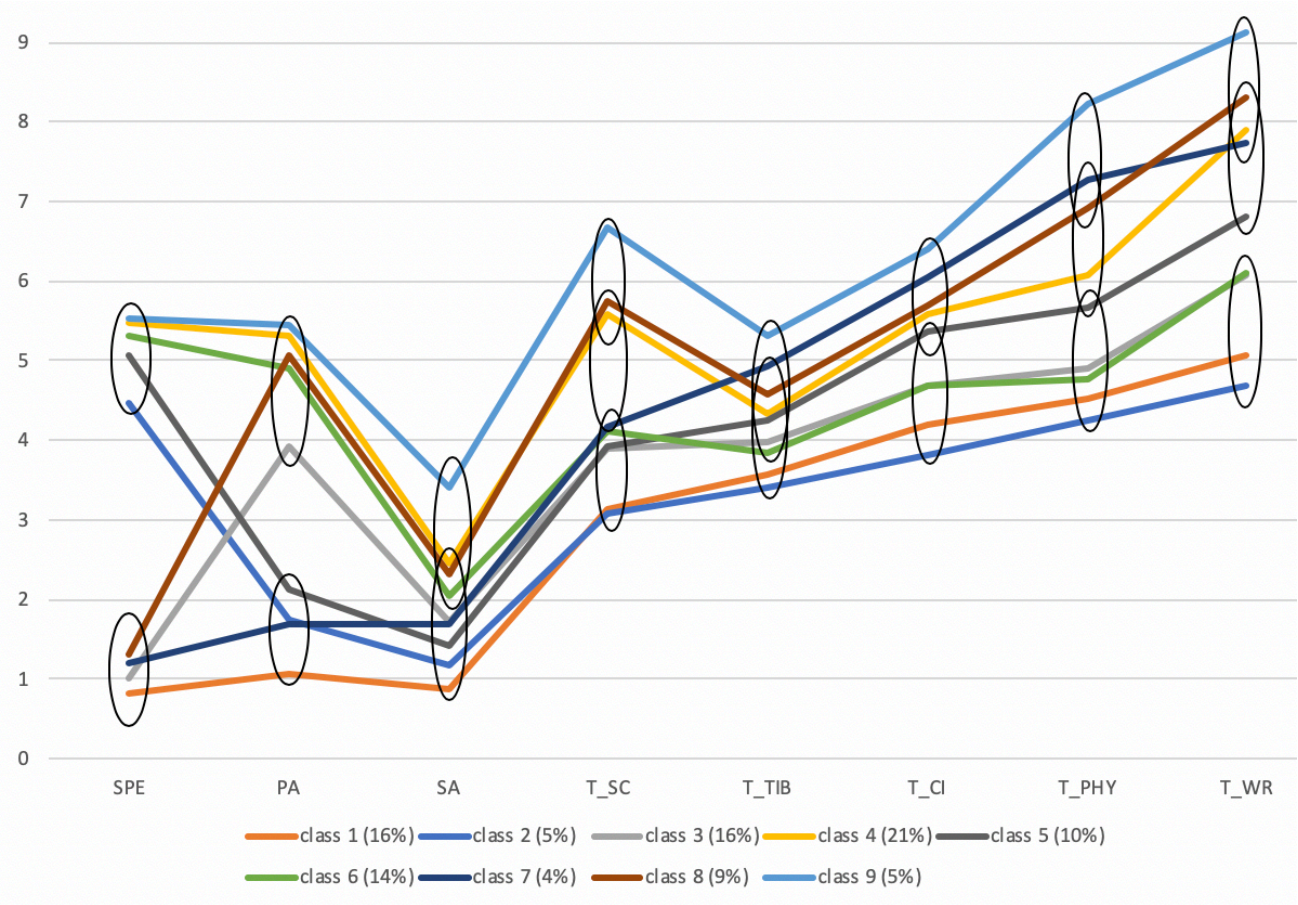

Figure 1. Standardized Factor/Scale Means in Nine Classes and Class Prevalence
SPE = Public Speaking; PA = Performance Anxiety-general; SA = Social Anxiety; T_SC = TAMA-Social Concerns; T_TIB = TAMA-Test Irrelevant Behaviors; T_CI = TAMA-Cognitive Interference; T_PHY = TAMA-Physiological Hyperarousal; T_WR = TAMA-Worry

Table 16
Demographic Characteristics of the Nine Classes

Demographic	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8	Class 9
N	139 (16%)	43(5%)	133 (16%)	181 (21%)	83 (10%)	117 (14%)	36 (4%)	76 (9%)	45 (5%)
Female	52 (37%)	7 (16%)	64 (48%)	110 (60%)	34 (41%)	47 (40%)	23 (64%)	47 (62%)	23(51%)
Age (mean)	15.74	15.98	16.24	15.91	15.95	16.09	16.17	16.01	16.09
Grade (mean)	8.92	8.88	9.58	9.02	9.07	9.23	9.17	9.22	9.00

In the high public speaking anxiety/high performance anxiety-general group, class 9 (5% of the overall population) had high levels of social and test anxiety; class 4 (21% of the overall population) had medium social anxiety and medium to high levels of test anxiety; class 6 (14% of the overall population) also had medium social anxiety but low to medium test anxiety.

In the high public speaking anxiety/low performance anxiety-general group, class 2 (5% of the overall population) had low social and test anxiety, while class 5 (10% of the overall population) had comparably low social anxiety and low to medium test anxiety.

Readers should note that the test anxiety levels were described globally as one construct, instead of separately by each scale. This was mainly done because the test anxiety scale scores strongly covaried across the nine classes, meaning, for example, when one scale score was at the low level, other scale scores were likely to be at the low levels as well. At medium levels, there were mild indications that more complex profiles of test anxiety may exist. For example, class 7 had low to medium level of test anxiety-social concerns and medium to high levels of other types of anxiety. However, such instances were rare, and all the scale scores were still grossly at the medium level. Investigation of the different dimensions of test anxiety was beyond the scope of the current study. Therefore, the test anxiety level was treated as a unified construct, and the current study showed that, at similar levels of social/performance anxiety, individuals can experience various levels of test anxiety (Table 17).

Table 17
Mean Levels of Each Type of Anxiety

	L-PA	H-PA
L-SPE	Classes 1 (16%) L-SA, L-TA	Classes 3 (16%) L-SA, L-TA
	Classes 7 (4%) L-SA, M-H-TA	Class 8 (9%) M-SA, M-H-TA
H-SPE	Class 2 (5%) L-SA, L-TA	Classes 6 (14%) M-SA, L-M-TA
		Classes 4 (21%) M-SA, M-H-TA
	Class 5 (10%) L-SA, L-M-TA	Classes 9 (5%) H-SA, H-TA

L = Low Level; M = Medium level; H = High Level; PA = Performance anxiety-general; SPE = Public Speaking; TA = Test Anxiety

To better understand the relationship between social and performance anxiety, it was helpful to compare the means of social anxiety, performance anxiety-general, and public speaking anxiety across the nine classes. As can be seen in Table 17, the class (i.e. class 9) with high social anxiety also had high public speaking anxiety and high performance anxiety-general. Classes with medium levels of social anxiety (classes 4, 6, and 8) also had high levels of performance anxiety-general; two of them (classes 4 and 6) also had high public speaking anxiety, while the third class (class 8) had low public speaking anxiety. Classes with low levels of social anxiety (classes 1, 2, 3, 5 and 7) had more complex profiles. Classes 1 and 7 had low public speaking anxiety and performance anxiety-general. Classes 2 and 5 had low levels of performance anxiety-general, but high public speaking anxiety. Class 3 and low public speaking anxiety, but high performance anxiety-general.

Research Question 8

Research question 8 was whether gender could predict the membership of any class. To answer this question, the latent class variable in LPA was regressed on gender. Because classes 1 and 2 were characterized with the lowest levels of social, performance, and test anxiety, they were first considered as reference classes when examining how gender might differentially predict membership in the other classes. Results indicated that when compared to class 1, females had a lower likelihood of being in class 2, and a higher likelihood of being in classes 4, 7, and 8 (Table 18). Compared to class 2, females had a higher likelihood to be in all of the other classes (Table 19).

Within the four larger groups previously identified, different levels of test anxiety were found across classes with similar levels of social/performance anxiety. Therefore, the author examined whether gender differentially predicted membership between these classes. Results

showed that at similar levels of social/performance anxiety, females had a higher likelihood of being in the higher test anxiety classes than in the lower test anxiety classes (Table 20). The only exception was regarding the class with the highest levels of all types of anxiety (class 9). Compared to other classes with comparable social/performance anxiety levels but lower test anxiety levels, males and females did not have a significantly different likelihood of being in class 9.

