GENERAL ANXIETY AND ACADEMIC INDICATORS AS PREDICTORS OF TEST ANXIETY IN ADOLESCENTS

By

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To my family

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TABLE OF CONTENTS

LIST OF TABLES

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

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Despite several decades of research addressing test anxiety, few studies have examined academic and emotional variables as they jointly relate to test anxiety. Two frameworks guide the existing test anxiety literature. The line of interest most prominent in educational research focuses on test anxiety primarily as an academic problem relating to impairments in test-taking (e.g., Naveh-Benjamin, 1991). Another framework stemming mostly from the clinical literature views test anxiety as an emotional problem relating to other broader forms of anxiety (e.g., Beidel, 1988). However, studies have not examined the extent to which various indicators of academic performance and general anxiety jointly predict test anxiety. Key research questions in this study examined the extent to which academic variables, general anxiety, and selected demographics predict test anxiety in male and female adolescents.

Self-report rating scales addressing test anxiety, general anxiety, and students' perceptions of academic skills and academic enabling behaviors were obtained from 104 adolescents in grades seven through nine. In addition, participants' grade point average and performance on a statewide achievement test were collected. Multiple regression analyses revealed that general anxiety and performance on a statewide achievement test were found to be significant predictors of test anxiety. A hierarchical regression analyses indicated that student perceptions of their

academic skills also contributed an additional small portion of the variance associated with test anxiety. Although some minor gender differences were identified, the predictive model including general anxiety and statewide achievement scores was applicable to both males and females. This study extends the existing information-processing model (Naveh-Benjamin, 1991) linking test anxiety with lower academic performance by incorporating the role of general anxiety in predicting test anxiety.

CHAPTER 1
REVIEW OF THE LITERATURE: TEST ANXIETY

Introduction

Test anxiety is a growing concern for both the academic and emotional well-being of children in public schools today. In recent years, the greater emphasis on educational accountability and high-stakes testing stemming from federal regulations such as the No Child Left Behind Act means that many students are being tested more than ever before. Although the concept of test anxiety has been documented by scientific and scholarly research with students across a wide range of age and grade levels (Cizek & Burg, 2007; Ergene, 2003), the processes operating in the experience of test anxiety have received minimal attention and remain not fully understood (Zeidner, 1998).

Two distinct frameworks exist in the professional literature with regard to test anxiety. One of the major guiding theories evident in the literature places test anxiety centrally as a problem relating to academic performance (Naveh-Benjamin, 1991). At the same time, another smaller body of literature explains test anxiety as primarily representing an emotional-behavioral experience (Beidel & Turner, 1988). In accordance with these “schools” of thought, test anxiety has been linked to several academic and emotional variables. However, the relative role and influence of these various factors in explaining the experience of test anxiety in adolescents and predicting which students are at highest risk has not been sufficiently explored. Although previous research has revealed a consistent relationship between academic performance and emotional functioning (e.g., Swanson & Howell, 1996), the extent to which academic and emotional variables jointly predict to the experience of test-anxiety in adolescent students remains unclear. Furthermore, it is unknown whether distinct patterns of academic versus emotional variables may best predict test anxiety.

The text that follows will review the literature on test anxiety and associated variables. First, a general overview of the construct of test anxiety, its prevalence, and associated outcomes will be provided. Consideration will be given to demographic variables that predict groups that may be at increased risk for experiencing test anxiety (Hembree, 1988; Osborne, 2001). Three models of test anxiety and its relationship with impaired academic performance will be introduced. Within the framework of these models of test anxiety, a discussion of correlates and predictors of test anxiety supported in the literature will follow. Emotional variables relevant to test anxiety will be discussed. Next, academically-related variables will be examined as they relate to test anxiety. Although previous studies regarding academic and emotional variables that play a role in the experience of test anxiety consistently conclude that test anxiety is a multifaceted phenomenon with numerous associated variables (e.g., Hembree, 1988), these studies fail to address how sets of variables may operate together to explain test anxiety.