Table 18
Logistic Regression Odds Ratio Results, Using Class 1 as the Reference Class

	Odds Ratio	Standard Error	*p*
Class 2	0.304	0.236	0.003
Class 3	1.497	0.473	0.294
Class 4	2.489	0.110	0.000
Class 5	1.220	0.478	0.645
Class 6	1.122	0.355	0.730
Class 7	2.309	0.196	0.004
Class 8	2.778	0.121	0.000
Class 9	1.663	0.719	0.356

Table 19
Logistic Regression Odds Ratio Results, Using Class 2 as the Reference Class

	Odds Ratio	Standard Error	*p*
Class 1	3.288	0.236	0.003
Class 3	4.926	0.157	0.000
Class 4	8.184	0.093	0.000
Class 5	4.011	0.175	0.000
Class 6	3.691	0.208	0.000
Class 7	7.595	0.111	0.000
Class 8	9.134	0.087	0.000
Class 9	5.469	0.155	0.000

Table 20
Logistic Regression Odds Ratio Results, Comparing Classes within the Four Larger Groups

	Odds Ratio	Standard Error	*p*
Class 1 vs Class 7	0.433	0.196	0.004
Class 2 vs Class 5	0.183	0.155	0.000
Class 3 vs Class 8	0.539	0.212	0.030
Class 4 vs Class 6	0.451	0.155	0.000
Class 4 vs Class 9	1.496	0.706	0.482
Class 6 vs Class 9	0.675	0.320	0.309

Summary

The current findings suggested that a three-factor model, social anxiety, public speaking anxiety, and performance anxiety-general, provided the best fit to the data for the RCMAS-2-C social and performance anxiety items. A two-factor model, public speaking anxiety and performance anxiety-general, provided the best fit to the data for the RCMAS-2-C performance anxiety items. When each of the TAMA-C scale items were added to the RCMAS-2-C social and performance anxiety items, a four-factor model separating the TAMA-C items and the RCMAS-2-C items provided adequate fit. The categorical omega coefficient for the RCMAS-2-C public speaking anxiety factor scores and the TAMA-C Task Irrelevant Behaviors scale scores were at .65; they were between .75 and .90 for the other TAMA-C scale scores and the RCMAS-2-C social anxiety and performance anxiety-other factor scores, as well as the Performance Anxiety cluster scores. LPA with social, performance, public speaking, and test anxiety in one model suggested nine latent classes. Classes with similar levels of social anxiety but different levels of performance and public speaking anxiety were detected, as well as classes with similar levels of social, performance, and public speaking anxiety, but different levels of test anxiety. Using gender as a covariate, logistic regression results suggested that females had the lowest likelihood of being in class 2, a class with low social, low performance, and low test anxiety but

high public speaking anxiety. At similar levels of social, performance, and public speaking anxiety, females had a higher likelihood of being in the classes with higher test anxiety.

Chapter V

Discussion

This chapter includes a discussion of the results from the current study. The discussion is organized by the research questions. Effort is made to explain the results in the context of the extant literature and to answer each research question. Implications of the results, limitations of the current study, and future research directions are also discussed.

Research Question 1: Factor Structure of the Social and Performance Anxiety Items

The first research question examined the factor structure of the RCMAS-2-C Social Anxiety and Performance Anxiety items. To answer this question, an EFA was first performed on half of the dataset and results pointed to either a two- or three-factor structure. Both these factor structures were then examined with a series of CFAs using the other half of the sample, and the two- and three-factor models provided an adequate fit to the data. However, a subsequent chi-square difference test revealed the three-factor model fitted better than the two-factor model; and therefore, the three-factor model was retained. Of the three factors, one centered on fears of speaking in public and was labeled public speaking. Another factor consisted of items that were originally on the RCMAS-2-C Performance Anxiety Cluster minus the items loaded on the public speaking factor; it was labeled performance anxiety-general. The third factor consisted of items that were originally on the RCMAS-2-C Social Anxiety scale and one item that was originally on the Performance Anxiety cluster; it was labeled social anxiety. The last item loaded most strongly on the social anxiety factor based on EFA results. The content of the item also conveyed a general feeling of nervousness in social situations rather than in particular performance situations. Therefore, the item was left on the social anxiety factor in the current study.

The separation of the RCMAS-2-C Social Anxiety scale and Performance Anxiety cluster items onto two factors supported the conceptual distinctiveness between the constructs of social and performance anxiety. This was also consistent with previous factor analytic studies that found performance anxiety to emerge as a separate factor on social anxiety measures (Blöte et al., 2009; Knappe et al., 2010; Kodal et al., 2017). The moderate to high correlation (.780) between the social anxiety and performance anxiety-general factors also supported a close relationship between these two constructs. Overall, current findings supported that social and performance anxiety were two related but distinct concepts.

The finding of a three-factor structure, particularly a separate public speaking factor was unexpected, as this was not indicated on the original RCMAS-2. Several factors might help explain the current finding. First, two of the three items on the public speaking factor had similar wording (to paraphrase: fears of presenting in class/groups). A previous study in a U.S. sample conducting CFA on the RCMAS-2 Performance Anxiety cluster also allowed the errors of these two items to correlate in order for the model to fit the data well (McGovern, 2016). During the initial validation of the RCMAS-2-C factor structure among Chinese adolescents, the authors allowed the errors of all three items to correlate (Zhu & Lowe, 2018). In other words, high correlations among these three items had been found in previous studies.

Additionally, it is possible that fear of public speaking is a more distinct phenomenon for Chinese students. Researchers have found that Asian students tend to speak up less often in class than their Western counterparts (Chalmers & Volet, 1997; Cheng, 2000; Lee, 2009). This could be related to different teaching methodologies across countries. While Western classes are more learner-based and encourage individual participation, classes in Eastern countries are more teacher-centered, and students typically focus on listening and memorization (Cheng, 2000; Lee,

2009). Some studies have shown that Asian students find speaking up in class inappropriate as they would be taking up instruction time for the other students (Chalmers & Volet, 1997). Therefore, it is reasonable to hypothesize that for students who have had long exposure to the teacher-centered approach of learning, speaking up in class or presenting in front of groups may evoke a level of discomfort. This feeling of discomfort may be beyond what could be explained by the fears of being ridiculed that underlies other social or performance anxiety.

Research Question 2: Factor Structure of the Performance Anxiety Cluster Items

The second research question was whether a one-factor structure provided adequate fit for the RCMAS-2-C Performance Anxiety cluster items. In the previous CFAs, the three items on the public speaking factor were originally found on the Performance Anxiety cluster. Therefore, based on previous results that these three items may group together as a separate factor, a two-factor structure (i.e. public speaking, and performance anxiety-general) was also examined. Results revealed that the one-factor model did not provide adequate fit to the data; the two-factor model provided adequate fit and fitted significantly better than the one-factor model.

This result is somewhat inconsistent with the previous finding supporting the one-factor structure for these items on the original RCMAS-2 (McGovern, 2016). However, as it was mentioned above, in the one-factor model, two of the public speaking items were allowed to have correlated errors, suggesting the items significantly related to each other beyond what could be explained by the performance anxiety factor. Also as discussed before, fears of public speaking may be a separate construct from other types of performance anxiety for Chinese students, due to the teacher-centered classroom environment and consequently, rarity of class participation. Overall, the RCMAS-2-C Performance Anxiety cluster appeared to include two

factors, one describing fears of speaking up in front of others and the other describing other performance anxiety.

Research Question 3: Factor Structures of the Performance, Social, and Test Anxiety Items

Now that a three-factor structure had been established on the RCMAS-2-C Performance Anxiety cluster and Social Anxiety scale items, research question 3 asked whether a four-factor structure would provide adequate fit to the data when each of the TAMA-C scales (i.e. Physiological Hyperarousal, Worry, Cognitive Interference, Task Irrelevant Behaviors, Social Concerns) items were added. To answer this question, five CFAs were performed where each of the five TAMA-C scales were added separately to the RCMAS-2-C Performance Anxiety cluster and Social Anxiety scale items. Results indicated the four-factor structure provided adequate fit for each of the TAMA-C scale items. In other words, each of the TAMA-C scale items appeared distinguishable from the RCMAS-2-C items. Correlations between the TAMA-C scale scores and the RCMAS-2-C performance anxiety-general and social anxiety factor scores were between .366 and .710. This was consistent with the current literature suggesting that test anxiety is a related but different construct from social and performance anxiety (Kodal, et al., 2017; Knappe et al., 2010).

Research Questions 4, 5, 6: Internal Consistency Reliability Estimates

Research questions 4 through 6 examined the internal consistency reliability of the RCMAS-2-C Social Anxiety scale, Performance Anxiety cluster, and the TAMA-C scale scores. Categorical omega coefficients were calculated for these scale/cluster scores. Additionally, categorical omega coefficients were calculated for the performance anxiety-general and public speaking factors within the Performance Anxiety cluster, based on previous results suggesting the two-factor structure. Results revealed that, with the exception of the public speaking factor

on the RCMAS-2-C and the Task Irrelevant Behaviors scale on the TAMA-C, the coefficients for the other scores were above .75, which were at or above the preferred level suggested by Reise et al. (2013). The coefficients for the public speaking factor and Task Irrelevant Behaviors scale scores were at .65, which were still above the .50 value suggested by Reise et al. (2013), although they appeared lower than the other coefficients.

The public speaking factor, first of all, consisted of only three items. It was the shortest scale among those examined in the current study. Researchers have found that the reliability of a measure correlates positively with its length (Brown, 1910; Spearman, 1910). In other words, a scale with as few as three items is expected to have lower reliability than a scale that has qualitatively similar but more items. The Task Irrelevant Behaviors scale, on the other hand, consisted of seven items. On the original TAMA, scores of this scale were found to have adequate internal consistency reliability (.78; Lowe, 2014b). However, similar to the current finding, the reliability coefficient of this scale score was also significantly lower than those of the other scale scores (.88-.93; Lowe, 2014b).

In addition, measures that are adapted to different languages and used in cross-culture studies often yield less reliable scores than their original versions (Cheng & Hamid, 1995; Rode, 2005; Sperber, 2004). This could be due to slight changes of meaning during translation or culture differences that affect individuals' responses to the measures (Rode, 2005; Sperber, 2004). In the current example, task irrelevant behaviors described on the TAMA-C included subtle distractions such as fidgeting with objects and excessive body movements. While all of these behaviors may be common among Western students, some of them, particularly the more noticeable ones may not be present as often among Chinese students. Once again, Chinese classrooms are often more structured than those in the Western culture, with distracting

behaviors less tolerated. One study surveying Chinese teacher's perception of classroom misbehaviors found that most teachers did not find a significant need to manage behavior in class. The most frequently reported misbehavior in Chinese classrooms was "daydreaming," compared to more noticeable behaviors such as speaking out of turn in Western classes (Ding, Li, Li, & Kulm, 2008). Taken together, it can be hypothesized that the culture differences may differentially impact Chinese students' responses to the Task Irrelevant Behaviors scale items, thus negatively impacting its internal consistency reliability. Technical factors such as change of meaning during translation may also have played a role. Overall, scores on the RCMAS-2-C public speaking factor and the TAMA-C Task Irrelevant Behaviors scale should be interpreted with caution.

Research Question 7: Heterogeneity of Social, Performance, and Test Anxiety

Research question 7 examined the possible heterogeneity of social, performance, and test anxiety in the overall population, as well as how such heterogeneity sheds light on the relationship among these constructs. To answer this question, an LPA was performed using the RCMAS-2-C social anxiety, performance anxiety-general, and public speaking anxiety factor scores and the TAMA-C scale scores as indicators. Results suggested that a nine-class model fitted the best. Of the nine classes, four larger groups emerged, namely, a low public speaking anxiety/low performance anxiety-general group, a low public speaking anxiety/high performance anxiety-general group, a high public speaking anxiety/low performance anxiety-general group, and a high public speaking anxiety/high performance anxiety-general group. Within each of these four groups, levels of social/performance/public speaking anxiety were grossly comparable across classes; level of test anxiety scale scores, while comparable among each other within a class, varied from low to high across classes.

The first pattern that emerged from the LPA results was, within any given class, mean levels of the five dimensions of test anxiety (i.e. social concerns, physiological hyperarousal, task-irrelevant behaviors, cognitive interference, and worry) appeared grossly at the same level, while the means of social anxiety, public speaking anxiety, and performance anxiety-general varied from low to high. Consistent with this finding, previous LPAs on test anxiety also have found the dimensions of test anxiety to be at the same level within each given class (von der Embse et al., 2014). This finding also suggests that the test anxiety dimensions are strongly related with each other while their relationship with social or performance anxiety might be relatively weaker.

A second pattern that emerged was mean levels of performance anxiety-general and public speaking anxiety appeared to covary (i.e. both low, both high) in the majority of the population (classes 1, 4, 6, 7, and 9). However, there were also smaller subgroups of individuals who experienced low performance anxiety-general but high public speaking anxiety (classes 2 and 5), as well as high performance anxiety-general but low public speaking anxiety (classes 3 and 8). This might indicate that fears of public speaking represent a distinguishable construct from a general performance anxiety for Chinese adolescents. Some researchers have previously treated performance anxiety and public speaking anxiety as equal constructs, using the terms interchangablely (Merritt et al., 2001). Others have considered public speaking a type of performance anxiety (Huberty & Dick, 2006; Kenny, 2005b). The current finding did not support either. Particularly, the low public speaking anxiety/high performance anxiety-general group was not consistent with conceptualizing performance anxiety as an umbrella construct for public speaking anxiety. If this were the case, one would not expect to find a substantial group of people who have high anxiety about performing in front of others in general but low anxiety

about public speaking. Rather, the current finding suggests that, at least in some subgroups of Chinese adolescents, public speaking anxiety and general performance anxiety may have different psychological underpinnings. This was, again, consistent with some previous studies that have suggested the teacher-centered instructional approach might have a unique contribution to Chinese students' fears of speaking up in class (Cheng, 2000; Lee, 2009).

The main purpose of conducting the LPA was to investigate whether there were subgroups in the overall population where individuals experienced different levels of social, performance, and test anxiety (e.g. high performance anxiety/low social anxiety, high test anxiety/low social anxiety, etc.). These profiles were clearly present when comparing test anxiety and the other types of anxiety: at similar levels of social, performance, and public speaking anxiety, mean levels of test anxiety varied significantly between low to high levels. Consistent with the literature, these findings support the conceptual distinctiveness between test and social anxiety, and between test and performance anxiety (Bögels et al., 2010; Knappe et al., 2010; Kodal, et al., 2017).

As previously discussed, public speaking anxiety may be a different construct from the general performance anxiety in Chinese adolescents. Therefore, to answer the original research question regarding the conceptual overlap between social and performance anxiety, a comparison between the mean levels of social anxiety and performance anxiety-general was the major focus although comparison between the social anxiety and public speaking anxiety means were also presented in the Results section. Results suggest that high levels of social anxiety tended to co-occur with high levels of performance anxiety (class 9). Subgroups with low social anxiety and low performance anxiety were also identified (classes 1 and 7). The presence of these subgroups was consistent with the conceptual overlap between social and performance anxiety, as their

respective levels covaried across the classes. Several classes with medium social anxiety and high performance anxiety were also identified (classes 4, 6, and 8). Most interestingly, a class with low social anxiety and high performance anxiety was identified as well (class 3). These results support medium to strong correlations between social and performance anxiety in the majority of the population. However, a small subgroup (approximately 16%) did exhibit the pattern of high performance anxiety without the presence of high social anxiety in general. As reviewed in the literature, performance anxiety is currently considered a subtype of social anxiety in the DSM-5. It is described as anxiety that is restricted to performance situations. The current finding is consistent with such conceptualization. The subgroup with low social anxiety/high performance anxiety fitted the performance-only subtype of social anxiety in the DSM-5. The prevalence of this subgroup was also not negligible as some other studies have suggested (Burstein et al., 2011; Crome et al., 2015; Kern et al., 2013; Kodal et al., 2017), thus supporting the clinical utility of the performance-only specifier.

Research Question 8: Gender and Class Membership

The eighth research question was whether gender would predict the membership to any of the classes. Results suggest that, at similar levels of social and performance anxiety, females had a higher likelihood of being in the higher test anxiety classes. Females also had a relatively lower likelihood of being in class 1 (the lowest anxiety class), and the lowest likelihood of being in class 2, a class characterized by low levels of social, performance, and test anxiety but high levels of public speaking anxiety. An examination of the demographics of the nine classes also revealed that class 2 consisted of the lowest proportion of females among the nine classes.

These findings were consistent with the current literature reporting that females have higher levels of social, performance, and test anxiety than males (Bandelow & Michaelis, 2015;

Copeland et al., 2014; Lowe, 2015; McGovern, 2016; Osborne & Kenny, 2005; Putwain, 2007). The finding that females also had a higher likelihood of being in class 1 compared to class 2 was somewhat unexpected, as class 1 had lower means of public speaking anxiety. It is important to note that this finding does not suggest females reported overall lower public speaking anxiety than males in the current sample, as the low proportion of females was only observed in class 2, but not in the other classes with high public speaking anxiety. More likely, this suggests that among the Chinese adolescents with low levels of social, performance, and test anxiety, there might be an even smaller subgroup, predominantly males, who experience high anxiety regarding speaking up in class. Further research is needed to better understand this phenomenon.

Another unexpected finding was that although females had a higher likelihood of being in class 9 (the highest anxiety class) compared to class 2, gender did not differentially predict membership to class 9 compared to class 1, a class with even lower public speaking anxiety. It is possible that classes 1 and 2 both represent a low social/test anxiety group, with high public speaking anxiety also found only in class 2, possibly being attributable to other factors not related to a general anxiety propensity. Had these two classes been combined, the predictive power of gender might have been different. However, it was also noted that class 9 consisted of approximately the same number of females and males, contrary to the belief that a class with such levels of all types of anxiety might consist of more females than males. This might suggest that, although females are more at risk for social, performance, and test anxiety, at extremely high levels of all types of anxiety, the gender disparity is not as evident.

Summary

The current study indicated that social and performance anxiety are positively related but qualitatively distinct constructs. The constructs of social/performance anxiety and test anxiety

were also found to be related but distinct. Additionally, it was found that public speaking anxiety might be a unique construct different from a general performance anxiety for Chinese adolescents. These conclusions were supported by the factor analytic results where social, performance, public speaking, and test anxiety items loaded on separate factors. Also, among the nine latent classes identified by LPA, one class consisting of 16% of the population, had low social anxiety but high performance anxiety. This sizable group supported both the theoretical and clinical meaningfulness of the performance-only specifier for the social anxiety disorder in the DSM-5. Across classes with similar levels of social, performance, and public speaking anxiety, various levels of test anxiety were found. Furthermore, although within the majority of the classes, performance and public speaking anxiety were found at the same level (i.e. both low, both high), several classes had low performance anxiety-general but high public speaking anxiety, and several other classes had high performance anxiety-general but low public speaking anxiety. These findings suggest that different psychological underpinnings might contribute to these constructs for some Chinese adolescents.

Practical Implications

The current findings have several practical implications. First, the study makes a unique contribution in the discussion of performance anxiety as a subtype of social anxiety. It is the first study to approach this question with factor analysis on separate scales of social and performance anxiety, and the first to utilize LPA in examining individuals' differential experience of these two types of anxiety. The LPA allows for the detection of subgroups of individuals in the overall population who might have different profiles regarding the levels of psychological constructs. Compared to previous studies, in which performance anxiety was strictly defined as anxiety in performance related situations but not other social situations, the approach used in the current

study was more lenient and accounted for individuals who potentially experience predominantly performance anxiety but have some subclinical social anxiety as well. The author argues that such a group, which as shown in the present study, does exist, also deserves clinical attention, particularly given the different etiologies and responses to previous treatments identified for social and performance anxiety. Overall, future researchers and clinicians are advised to consider performance anxiety as a unique subtype of social anxiety.

The second implication regards the confirmation of the distinctiveness between social/performance and test anxiety constructs. This was, again, consistent with literature and indicates that social/performance anxiety and test anxiety warrant different treatment in research and clinical practice.

Additionally, the internal consistency was found to be acceptable for the TAMA-C Task Irrelevant Behaviors scale scores and at or above the preferred level for the other TAMA-C scale scores. This suggests that the TAMA-C is a promising tool to measure test anxiety for Chinese adolescents, although additional caution should be given to interpreting the Task Irrelevant Behaviors scale scores. The detection of public speaking anxiety as a unique construct from more general performance anxiety, on the other hand, suggests that the Performance Anxiety cluster on the RCMAS-2-C should be interpreted with caution, as the fears about speaking up in class may be a somewhat unique experience for Chinese adolescents, and needs to be measured and treated differently.