Test Anxiety: Overview, Context, Prevalence, and Associated Outcomes

Test anxiety refers to a set of physiological, behavioral, emotional, and cognitive responses to the perceived threat of failure on a test or other evaluative situation (e.g., Sapp, 1999). Among scholars, the most widely agreed-upon conceptualization describes test anxiety as a multidimensional unpleasant state. Test anxiety involves an interaction among physical and emotional tension and autonomic nervous system arousal, cognitive worry and doubt in one's abilities, and behavioral responses that interfere with test preparedness (e.g., avoidance and procrastination of studying) (e.g., Ergene, 2003; Sarason & Sarason, 1990; Spielberger, 1972; Zeidner, 1998). Zeidner describes test anxiety as "…the responses that accompany concern about possible negative consequences or failure on an exam or similar evaluative situation," (pp. 17-18). A student experiencing test anxiety may present as easily distracted, forgetting previously known information, or "freezing up" when taking an exam (Emery & Krumboltz, 1967; Keogh,

Bond, French, Richards, & Davis, 2004). Other presentations of a test-anxious student may include negative emotions, negative thoughts about the self, and feelings of panic (Zeidner, 1998). Students with anxiety about tests may exhibit any combination of associated physiological, cognitive, emotional, or behavioral symptoms (Sarason, 1984).

Across several decades of research exploring test anxiety, a multidimensional conceptualization of test anxiety has been widely agreed upon (Cizek & Burg, 2006; Zeidner, 1998). That is, test anxiety represents a complex phenomenon consisting of multiple symptoms that present somewhat differently across individuals. The first systematic study of test anxiety occurred in the 1950s, resulting in a portrayal of test anxiety as a multidimensional construct (Zeidner, 1998). Two major components of test anxiety have been emphasized, including both cognitive and emotional components, often referred to as worry and emotionality (Cizek & Burg, 2006; Liebert & Morris, 1967). Worry includes cognitive concerns about evaluation and consequences of failure, while emotionality consists of how an individual perceives physiological autonomic reactions to an evaluative situation (Liebert & Morris, 1967). Worry—or cognitive test anxiety—can include a variety of thoughts about an evaluative situation. Specifically, these cognitions may occur in the form of social comparisons about one's performance versus peers, negative outcomes associated with failure, limited confidence in one's performance and preparedness, and fears of disappointing other individuals such as parents (Cassady & Johnson, 2002; Hembree, 1988). Specific to the affective dimension of test anxiety, physiological reactions can include sensations such as increased heart rate, dizziness, nausea, or panic (Morris, Davis, & Hutchings, 1981). Emotionality consists of an individual's subjective interpretation of such autonomic reactions (Schwarzer, 1984). Much research has supported the psychometric distinction between these two components (Everson, Millsap, & Rodriguez, 1991;

Schwarzer,1984; Spielberger, 1980; Stober, 2004). In addition to cognitive and affective dimensions of test anxiety, a behavioral component of test anxiety has also been acknowledged, pointing to behaviors such as procrastination and avoidance, as well as deficient skills related to studying and test-taking (Paulman & Kennelly, 1984; Zeidner, 1998).

Context

Emphasis on educational accountability and efforts to improve student achievement through high-stakes assessments has been highlighted in recent decades. The authorization of the national *No Child Left Behind Act* in 2002 mandated that each state department of education adhere to stricter accountability guidelines—including annual testing in reading, mathematics, and writing of each student in grade three through eight—in an effort to document and improve student achievement outcomes. The term “high stakes testing” has become familiar language in the national and local media. The emphasis on achievement on crucial tests has pervaded school and classroom environments.

Test anxiety represents an unintended consequence of increased emphasis on test performance. Smyth (2008) asserted that due to test anxiety and other related negative side effects of high-stakes testing, subgroups of the population—in particular students from lower socioeconomic status backgrounds, minorities, English language learners, and special education students—are especially negatively affected.

The cost of high-stakes testing nationally was estimated between $20 and $50 billion annually, which is between 5.5 and 14 percent of every dollar spent for public schools (Center for Educational Policy, 2003). The state of Florida reports spending over $50 million annually on the development, norming, administration, scoring, and reporting of the Florida Comprehensive Academic Test (FCAT), which breaks down to approximately $19 per pupil to *take* the test in 2008 (Florida Department of Education [FDOE], 2008). Despite these costs, test anxiety may be

undermining the meaning of test results for some students. Haladyna & Downing (2004) noted that test anxiety introduces concerning amounts of construct-irrelevant variance in high-stakes tests, thus representing a serious threat to the validity of test results.