Limitations and Future Directions

The current study has a few limitations. First, the Performance Anxiety cluster and Social Anxiety scale on the RCMAS-2-C, although different, do have overlapping items. This limits our ability to examine the distinctiveness between the cluster and the scale. Furthermore,

the Performance Anxiety cluster and Social Anxiety scale are subcomponents of a larger measure that was designed to assess manifest anxiety. Although they are intended to measure anxiety in social and performance situations, they may not capture the full spectrum of social and performance anxiety. Future studies should examine the distinctiveness between two measures that are separate and specifically constructed to measure social and performance anxiety.

Another limitation is the sampling method used. Current participants were recruited using a convenience sampling method, from two middle schools in a city located in Central China. It was possible that the current sample did not represent the full spectrum of culture differences in various geographic locations in China. Also, the selection of the best fitting model in LPA was highly data driven, and there were mild inconsistencies regarding the performance of the different fit indices. Therefore, the current results will need to be replicated by mixture models using other independent samples. Future researchers are advised to examine the current issues among students from other parts of China, as well as among other cultures as well.

Several questions also arose in the current study that warrant further exploration in the future. First of all, the latent profiles regarding different dimensions of test anxiety were roughly examined but not in substantial detail. It would be of interest to investigate whether certain dimensions of test anxiety tend to exhibit different manifestations at lower or higher levels than other dimensions, and whether there are dimensions of test anxiety that are conceptually closer to social/performance anxiety than others. The lower internal consistency for the Task Irrelevant Behaviors scale scores also warrants further attention, as well as the emergence of the public speaking anxiety as a unique construct. Future researchers are advised to further explore these constructs in Chinese adolescents. Efforts should be made to better understand how these constructs differ for Chinese adolescents versus their counterparts in other cultures.

References

Abrahamsen, F. E., Roberts, G. C., & Pensgaard, A. M. (2008). Achievement goals and gender effects on multidimensional anxiety in national elite sport. *Psychology of Sport and Exercise*, *9*, 449-464. doi: 10.1016/j.psychsport.2007.06.005

Akaike, H. (1987). Factor analysis and AIC. In E. Parzen, K. Tanabe, & G. Kitagawa. (Eds.), *Selected papers of Hirotugu Akaike* (pp. 371-386). New York, NY: Springer. doi: 10.1007/978-1-4612-1694-0_29

American Psychiatric Association. (1952). *Diagnostic and statistical manual of mental disorders.* Washington, DC: American Psychiatric Association.

American Psychiatric Association. (1968). *Diagnostic and statistical manual of mental disorders (2nd ed.).* Washington, DC: American Psychiatric Association.

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders (3th ed.).* Arlington, VA: American Psychiatric Publishing.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental Disorders (4th ed.): DSM-IV.* Washington, DC: American Psychiatric Association.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.).* Arlington, VA: American Psychiatric Publishing.

Anderson, K. J. (1990). Arousal and the inverted-u hypothesis: A critique of Neiss's "Reconceptualizing arousal." *Psychological Bulletin, 107,* 96-100. doi:10.1037/0033-2909.107.1.96

Ang, R. P., & Huan, V. S. (2006). Academic Expectations Stress Inventory (AESI): Development, factor analysis, reliability, and validity. *Educational and Psychological Measurement, 66,* 522–539. doi:10.1177/ 0013164405282461

Ang, R. P., Lowe, P. A., & Yusof, N. (2011). An examination of the RCMAS-2 scores across gender, ethnic background, and age in a large Asian school sample. *Psychological Assessment*, *23*, 899-910. doi: 10.1037/a0023891

Ang, R. P., & Raine, A. (2009). Reliability, validity and invariance of the Narcissistic Personality Questionnaire for Children-Revised (NPQC-R). *Journal of Psychopathology and Behavioral Assessment, 31,* 143–151. doi:10.1007/s10862-008-9112-2

Angel, R., & Thoits, P. (1987). The impact of culture on the cognitive structure of illness. *Culture, Medicine and Psychiatry*, *11*, 465-494. doi: 10.1007/bf00048494

Angold, A., & Costello, E. J. (2000). The Child and Adolescent Psychiatric Assessment (CAPA). *Journal of the American Academy of Child & Adolescent Psychiatry*, *39*, 39-48. doi: 10.1097/00004583-200001000-00015

Asparouhov, T., & Muthén, B. (2012). Using Mplus TECH11 and TECH14 to test the number of latent classes. Retrieved from http://www.statmodel.com/examples/webnote.shtml

Bandalos, D. L., & Finney, S. J. (2018). Factor analysis: Exploratory and confirmatory. In G. R. Hancock, L. M. Stapleton, & R. O. Mueller. (Eds). *The reviewer's guide to quantitative methods in the social sciences* (pp. 98-122). New York, NY: Routledge.

Bandelow, B., & Michaelis, S. (2015). Epidemiology of anxiety disorders in the 21st century. *Dialogues in Clinical Neuroscience*, *17*, 327-335. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4610617/

Bartholomew, D. J., Knott, M., & Moustaki, I. (2011). *Latent variable models and factor analysis: A unified approach*, 3rd Edition. Chichester, England: John Wiley & Sons.

Bauer, D. J., & Curran, P. J. (2003). Distributional assumptions of growth mixture models:

Implications for overextraction of latent trajectory classes. *Psychological Methods*, *8*, 338-363. doi: 10.1037/1082-989X.8.3.338

Beatty, M. J., Heisel, A. D., Hall, A. E., Levine, T. R., & La France, B. H. (2002). What can we learn from the study of twins about genetic and environmental influences on interpersonal affiliation, aggressiveness, and social anxiety? A meta-analytic study. *Communication Monographs*, *69*, 1-18. doi: 10.1080/03637750216534

Beesdo, K., Bittner, A., Pine, D. S., Stein, M. B., Höfler, M., Lieb, R., & Wittchen, H. U. (2007). Incidence of social anxiety disorder and the consistent risk for secondary depression in the first three decades of life. *Archives of General Psychiatry, 64*, 903-912. doi: 10.1001/archpsyc.64.8.903a

Beesdo-Baum, K., Knappe, S., Fehm, L., Höfler, M., Lieb, R., Hofmann, S. G., & Wittchen, H. U. (2012). The natural course of social anxiety disorder among adolescents and young adults. *Acta Psychiatrica Scandinavica*, *126*, 411-425. doi: 10.1111/j.1600-0447.2012.01886.x

Behnke, R. R., & Sawyer, C. R. (2000). Anticipatory anxiety patterns for male and female public speakers. *Communication Education*, *49*, 187-195. Retrieved from https://nca.tandfonline.com/doi/abs/10.1080/03634520009379205

Beidel, D. C., & Turner, S. M. (1988). Comorbidity of test anxiety and other anxiety disorders in children. *Journal of Abnormal Child Psychology*, *16*, 275-287. doi: 10.1007/bf00913800

Beidel, D. C., Turner, S. M., & Morris, T. L. (1999). Psychopathology of childhood social phobia. *Journal of the American Academy of Child & Adolescent Psychiatry, 3*8, 643-650. doi:10.1097/00004583-199906000-00010

Bennett, D. A. (2001). How can I deal with missing data in my study? *Australian and New*

Zealand Journal of Public Health, *25*, 464-469. doi: 10.1111/j.1467-842x.2001.tb00659.x

Benson, J., Moulin-Julian, M., Schwarzer, C., Seipp, B., & El-Zahhar, N. (1992). Cross validation of a Revised Test Anxiety Scale using multi-national samples. In K. A. Hagvet & B. Johnsen (Eds.) *Advances in test anxiety research* (pp. 62–83). Lisse, Netherlands: Swets & Zeitlinger

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*, 238-246. doi: 10.1037/0033-2909.107.2.238

Bitran, S., & Barlow, D. H. (2004). Etiology and treatment of social anxiety: A commentary. *Journal of Clinical Psychology*, *60*, 881-886. doi: 10.1037/11533-004

Black, J. J., Clark, D. B., Martin, C. S., Kim, K. H., Blaze, T. J., Creswell, K. G., & Chung, T. (2015). Course of alcohol symptoms and social anxiety disorder from adolescence to young adulthood. *Alcoholism: Clinical and Experimental Research*, *39*, 1008-1015. doi: 10.1111/acer.12711

Bock, R. D., & Aitkin, M. (1981). Marginal maximum likelihood estimation of item parameters: Application of an EM algorithm. *Psychometrika*, *46*, 443-459. doi: 10.1007/bf02293801

Bögels, S. M., Alden, L., Beidel, D. C., Clark, L. A., Pine, D. S., Stein, M. B., & Voncken, M. (2010). Social anxiety disorder: Questions and answers for the DSM-V. *Depression and Anxiety, 27,* 168-189. doi: 10.1002/da.20670

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York, NY: Guilford Press.

Brown, W. (1910). Some experimental results in the correlation of mental abilities. *British Journal of Psychology, 3*, 296-322. doi: 10.1111/j.2044-8295.1910.tb00207.x

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newbury Park, CA: SAGE.

Bruch, M. A., & Heimberg, R. G. (1994). Differences in perceptions of parental and personal characteristics between generalized and nongeneralized social phobics. *Journal of Anxiety Disorders*, *8*, 155-168. doi: 10.1016/0887-6185(94)90013-2

Buckner, J. D., Schmidt, N. B., Lang, A. R., Small, J. W., Schlauch, R. C., & Lewinsohn, P. M. (2008). Specificity of social anxiety disorder as a risk factor for alcohol and cannabis dependence. *Journal of Psychiatric Research*, *42*, 230-239. doi: 10.1016/j.jpsychires.2007.01.002

Burstein, M., He, J. P., Kattan, G., Albano, A. M., Avenevoli, S., & Merikangas, K. R. (2011). Social phobia and subtypes in the National Comorbidity Survey–Adolescent Supplement: Prevalence, correlates, and comorbidity. *Journal of the American Academy of Child & Adolescent Psychiatry*, *50*, 870-880. doi: 10.1016/j.jaac.2011.06.005

Buuren, S. V., & Groothuis-Oudshoorn, K. (2011). Mice: Multivariate imputation by chained equations in R. *Journal of Statistical Software*, *45,* 1-68. doi: 10.18637/jss.v045.i03

Cattell, R. B. (1966). The scree plot test for the number of factors. *Multivariate Behavioral Research, 1,* 140-161. doi: 10.1207/s15327906mbr0102_10

Cattell, R. B. (1978). *The scientific use of factor analysis in behavioral and life sciences.* New York, NY: Plenum Press.