Prevalence

Within the context of this increased national emphasis on high-stakes testing, many researchers have suggested that test anxiety appears to have increased over time (Cizek & Berg, 2006; Wren & Benson, 2004). Test anxiety is a widespread concern, with increasing numbers of students suffering from its detrimental effects (McDonald, 2001). Test anxiety has been examined in countries from numerous regions of the world, suggesting that this problem transcends national and cultural boundaries (Bodas & Ollendick, 2005; McDonald, 2001; Putwain, 2007). Previous estimates of students experiencing test anxiety range from 10% (Kondas, 1967) to 30% (e.g., Nottelmann & Hill, 1977) for school-age children. Early research estimated that two or three students per classroom suffered from severe levels of test anxiety (Hill & Wigfield, 1984). Somewhat more recently, prevalence estimates between 34% and 41% have been reported for children between the ages of 8 and 12 in the third through sixth grades (Beidel, 1991; Turner, et al., 1993). In light of increased frequency of testing in schools, these figures are likely to be higher in the last decade (Cizek & Burg, 2006; Zeidner, 1998; Whitaker Sena, Lowe, & Lee, 2007). This purported increase in recent decades has also been explained as resulting from increased achievement pressures from parents and teachers, higher expectations for mastering more complex material at an earlier age, and increased pressure to achieve on national or state-wide standardized testing (Locker & Cropley, 2004; Turner et al., 1993).

Associated Outcomes

Test anxiety has been linked with detrimental outcomes in regard to academic, social, and emotional functioning. Birenbaum and Nasser (1994) considered test anxiety to be one of the

most disruptive problems in schools. Academically, test anxiety can have a negative cognitive impact at all phases of learning new information, studying and preparation, and taking tests (Cassady, 2004). Test-anxious children are at elevated risk for receiving worse grades, being retained, and having lower test scores than children without test anxiety (Warren, Ollendick, & King, 1996). However, a distinction exists between “facilitating” and “debilitating” forms of anxiety, such that test anxiety does not impair functioning for all individuals. Modest amounts of anxiety about a test can be associated with elevated performance for some students (Alpert & Haber, 1960). Although small or moderate levels of anxiety surrounding one’s performance on a test often represent a normal part of development**,** excessive levels of test anxiety can have detrimental effects on students’ test-taking ability.

In addition to its immediate academic effects, test anxiety can relate to lower motivation (Hancock, 2006), and lower levels of educational and occupational attainment (e.g., Zeidner, 1998). Given that some severely test-anxious students’ behavioral response is avoidance of the anxiety-provoking experience of test-taking (e.g., McDonald, 2001), test anxiety appears to place students at elevated risk for dropping out of school (Scholze & Sapp, 2006). Scholze and Sapp suggested that dropout rates for students from culturally and linguistically diverse backgrounds in particular may be affected by test anxiety (2006).

Test anxiety has been associated with lower self-esteem, dependency, and passivity (Campbell, 1986). The experience of severe test anxiety is thought to contribute to school refusal in some students (Ollendick & Meyer, 1984). At the social and emotional level, anxiety beyond the normal range can place students at risk for problems such as poor social relationships, chronic mental health problems, substance abuse, and suicidal tendencies (Merrell, 1999). Anxious children may avoid peer interaction and interact less competently with peers (Barrett &

Heubeck, 2000). Cross-sectional studies have confirmed a relationship between elevated anxiety and impairments in social functioning and peer relationships (Langley, Bergman, McCracken, & Piacentini, 2004). Indeed, reducing students' anxiety is associated with improved social functioning in addition to improvements in academic performance (Wood, 2006). This finding supports the idea of general anxiety playing a role in the academic impairment associated with test anxiety; however, it does not account for the ways in which academic variables may simultaneously operate in test anxiety. Test anxiety represents a significant problem with aversive effects on students' academic and emotional experiences.

Demographics and Group Differences in Risk for Test Anxiety

Although the processes surrounding test anxiety are undoubtedly complicated and multidimensional, a body of literature indicates support for certain non-causal demographic factors that may be useful in predicting elevated risk for test anxiety.