Celeux, G., & Soromenho, G. (1996). An entropy criterion for assessing the number of clusters in a mixture model. *Journal of Classification*, *13*, 195-212. doi: 10.1007/bf01246098

Chan, M. (2011). *The relationship between music performance anxiety, age, self-*

esteem, and performance outcomes in Hong Kong music students (Doctoral dissertation). Retrieved from http://etheses.dur.ac.uk/637/

Chartier, M. J., Walker, J. R., & Stein, M. B. (2001). Social phobia and potential childhood risk factors in a community sample. *Psychological Medicine*, *31*, 307-315. doi: 10.1017/s0033291701003348

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14,* 464-504. doi: 10.1080/10705510701301834

Chen, H. (2012). Impact of parent's socioeconomic status on perceived parental pressure and test anxiety among Chinese high school students. *International Journal of Psychological Studies*, *4*, 235. doi: 10.5539/ijps.v4n2p235

Cheng, S. T., & Hamid, P. N. (1995). An error in the use of translated scales: The Rosenberg Self-Esteem Scale for Chinese. *Perceptual and Motor Skills*, *81*, 431-434. doi: 10.1177/003151259508100214

Cheng, W., Hardy, L., & Markland, D. (2009). Toward a three-dimensional conceptualization of performance anxiety: Rationale and initial measurement development. *Psychology of Sport and Exercise, 10*, 271-278. doi: 10.1016/j.psychsport.2008.08.001

Cheng, W., Hardy, L., & Markland, D. (2011). Cross-cultural validation of a three-dimensional measurement model of performance anxiety in the contest of Chinese sports. *International Journal of Sport Psychology*, *42*, 417-435. Retrieved from https://www.researchgate.net/profile/Wen-Nuan_Cheng/publication

Cheng, X. (2000). Asian students' reticence revisited. *System*, *28*, 435-446. doi: 10.1016/S0346-251X(00)00015-4

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal,* 9, 233-255. doi: 10.1207/S15328007SEM0902_5

Cizek, G. J., & Burg, S. S. (2006). *Addressing test anxiety in a high-stakes environment*. Thousand Oaks, CA: Corwin Press.

Cloitre, M., Garvert, D. W., Brewin, C. R., Bryant, R. A., & Maercker, A. (2013). Evidence for proposed ICD-11 PTSD and complex PTSD: A latent profile analysis. *European Journal of Psychotraumatology*, *4*, 20706. doi: 10.3402/ejpt.v4i0.20706

Collins, L. M., & Lanza, S. T. (2010). *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences*. Hoboken, NJ: John Wiley & Sons.

Conners C. K. (1990). *Conners Rating Scales manual: Instruments for use with children and adolescents.* New York, NY: Multi-Health Systems.

Copeland, W. E., Angold, A., Shanahan, L., & Costello, E. J. (2014). Longitudinal patterns of anxiety from childhood to adulthood: The Great Smoky Mountains Study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *53*, 21-33. doi: doi.org/10.1016/j.jaac.2013.09.017

Costello, E. J., Egger, H. L., & Angold, A. (2005). The developmental epidemiology of anxiety disorders: Phenomenology, prevalence, and comorbidity. *Child and Adolescent Psychiatric Clinics*, *14*, 631-648. doi: 10.1016/j.chc.2005.06.003

Courtney, M. G. R., & Gordon, M. (2013). Determining the number of factors to retain in EFA:

Using the SPSS R-Menu v2.0 to make more judicious estimations. *Practical Assessment, Research & Evaluation*, *18*, 1-14. Retrieved from https://pareonline.net/getvn.asp?v=18&n=8

Cox, B. J., Clara, I. P., Sareen, J., & Stein, M. B. (2008). The structure of feared social situations among individuals with a lifetime diagnosis of social anxiety disorder in two independent nationally representative mental health surveys. *Behaviour Research and Therapy*, *46*, 477-486. doi: 10.1016/j.brat.2008.01.011

Crocq, M. A. (2015). A history of anxiety: From Hippocrates to DSM. *Dialogues in Clinical Neuroscience*, *17*, 319. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4610616/

Cronbach L. (1951). Coefficient alpha and the internal structure of tests. *Psychomerika,16,* 297-334. 10.1007/BF02310555

Davidson, J. R. T. (2003). Pharmacotherapy of social phobia. *Acta Psychiatrica Scandinavica*, *108*, 65-71. doi: 10.1034/j.1600-0447.108.s417.7.x

Dickman, S. J. (2002). Dimensions of arousal: Wakefulness and vigor. *Human Factors*, *44*, 429-442. doi: 10.1518/0018720024497673

Ding, M., Li, Y., Li, X., & Kulm, G. (2008). Chinese teachers' perceptions of students' classroom misbehaviour. *Educational Psychology*, *28*, 305-324. doi: 10.1080/01443410701537866

Dion, K. L., & Toner, B. B. (1988). Ethnic differences in test anxiety. *The Journal of Social Psychology*, *128*, 165-172. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/00224545.1988.9711359

Dong, Y., & Peng, C. Y. J. (2013). Principled missing data methods for researchers. *SpringerPlus*, *2*, 222. doi: 10.1186/2193-1801-2-222

Drost, E. A. (2011). Validity and reliability in social science research. *Education Research and Perspectives*, *38*, 105-124. Retrieved from https://search.proquest.com/docview/1020696142?pq-origsite=gscholar

Elliot, A. J., & McGregor, H. A. (1999). Test anxiety and the hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 76,* 628-644. doi: 10.1037/0022–3514.76.4.628

Everitt, B. S. (1984). *An introduction to latent variables models*. New York, NY: Chapman & Hall.

Finch, A. J., Kendall, P. C., & Montgomery, L. E. (1974). Multidimensionality of anxiety in children: Factor structure of the Children's Manifest Anxiety Scale. *Journal of Abnormal Child Psychology, 2*, 331-336. doi: 10.1007/BF00919262

Fisher, P. H., Masia-Warner, C., & Klein, R. G. (2004). Skills for social and academic success: A school-based intervention for social anxiety disorder in adolescents. *Clinical Child and Family Psychology Review*, *7*, 241-249. doi: 10.1007/s10567-004-6088-7

Freud, S. (1924). *A general introduction to psychoanalysis.* New York, NY: Washington Square Press.

Friedman, I. A., & Bendas-Jacob, O. (1997). Measuring perceived test anxiety in adolescents: A self-report scale. *Educational and Psychological Measurement*, *57*, 1035-1046. doi: 10.1177/0013164497057006012

Fuentes-Rodriguez, G., Garcia-Lopez, L. J., & Garcia-Trujillo, V. (2018). Exploring the role of the DSM-5 performance-only specifier in adolescents with social anxiety disorder. *Psychiatry Research*, *270*, 1033-1038. doi: 10.1016/j.psychres.2018.03.052

Giraud, C. (2014). *Introduction to high-dimensional statistics*. Boca Raton, FL: Chapman and Hall/CRC.

Gould, D., & Krane, V. (1992). The arousal-performance relationship: Current status and future directions. In T. Horn (Ed.), *Advances in sport psychology* (pp. 119-141). Champaign, IL: Human Kinetics.

Grace-Martin, K. (2008). *Can Likert scale data ever be continuous? Retrieved from* http://karengracemartin.articlealley.com/can-likert-scale-data-ever-be-continuous-670606.html

Graham, J. M. (2006). Congeneric and (essentially) tau-equivalent estimates of score reliability: What they are and how to use them. *Educational and Psychological Measurement*, *66*, 930-944. doi: 10.1177/0013164406288165

Green, R. G. (1984). Preferred stimulation levels in introverts and extroverts: Effects on arousal and performance. *Journal of Personality and Social Psychology*, *46*, 1303-1312. doi: 10.1037/0022-3514.46.6.1303

Guo, X., Meng, Z., Huang, G., Fan, J., Zhou, W., Ling, W., ... & Su, L. (2016). Meta-analysis of the prevalence of anxiety disorders in mainland China from 2000 to 2015. *Scientific Reports*, *6*, 1-15. doi: 10.1038/srep28033

Hanin, Y.L. (1980). A study of anxiety in sports. In W.F. Siraub (Ed.), *Sport psychology: An analysis of athlete behavior* (pp. 236-249). Ithaca, NY: Movement Publications.

Hardy, L., & Parfitt, G. (1991). A catastrophe model of anxiety and performance. *British Journal of Psychology*, *82*, 163-178. doi: 10.1111/j.2044-8295.1991.tb02391.x

Harel, O., & Zhou, X. H. (2007). Multiple imputation: Review of theory, implementation and software. *Statistics in Medicine*, *26*, 3057-3077. doi: doi.org/10.1002/sim.2787

Hathaway, S. R., & McKinley, J. C. (1943). *Minnesota Multiphasic Personality Inventory* (MMPI). Minneapolis, MN: University of Minnesota Press.