Gender

From elementary school through medical school and across cultures, females typically report higher levels of test anxiety than males (Hembree, 1988; Putwain, 2007; Stober, 2004; Zeidner, 1998). Based on a meta-analytic review of 143 studies examining gender differences, Hembree (1988) found that females endorsed significantly higher levels of test anxiety than males from grades 1 through 12 and in college. More recently, Wren and Benson (2004) found that from a sample of 261 children grades 3 through 6, girls' test anxiety scores were significantly greater than boys'. On surveys of general fears, girls reported more evaluation and test-related anxiety than boys (e.g., King et al., 1989). Findings about higher reported test anxiety in females have been replicated using various specific test anxiety measures (Di Maria & Di Nuovo, 1990; Zeidner & Safir, 1989; Whitaker Sena, Lowe, & Lee, 2007). Furthermore, this pattern of findings appears to extend beyond samples of elementary and secondary students.

Female college students have reported higher mean test anxiety scores than males, particularly with regard to the emotionality component of test anxiety (Corcoran, Macdougall, & Scarborough, 1985; McDonald, 2001). Despite these apparent gender differences, when different cut-off scores are used to identify significant degrees of test anxiety in boys versus girls, the prevalence becomes more similar across sexes (McDonald, 2001; Turner et al., 1993).

Multiple theories have attempted to explain the observed gender difference in test anxiety. One prominent explanation noted in the literature is that differences in socialization patterns play a role (Zeidner, 1998). This theory posits that from an early age women are socialized to express emotions whereas men learn to minimize emotional experiences (e.g., Maccoby & Jacklin, 1974, as cited in Lowe & Lee, 2008). Self-report data on general and specific types of anxiety may in part reflect differences in reporting and willingness to admit anxiety (e.g.,Whitaker Sena, Lowe, & Lee, 2007). Other explanations of gender differences in test anxiety relate to coping styles (e.g., Zeidner, 1998) and biological and hormonal factors (Altemus, 2006). The pervasiveness of higher anxiety in females across cultures and subtypes of anxiety supports the role of biological processes (Altemus, 2006).

Race

In addition to gender differences, some evidence has suggested that demographic variables such as race and socioeconomic status may be relevant to the experience of test anxiety. For example, results from a meta-analysis reflected higher levels of test anxiety among African American and Hispanic students during elementary school, with the effects of race no longer evident in samples of high-school students (Hembree, 1988). However, other authors have concluded that test anxiety is roughly equivalent in Caucasian and African American children in grades 3 through 6 (Beidel et al., 1994). Asian-American students may also experience higher

levels of test anxiety; a small sample of Asian-American middle school students reported significantly higher levels of test anxiety than their European-American peers (Pang, 1991). More recently, it was found that African American, Latino, and Native American students all had significantly higher anxiety related to test-taking compared to their White counterparts (Osborne, 2001). When achievement was covaried with anxiety and race, African Americans and Latinos continued to have higher levels of anxiety than Whites; however, Native Americans no longer showed significantly higher levels of test anxiety (Osborne, 2001). Thus, although race and ethnicity have some relationship with test anxiety, other factors such as achievement may explain some of the variance in the experience of test anxiety.

Socioeconomic Status

Socioeconomic characteristics have also been linked with test anxiety, with students from lower socioeconomic backgrounds experiencing greater levels of test anxiety than students from middle- and upper-class backgrounds across several cultures (Guida & Ludlow, 1989; Zeidner & Safir, 1989). Several explanations have been posed to account for this phenomenon, including differences in parenting and home variables as well as school and teacher variables (e.g., Cizek & Burg, 2006; Zeidner, 1998). An explanation that has received some empirical support is the phenomenon of stereotype threat; which has been found to play a role in the existence of higher test anxiety in lower-income as well as minority students. In a recent study of stereotype threat and test anxiety in college students, Harrison and colleagues (2006) found that students from lower-income backgrounds exhibited higher levels of test anxiety and decreased academic performance specifically when they were informed prior to an academic test that the information obtained would be used for diagnostic purposes to understand why lower income students have lower academic abilities. Stereotype threat has also been studied in racial minority groups and in

women. For example, African American students performed worse than European American students when informed that a test would be used to measure their academic abilities but performed generally the same when *not* informed of the purpose of the assessment (Steel & Aronson, 1995; Osborne, 2001). Thus, the role of stereotype threat may represent a possible explanation for socioeconomic, racial, and gender variations occurring in test anxiety and performance.