Hayward, C., Killen, J. D., Kraemer, H. C., & Taylor, C. B. (1998). Linking self-reported childhood behavioral inhibition to adolescent social phobia. *Journal of the American Academy of Child & Adolescent Psychiatry*, *37*, 1308-1316. doi: 10.1097/00004583-199812000-00015

Hembree, R. (1988). Correlates, causes, effects, and treatment of test anxiety. *Review of Educational Research*, *58*, 47-77. doi: 10.2307/1170348

Hill, K. T., & Wigfield, A. (1984). Test anxiety: A major educational problem and what can be done about it. *The Elementary School Journal*, *85*, 105-126. doi: 10.1086/461395

Hirshfeld-Becker, D. R., Micco, J., Henin, A., Bloomfield, A., Biederman, J., & Rosenbaum, J. (2008). Behavioral inhibition. *Depression and Anxiety*, *25*, 357-367. doi: 10.1002/da.20490

Ho, L. Y., & Lau, A. S. (2011). Do self-report measures of social anxiety reflect cultural bias or real difficulties for Asian American college students? *Cultural Diversity & Ethnic Minority Psychology, 17,* 52–58. doi:10.1037/a0022533

Hofmann, S. G., Anu Asnaani, M. A., & Hinton, D. E. (2010). Cultural aspects in social anxiety and social anxiety disorder. *Depression and Anxiety*, *27*, 1117-1127. doi: 10.1002/da.20759

Hong, J. J., & Woody, S. R. (2007). Cultural mediators of self-reported social anxiety. *Behaviour Research and Therapy, 45*, 1779 –1789. doi: 10.1016/j.brat.2007.01.011

Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling: Guidelines for

determining model fit. *Electronic Journal of Business Research Methods*, *6*, 53-60. doi: 10.21427/D7CF7R

Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika, 30,* 179-185. doi:10.1007/BF02289447

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structural analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55. doi: 10.1080/10705519909540118

Huberty, T. J., & Dick, A. C. (2006). Performance and test anxiety. In G. G. Bear & K. M. Minke (Eds.), *Children's needs III: Development, prevention, and intervention* (pp. 281-291). Bethesda, MD: National Association of School Psychologists.

Hughes, A. A., Heimberg, R. G., Coles, M. E., Gibb, B. E., Liebowitz, M. R., & Schneier, F. R. (2006). Relations of the factors of the tripartite model of anxiety and depression to types of social anxiety. *Behaviour Research and Therapy*, *44*, 1629-1641. doi: 10.1016/j.brat.2005.10.015

IBM Corp. (2017). *IBM SPSS statistics for windows, version 25.0.* Armonk, NY: IBM Corp.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*, 141-151. doi: 10.1177/001316446002000116

Kelley, K., & Pornprasertmanit, S. (2016). Confidence intervals for population reliability coefficients: Evaluation of methods, recommendations, and software for composite measures. *Psychological Methods, 21*, 69-92. doi: 10.1037/a0040086

Kenny, D. T. (2005a). A systematic review of treatments for music performance anxiety. *Anxiety, Stress, and Coping*, *18*, 183-208. doi: 10.1080/10615800500167258

Kenny, D. T. (2005b). Performance anxiety: Multiple phenotypes, one genotype? Introduction to

the special edition on performance anxiety. *International Journal of Stress Management, 12*, 307-311. doi:10.1037/1072-5245.12.4.307

Kenny, D. T. (2006). Music performance anxiety: Origins, phenomenology, assessment and treatment. *Context: Journal of Music Research*, *31*, 51. Retrieved from https://search.informit.com.au/documentSummary;dn=321654703853337;res=IELHSS

Kenny, D. T. (2011). *The psychology of music performance anxiety*. New York, NY: Oxford University Press.

Kenny, D. T., Davis, P., & Oates, J. (2004). Music performance anxiety and occupational stress amongst opera chorus artists and their relationship with state and trait anxiety and perfectionism. *Journal of Anxiety Disorders*, *18*, 757-777. doi: 10.1016/j.janxdis.2003.09.004

Kenny, D. T., & Osborne, M. S. (2006). Music performance anxiety: New insights from young musicians. *Advances in Cognitive Psychology*, *2*, 103-112. doi: 10.2478/v10053-008-0049-5

Kessler, R. C., Petukhova, M., Sampson, N. A., Zaslavsky, A. M., & Wittchen, H. U. (2012). Twelve-month and lifetime prevalence and lifetime morbid risk of anxiety and mood disorders in the United States. *International Journal of Methods in Psychiatric Research*, *21*, 169-184. doi: 10.1002/mpr.1359

Kessler, R. C., & Üstün, T. B. (2004). The World Mental Health (WMH) survey initiative version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *International Journal of Methods in Psychiatric Research*, *13*, 93-121. doi: 10.1037/t28053-000

King, N. J., Mietz, A., Tinney, L., & Ollendick, T. H. (1995). Psychopathology and cognition in

adolescents experiencing severe test anxiety. *Journal of Clinical Child Psychology*, *24*, 49-54. doi: 10.1207/s15374424jccp2401_6

King, N. J., & Ollendick, T. H. (1989). Children's anxiety and phobic disorders in school settings: Classification, assessment, and intervention issues. *Review of Educational Research*, *59*, 431-470. doi: 10.3102/00346543059004431

Knappe, S., Beesdo-Baum, K., Fehm, L., Stein, M. B., Lieb, R., & Wittchen, H. U. (2010). Social fear and social phobia types among community youth: Differential clinical features and vulnerability factors. *Journal of Psychiatric Research*, *45*, 111-120. doi:10.1016/j.jpsychires.2010.05.002

Kovacs, M. (1992). *Children's Depression Inventory.* North Tonawanda, NY: Multi-Health Systems, Inc.

Krane, V. (1993). A practical application of the anxiety–athletic performance relationship: The zone of optimal functioning hypothesis. *The Sport Psychologist*, *7*, 113-126. doi: 10.1123/tsp.7.2.113

Krieg, A., & Xu, Y. (2015). Ethnic differences in social anxiety between individuals of Asian heritage and European heritage: A meta-analytic review. *Asian American Journal of Psychology*, *6*, 66. doi: 10.1037/a0036993

Lai, B. S., Kelley, M. L., Harrison, K. M., Thompson, J. E., & Self-Brown, S. (2015). Posttraumatic stress, anxiety, and depression symptoms among children after Hurricane Katrina: A latent profile analysis. *Journal of Child and Family Studies*, *24*, 1262-1270. doi: 10.1007/s10826-014-9934-3

Lazarsfeld, P. F., & Henry, N. W. (1968). *Latent structure analysis*. Boston, MA: Houghton Mifflin Co.

Lee, G. (2009). Speaking up: Six Korean students' oral participation in class discussions in US graduate seminars. *English for Specific Purposes*, *28*, 142-156. doi: 10.1016/j.esp.2009.01.007

Liebowitz, M. R., Gorman, J. M., Fyer, A. J., & Klein, D. F. (1985). Social phobia: Review of a neglected anxiety disorder. *Archives of General Psychiatry*, *42*, 729-736. doi: 10.1001/archpsyc.1985.01790300097013

Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*, 1198-1202. doi: 10.2307/2290157

Liu, P. C. (2016). *Music performance anxiety among college piano majors in Taiwan* (Doctoral dissertation). Retrieved from https://open.bu.edu/handle/2144/19580

Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika*, *88*, 767-778. doi: 10.1093/biomet/88.3.767

Lou, W., & Chi, I. (2000). The stressors and psychological well-being of senior secondary school students. *Psychological Science China, 23,* 156–159. Retrieved from http://en.cnki.com.cn/Article_en/CJFDTOTAL-XLKX200002005.htm

Lowe, P. A. (2014a). A closer look at the psychometric properties of the Revised Children's Manifest Anxiety Scale–Second Edition among U.S. elementary and secondary school students. *Journal of Psychoeducational Assessment*, *32*, 495-508. doi: 10.1177/0734282914528611

Lowe, P. A. (2014b). The Test Anxiety Measure for Adolescents (TAMA): Examination of the

reliability and validity of the scores of a new multidimensional measure of test anxiety for middle and high school students. *Journal of Psychoeducational Assessment*, *32*, 404-416. doi: 10.1177/0734282913520595

Lowe, P. A. (2015). Should test anxiety be measured differently for males and females? Examination of measurement bias across gender on measures of test anxiety for middle and high school, and college students. *Journal of Psychoeducational Assessment*, *33*, 238-246. doi: 10.1177/0734282914549428

Lowe, P. A., & Ang, R. P. (2012). Cross-cultural examination of test anxiety among U.S. and Singapore students on the Test Anxiety Scale for Elementary Students (TAS-E). *Educational Psychology*, *32*, 107-126. doi: 10.1080/01443410.2011.625625

Lowe, P. A., Goldenberg, L., & Wheeler, V. (2014, August). *Measurement invariance across gender on a new test anxiety measure*. Paper presented at the 122nd Annual Convention of the American Psychological Association, Washington, DC.

Lowe, P. A., & Lee, S. W. (2008). Factor structure of the Test Anxiety Inventory for Children and Adolescents (TAICA) scores across gender among students in elementary and secondary school settings. *Journal of Psychoeducational Assessment*, *26*, 231-246. doi: 10.1177/0734282907303773

Lowe, P. A., Lee, S. W., Witteborg, K. M., Prichard, K. W., Luhr, M. E., Cullinan, C. M., ... & Janik, M. (2008). The Test Anxiety Inventory for Children and Adolescents (TAICA) examination of the psychometric properties of a new multidimensional measure of test anxiety among elementary and secondary school students. *Journal of Psychoeducational Assessment*, *26*, 215-230. doi: 10.1177/0734282907303760

Lowe, P. A., & Zhu, Q. (2017, February). *Examination of the TAMA factor structure with*

Chinese secondary students. Paper presented at the Annual Convention of the National Association of School Psychologists, San Antonio, TX.

Mandler, G., & Sarason, S. B. (1952). A study of anxiety and learning. *The Journal of Abnormal and Social Psychology*, *47*, 166-173. doi: 10.1037/h0062855

Mannuzza, S., Schneier, F. R., Chapman, T. F., Liebowitz, M. R., Klein, D. F., & Fyer, A. J. (1995). Generalized social phobia: Reliability and validity. *Archives of General Psychiatry*, *52*, 230-237. doi: 10.1001/archpsyc.1995.03950150062011

Marks, I. M., & Gelder, M. G. (1966). Different ages of onset in varieties of phobia. *American Journal of Psychiatry*, *123*, 218-221. doi: 10.1176/ajp.123.2.218

Marmorstein, N. R. (2006). Generalized versus performance-focused social phobia: Patterns of comorbidity among youth. *Journal of Anxiety Disorders*, *20*, 778-793. doi:10.1016/j.janxdis.2005.08.004

Martens, R., Burton, D., Vealey, R., Bump, L.A., & Smith, D. E. (1990). Development and validation of the Competitive State Anxiety Inventory-2. In R. Martens, R.S. Vealey, & D. Burton, (Eds). *Competitive state anxiety in sport* (pp. 117-190). Champaign, IL: Human Kinetics.

Mattick, R. P., & Clarke, J. C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy, 36*, 455-470. doi: 10.1016/s0005-7967(97)10031-6

McCabe, R. E., Antony, M. M., Summerfeldt, L. J., Liss, A., & Swinson, R. P. (2003). Preliminary examination of the relationship between anxiety disorders in adults and self-reported history of teasing or bullying experiences. *Cognitive Behaviour Therapy*, *32*, 187-193. doi: 10.1080/16506070310005051

McDonald, A. S. (2001). The prevalence and effects of test anxiety in school children. *Educational Psychology*, *21*, 89-101. doi: 10.1080/01443410020019867

McGovern, J. (2016). *A closer look at the Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2) Performance Anxiety Cluster.* (Doctoral dissertation). Retrieved from https://kuscholarworks.ku.edu/handle/1808/23933

McReynolds, P. (1985). Changing conceptions of anxiety: A historical review and a proposed integration. *Issues in Mental Health Nursing*, *7*, 131-158. doi: 10.3109/01612848509009453

Meade, A. W., & Craig, S. B. (2012). Identifying careless responses in survey data. *Psychological Methods*, *17*, 437. doi: 10.1037/e518362013-127

Merritt, L., Richards, A., & Davis, P. (2001). Performance anxiety: Loss of the spoken edge. *Journal of Voice, 15,* 257–269. doi: 10.1016/S0892-1997(01)00026-1

Metropolis, N., & Ulam, S. (1949). The Monte Carlo method. *Journal of the American Statistical Association, 44,* 335-341. doi:10.2307/2280232.

Miller, S. R., & Chesky, K. (2004). The multidimensional anxiety theory: An assessment of and relationships between intensity and direction of cognitive anxiety, somatic anxiety, and self-confidence over multiple performance requirements among college music majors. *Medical Problems of Performing Artists*, *19*, 12-22. Retrieved from https://www.gale.com/

Mulaik, S. A. (2009). *Foundations of factor analysis*. Boca Raton, FL: Taylor & Francis.

Muthén, B. O. (2003). Statistical and substantive checking in growth mixture modeling: Comment on Bauer and Curran (2003). *Psychological Methods, 8,* 369-377. doi: 10.1037/1082-989X.8.3.369

Muthén, L. K., & Muthén, B. O. (1998-2017). *Mplus user's guide (8th ed.).* Los Angeles, CA: Muthén & Muthén.

Nagata, T., Suzuki, F., & Teo, A. R. (2015). Generalized social anxiety disorder: A still-neglected anxiety disorder 3 decades since Liebowitz's review. *Psychiatry and Clinical Neurosciences*, *69*, 724-740. doi: 10.1111/pcn.12327

National Association of School Psychologists. (2010). *Principles for professional ethics.* Retrieved from http://www.nasponline.org/standards/2010standards.aspx

Norton, G. R., Cox, B. J., Hewitt, P. L., & McLeod, L. (1997). Personality factors associated with generalized and non-generalized social anxiety. *Personality and Individual Differences*, *22*, 655-660. doi: 10.1016/s0191-8869(96)00243-7

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*, 535-569. doi: 10.1080/10705510701575396

Oakman, J., Van Ameringen, M., Mancini, C., & Farvolden, P. (2003). A confirmatory factor analysis of a self-report version of the Liebowitz Social Anxiety Scale. *Journal of Clinical Psychology*, *59*, 149-161. doi: 10.1002/jclp.10124

O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instruments, & Computers*, *32*, 396-402.

Osborne, M. S., Kenny, D. T., & Holsomback, R. (2005). Assessment of music performance

anxiety in late childhood: A validation study of the Music Performance Anxiety Inventory for Adolescents (MPAI-A). *International Journal of Stress Management*, *12*, 312-330. doi: 10.1037/1072-5245.12.4.312

Öst, L. G., & Hugdahl, K. (1981). Acquisition of phobias and anxiety response patterns in clinical patients. *Behaviour Research and Therapy*, *19*, 439-447. doi: 10.1016/0005-7967(81)90134-0

Parker, J., Rubin, K. H., Erath, S. A., Wojslawowicz, J. C., & Buskirk, A. A. (2006). Peer relationships, child development, and adjustment: A developmental psychopathology perspective. In D. Cicchetti and D. J. Cohen. (Eds.), *Developmental psychopathology (Vol.1): Theory and method* (2nd ed., pp. 419-437). New York, NY: Wiley.

Putwain, D., & Daly, A. L. (2014). Test anxiety prevalence and gender differences in a sample of English secondary school students. *Educational Studies*, *40*, 554-570. doi: 10.1080/03055698.2014.953914

Putwain, D. W., & Pescod, M. (2018). Is reducing uncertain control the key to successful test anxiety intervention for secondary school students? Findings from a randomized control trial. *School Psychology Quarterly*, *33*, 283. doi: 10.1037/spq0000228

R Development Core Team. (2019). *R* (*Version 3.5.3*). Retrieved from https://www.r-project.org/

Reise, S. P., Bonifay, W. E., & Haviland, M. G. (2013). Scoring and modeling psychological measures in the presence of multidimensionality. *Journal of Personality Assessment*, *95*, 129-140. doi: 10.1080/00223891.2012.725437

Reynolds, C. R., & Kamphaus, R. W. (2004). *Behavior Assessment System for Children-Self-Report of Personality*. Circle Pines, MN: American Guidance Services.

Reynolds, C. R., & Richmond, B. O. (1985). *The Revised Children's Manifest Anxiety Scale (RCMAS) manual*. Los Angeles, CA: Western Psychological Services.

Reynolds, C. R., & Richmond, B. O. (2008a). *Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2): Manual. Los Angeles, CA: Western Psychological Services.*

Reynolds, C. R., & Richmond, B. O. (2008b). *The Revised Children's Manifest Anxiety Scale—Second Edition (RCMAS-2).* Los Angeles, CA: Western Psychological Service.

Reynolds, M. R., & Keith, T. Z. (2013). Measurement and statistical issues in child assessment research. In D. H. Saklofske, C. R. Reynolds, & V. L. Schwean (Eds.), *The Oxford handbook of child psychological assessment* (pp. 48-83). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199796304.013.0003

Rode, N. (2005). Translation of measurement instruments and their reliability: An example of job-related affective well-being scale. *Metodoloski Zvezki*, *2*, 15. Retrieved from http://mrvar.fdv.uni-lj.si/

Ruscio, A., Brown, T. A., Chiu, W. T., Sareen, J., Stein, M. B., & Kessler, R. C. (2008). Social fears and social phobia in the United States: Results from the National Comorbidity Survey Replication. *Psychological Medicine, 38,* 15-28. doi: 10.1017/S0033291707001699

Salkind, N. J. (2007). *Statistics for people who (think they) hate statistics (2nd ed.).* Thousand Oaks, CA: Sage.

Sarason, S. B., Mandler, G., & Craighill, P. G. (1952). The effect of differential instructions on anxiety and learning. *The Journal of Abnormal and Social Psychology*, *47*, 561-565. doi: 10.1037/h0058554

Schwarz, G. E. (1978). Estimating the dimension of a model. *Annals of statistics, 6,* 461-

464. doi:10.1214/aos/1176344136.

Sclove, L. (1987). Application of model-selection criteria to some problems in multivariate analysis. *Psychometrika, 52,* 333-343. doi: 10.1007/BF02294360

Segool, N. K., Carlson, J. S., Goforth, A. N., Von Der Embse, N., & Barterian, J. A. (2013). Heightened test anxiety among young children: Elementary school students' anxious responses to high-stakes testing. *Psychology in the Schools*, *50*, 489-499. doi: 10.1002/pits.21689

Shaffer, D., Fisher, P., Dulcan, M. K., Davies, M., Piacentini, J., Schwab-Stone, M. E., ... & Canino, G. (1996). The NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3): Description, acceptability, prevalence rates, and performance in the MECA study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *35*, 865-877. doi: 10.1097/00004583-199607000-00012

Shen, Y. C., Zhang, M. Y., Huang, Y. Q., He, Y. L., Liu, Z. R., Cheng, H., ... & Kessler, R. C. (2006). Twelve-month prevalence, severity, and unmet need for treatment of mental disorders in metropolitan China. *Psychological Medicine*, *36*, 257-267. doi: 10.1017/s0033291705006367

Silverman, W. K., & Albano, A. M. (1997). *The Anxiety Disorders Interview Schedule for Children for DSM- IV: Child and parent versions.* San Antonio, TX: Psychological Corporation.

Smith, R. E., Smoll, F. L., Cumming, S. P., & Grossbard, J. R. (2006). Measurement of multidimensional sport performance anxiety in children and adults: The Sport Anxiety Scale-2. *Journal of Sport and Exercise Psychology*, *28*, 479-501. doi: 10.1123/jsep.28.4.479

Spearman, C. C. (1910). Correlation calculated from faulty data. *British Journal of Psychology, 3,* 271–295. doi: 10.1111/j.2044-8295.1910.tb00206.x

Spence, J. T., & Spence, K. W. (1966). The motivational component of manifest anxiety: Drive and drive stimuli. In C. D. Spielberger (Ed.), *Anxiety and behavior* (pp. 291-326). New York, NY: Academic Press.