Age

Some developmental differences in the experience of test anxiety have also been suggested in the literature (Hembree, 1988; Whitaker Sena, Lowe, & Lee, 2007). However, the pattern is somewhat inconsistent and must be interpreted with caution due to the cross-sectional designs often used in the research (Zeidner, 1998). Hembree's (1988) meta-analysis revealed that test anxiety increased from grades 1 through 5 and then stabilized throughout middle school and high school. Other findings revealed an increase in test anxiety in middle school that stabilized in high school (Wigfield & Eccles, 1989). More recently, Whitaker Sena and colleagues (2007) found age-related differences within specific symptoms of test anxiety. Specifically, they found that older students experienced higher levels of cognitive symptoms and less physiological arousal, and hypothesized that perhaps physiological symptoms are more common among children and cognitive symptoms are more apparent in adolescents and adults.

Although demographic variables are of interest in understanding aspects of the processes underlying the experience of test anxiety, other variables (e.g., academic achievement) represent more prominent correlates (e.g., Osborne, 2001). Several theorists and researchers have attempted to explain this relationship between test anxiety and observed impairments in test-taking.

Test Anxiety Literature: Two Major Frameworks

Several decades of test anxiety research reveal a division in the general focus of studies identified in the literature. These studies focus on either understanding test anxiety as primarily an academic problem *or* test anxiety as primarily an emotional problem. In educational research, test anxiety has been approached as a school-specific problem, with a focus on detrimental academic correlates (e.g., Cassady & Johnson, 2002). Drawing primarily from the clinical literature, a relationship has been identified among test anxiety and other anxiety disorders (e.g., Beidel & Turner, 1988; Bodas & Ollendick, 2005). Thus, this line of research focuses on test anxiety largely as an individual emotional problem. Despite this somewhat dichotomous approach to understanding test anxiety, more theoretical and empirical work has been done examining the relationship of test anxiety with impaired academic functioning. Few empirical studies have examined academic and emotional variables together and their relationship to test anxiety.

The next section of this review will examine both academic and emotional conceptualizations of test anxiety in the literature. First, three models of test anxiety and the relationship to academic functioning will be introduced. Although these three models explain the effects of test anxiety on academic performance, it is noted that emotional variables are likely to play a role in the processes suggested in each of the models discussed below. Further attention will be given to the third, information-processing model, as it allows a broader conceptualization of test-anxiety (e.g., Naveh-Benjamin, 1991) and is more compatible with the inclusion of emotional processes operating in test anxiety. Including both academic and emotional variables in existing models of test anxiety is of central interest in this study, and these will be subsequently discussed in the text.

The Academic Approach: Models Linking Test Anxiety to Academic Performance

Three major models have been proposed to explain the association between test anxiety and impairments in test-taking and academic achievement: interference model, deficits model, information processing model. Each of these models has received some support in the literature and provides insights regarding the processes by which test anxiety may develop and be maintained (Bodas & Ollendick, 2005).

Interference model

Cognitive interference refers to interfering thoughts that impede the direction of one's total attention during learning or test-taking situations (Sarason & Stoops, 1978). In the case of test anxiety, cognitive interference occurs in the form of thoughts and fears about one's performance and consequences of poor test outcomes (e.g., Sarason, 1984). Thus, the negative influence of test anxiety on student academic performance has often been explained as resulting from the diversion of cognitive resources (e.g., distraction) from the academic task at hand that interfere with the processes of information encoding and retrieval (Morris, Davis, & Hutchings, 1981; Wine, 1971). Task-irrelevant thoughts (e.g., worries about performance) during a test-taking situation hinder one's ability to learn and store new information as well as their ability to demonstrate previously learned information during the testing situation. Data indicate that students who report "freezing up" during a test experience cognitive interference during all stages of the learning-testing cycle, resulting in difficulties retrieving previously-learned information during the test in addition to problems in the initial processing and storage of information prior to a test (Naveh-Benjamin, 1991). Within the framework of this "interference model" of test anxiety, the cognitive component of test anxiety specifically (e.g., worry) has received much attention as being associated with detrimental academic outcomes, while the emotionality component of test anxiety does not appear to have the same link to negative