Spence, S. H., Donovan, C., & Brechman-Toussaint, M. (1999). Social skills, social outcomes, and cognitive features of childhood social phobia. *Journal of Abnormal Psychology*, *108*, 211-221. doi:10.1037/0021-843X.108.2.211

Sperber, A. D. (2004). Translation and validation of study instruments for cross-cultural research. *Gastroenterology*, *126*, S124-S128. doi: 10.1053/j.gastro.2003.10.016

Spielberger, C.D. (1973). *The State-Trait Anxiety Inventory for Children (STAIC).* San Antonio, TX: The Psychological Corporation,

Spielberger, C. D. (1980). *Preliminary professional manual for the test anxiety inventory.* Palo Alto, CA: Consulting Psychologists Press.

Spielberger, C.D. (1989). Stress and anxiety in sports. In D. Hackfort & C.D. Spielberger (Eds.), *Anxiety in sports: An international perspective* (pp. 3-20). New York, NY: Hemisphere Publishing Corporation.

Spielberger, C. D., & Vagg, P. R. (1995). *Test anxiety: Theory, assessment, and treatment*. Washington, DC: Taylor & Francis.

Stankov, L. (2010). Unforgiving Confucian culture: A breeding ground for high academic achievement, test anxiety and self-doubt? *Learning and Individual Differences*, *20*, 555-563. doi: 10.1016/j.lindif.2010.05.003

Stein, M. B., & Kean, Y. M. (2000). Disability and quality of life in social phobia:

Epidemiologic findings. *American Journal of Psychiatry*, *157*, 1606-1613. doi: 10.1176/appi.ajp.157.10.1606

Stein, M. B., Torgrud, L. J., & Walker, J. R. (2000). Social phobia symptoms, subtypes, and severity: Findings from a community survey. *Archives of General Psychiatry*, *57*, 1046-1052. doi: 10.1001/archpsyc.57.11.1046

Stemberger, R. T., Turner, S. M., Beidel, D. C., & Calhoun, K. S. (1995). Social phobia: An analysis of possible developmental factors. *Journal of Abnormal Psychology*, *104*, 526. doi: 10.1037//0021-843x.104.3.526

Stennett, R. G. (1957). The relationship of performance level to level of arousal. *Journal of Experimental Psychology*, *54*, 54-61. doi: 10.1037/h0043340

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics (5th ed.)*. Boston, MA: Pearson Education

Tamborrino, R. A. (2001). An examination of performance anxiety associated with solo performance of college-level music majors. *Dissertation Abstracts International Section A: Humanities and Social Sciences, 62,* 1636.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53-55. doi: 10.5116/ijme.4dfb.8dfd

Taylor, J. A. (1951). The relationship of anxiety to the conditioned eyelid response. *Journal of Experimental Psychology*, *41*, 81. doi: 10.1037/h0059488

Taylor, J. A. (1956). Drive theory and manifest anxiety. *Psychological Bulletin*, *53*, 303-320. doi: 10.1037/h0040353

Tein, J. Y., Coxe, S., & Cham, H. (2013). Statistical power to detect the correct number of

classes in latent profile analysis. *Structural Equation Modeling: A Multidisciplinary Journal*, *20*, 640-657. doi: 10705511.2013.824781

Thomas, C. L., Cassady, J. C., & Finch, W. H. (2018). Identifying severity standards on the cognitive test anxiety scale: Cut score determination using latent class and cluster analysis. *Journal of Psychoeducational Assessment*, *36*, 492-508. doi: 10.1177/0734282916686004

Tillfors, M., Persson, S., Willén, M., & Burk, W. J. (2012). Prospective links between social anxiety and adolescent peer relations. *Journal of Adolescence*, *35*, 1255-1263. doi: 10.1016/j.adolescence.2012.04.008

Tobias, S. (1979). Anxiety research in educational psychology. *Journal of Educational Psychology, 71*, 573-582. doi: 10.1037/0022-0663.71.5.573

Turner, B. G., Beidel, D. C., Hughes, S., & Turner, M. W. (1993). Test anxiety in African American school children. *School Psychology Quarterly*, *8*, 140. doi: 10.1037/h0088835

Turner, S. M., Beidel, D. C., & Townsley, R. M. (1992). Social phobia: A comparison of specific and generalized subtypes and avoidant personality disorder. *Journal of Abnormal Psychology, 101*, 326. doi: 10.1037//0021-843x.101.2.326

Velicer, W. F. (1976). Determining the number of components from the matrix of partial correlations. *Psychometrika, 41,* 321-327. doi:10.1007/BF02293557

von der Embse, N. P., & Hasson, R. (2012). Test anxiety and high-stakes test performance between school settings: Implications for educators. *Preventing School Failure: Alternative Education for Children and Youth*, *56*, 180-187. doi: 1045988x.2011.633285

von der Embse, N. P., Mata, A. D., Segool, N., & Scott, E. C. (2014). Latent profile analyses of

test anxiety: A pilot study. *Journal of Psychoeducational Assessment*, *32*, 165-172. doi: 10.1177/0734282913504541

Werner, C., & Schermelleh-Engel, K. (2010). Deciding between competing models: Chi-square difference tests. Retrieved from https://www.psychologie.uzh.ch/dam/jcr:ffffffff-b371-2797-0000-00000fda8f29/chisquare_diff_en.pdf

Wessely, S. (1990). Old wine in new bottles: Neurasthenia and 'ME'. *Psychological Medicine*, *20*, 35-53. doi: 10.1017/s0033291700013210

White, I. R., Royston, P., & Wood, A. M. (2011). Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine*, *30*, 377-399. doi: 10.1002/sim.4067

Williams, J. B. W., & American Psychiatric Association. (1987). *Diagnostic criteria from DSM-III-R*. Washington, DC: American Psychiatric Association.

Wine, J. (1971). Test anxiety and direction of attention. *Psychological Bulletin*, *76*, 92. doi: 10.1037/h0031332

Wittchen H.U., & Pfister H. (1997). *DIA-X-Interviews: Manual fuÈr Screening-Verfahren und Interview; Interviewheft LaÈngsschnittuntersuchung (DIA-X-Lifetime); ErgaÈnzungsheft (DIA-X-Lifetime); Interviewheft Querschnittuntersuchung (DIA-X-Monate); ErgaÈnzungsheft (DIA-X-Monate); PC-Programm zur DurchfuÈhrung des Interviews (LaÈngs- und Querschnittuntersuchung); Auswertungsprogramm.* Frankfurt, German: Swets and Zeitlinger.

World Health Organization. (1997). *Composite International Diagnostic Interview, version 2.1.* Geneva: WHO.

Wren, D. G., & Benson, J. (2004). Measuring test anxiety in children: Scale development and

internal construct validation. *Anxiety, Stress & Coping*, *17*, 227-240. doi: 10.1080/10615800412331292606

Wu, L. M., Liu, Y., Chen, H. M., Tseng, H. C., & Lin, W. T. (2016). Psychometric properties of the RCMAS-2 in pediatric cancer patients. *European Journal of Oncology Nursing*, *20*, 36-41. doi: 10.1016/j.ejon.2015.07.008

Xing, L. F., Huang, X. Y., & Huang, H. X. (2005). Middle school students' parent-related test anxiety: Comparisons between United States and China. *Chinese Mental Health Journal*, 19, 509–512. Retrieved from http://en.cnki.com.cn/Article_en/CJFDTOTAL-ZXWS200508001.htm

Yang, Y., & Green, S. B. (2015). Evaluation of structural equation modeling estimates of reliability for scales with ordered categorical items. *Methodology*, *11*, 23-34. doi: 10.1027/1614-2241/a000087

Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology*, *18*, 459-482. doi: 10.1002/cne.920180503

Zeidner, M. (1998). *Test anxiety: The state of the art*. New York, NY: Springer Science & Business Media.

Zeidner, M., & Matthews, G. (2005). Evaluation anxiety. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 141–163). London, England: Guilford Press.

Zhu, Q., & Lowe, P. A. (2018). Examination of the psychometric properties of the Revised

Children's Manifest Anxiety Scale–Second Edition scores among Chinese secondary school students. *Journal of Psychoeducational Assessment*, *36*, 725-735. doi: 10.1177/0734282917698302

Zwick, W. R., & Velicer, W. F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological Bulletin, 99,* 432-442. doi:10.1037/0033-2909.99.3.432

APPENDIX A

IRB Letter of Approval

THE UNIVERSITY OF KANSAS
Research

APPROVAL OF PROTOCOL

June 5, 2015

Qingqing Zhu
qingqing@ku.edu

Dear Qingqing Zhu:

On 6/5/2015, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	Validation of the Test Anxiety Measure for Adolescents in Chinese Adolescents
Investigator:	Qingqing Zhu
IRB ID:	STUDY00002627
Funding:	None
Grant ID:	None
Documents Reviewed:	• adolescent assent form, • letter to Chinese Department of Education, • Qingqing Zhu - HSCL_Initial_Submission_Form TAMA_5-4-15.pdf, • letter to the principle, • Revised Children Manifest Scale--Second Edition, • Test Anxiety Measure for Adolescent, • parent notification letter_Mandarin version, • parent notification letter_English version, • TAMA again, • adolescent assent form Chinese version, • RCMAS-2 again,

The IRB approved the study on 6/5/2015.

1. Notify HSCL about any new investigators not named in the original application. Note that new investigators must take the online tutorial at https://rgs.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

Human Subjects Committee Lawrence
Youngberg Hall | 2385 Irving Hill Road | Lawrence, KS 66045-7568 | (785) 864-7429 | www.research.ku.edu