academic outcomes (e.g., Cassady & Johnson, 2002; Hembree, 1988; Kim & Rocklin, 1991; Morris & Liebert, 1970; Wine, 1971). The association between worry and reduced academic achievement has been observed in both adolescents (Williams, 1991) and college students (Bandalos, Yates, & Thorndike-Christ, 1995). For example, a classic study by Sarason and Palola (1960) revealed that under high-pressure testing conditions, students experiencing test anxiety perform worse on a simple memory task. Replications of this work provided additional support that highly test-anxious college students performed worse on a memory task and experienced greater cognitive interference than students reporting low levels of test anxiety (Sarason, 1984). Overall, this line of research supported the relationship among test anxiety, worry, cognitive interference, and reduced academic outcomes (Cassady & Johnson, 2002). However, these findings do not inform the extent to which previous academic experiences or existing skills deficits may play a role in the development of test anxiety, nor do they provide information about trait-like individual characteristics that may in fact predict cognitive interferences (e.g., the extent to which students may exhibit worry and emotionality across situations). Furthermore, this model does not explain the experience of test anxiety in students for whom academic performance is not significantly impaired; that is, students who exhibit test anxiety but continue to perform successfully on tests.

Deficits model

Theoretical weaknesses of the interference model of test anxiety were highlighted when certain intervention strategies successfully reduced symptoms of test anxiety but did not result in the expected academic improvements in many students (Tryon, 1980; Tobias, 1985). Thus, it was proposed that the connection between test-anxiety and academic struggles may in fact reflect lower abilities and deficient skills related to studying and test-taking (Culler & Hollahan,1980; Tobias, 1985). A skills-deficit model has received empirical support as evidenced by students'

responsiveness to interventions designed to enhance study skills and test-taking strategies (Beidel, Turner, & Taylor-Ferreira, 1999; Ergene, 2003; Naveh-Benjamin, 1991; Zeidner, 1998). Specifically, the "Testbusters" program includes 11 sessions to teach study skills and test-taking strategies to children in grades 4 through 7 (Beidel et al., 1999). This program has been evaluated with children experiencing both academic difficulties and test anxiety, demonstrating promise as an intervention for both improving academics and decreasing test anxiety (Beidel et al., 1999). Furthermore, this line of research demonstrates the existence of a group of students whose test anxiety may be likely to be most strongly predicted by academic types of variables. However, these studies did not include variables reflecting general anxiety or trait anxiety in the sample of children with academic deficits and test anxiety, thus limiting the extent to which conclusions can be drawn regarding the relationship among emotional variables and academic variables in the process of developing test anxiety. In addition, research on the effectiveness of academic-focused interventions (e.g., "Testbusters") primarily focuses on a sample of students identified based on meeting criteria related to having both academic deficits and test anxiety. Tobias (1985) argued that the deficits model of test anxiety does not account for highly test-anxious students with strong academic and study skills. Finally, although general self-esteem within various domains was considered, the role of student beliefs and perceptions specific to their academic skills was not taken into account in the work of Beidel and colleagues.

Information processing or "hybridized" model

In addition to the interference and deficit models relating test anxiety to academic impairments, an information processing model has received support in the literature (Benjamin, McKeachie, Lin, & Holinger, 1981; Naveh-Benjamin, 1991). Essentially a combination of the other two theories, this model posits that test-anxious students experience detrimental cognitive interference at all stages of the learning and test-taking process as well as academic or study skill

deficits (Bodas & Ollendick, 2005). Highlighting theoretical weaknesses of the deficits-model linking test anxiety to poor academic performance, Tobias (1985) pointed out that if test anxiety stems from a student's knowledge about their lack of mastery of test-relevant material, anxiety-reduction intervention strategies without academic-improvement components (i.e., exclusively aimed at reducing anxiety) should not result in lowered test anxiety. However, if cognitive interference represents the central element impairing academic performance, interventions targeting worry should result in improved in academic performance (Tryon, 1980). Thus, poor performance in test-anxious students is attributed to cognitive deficits relating to organizing and encoding information (e.g., learning and studying deficits), as well as difficulties in retrieving academic information during test-taking scenarios due to cognitive interference (Naveh-Benjamin, 1991).

Applications of the information-processing model

Based on work with university students in Germany and consideration of the test anxiety literature over several decades, Naveh-Benjamin (1991) posited that two types of highly test-anxious students exist within the framework of the information-processing model. Specifically, in individuals with good study skills and no deficits in encoding and organizing information, reduced academic performance stemmed from problems in retrieval associated with interfering worries and doubts in their abilities; in other words, the classic "interference" model is thought to indeed apply for some students (Naveh-Benjamin, 1991; Sarason, 1984; Tobias, 1985). Interventions focused on reducing anxiety (e.g., desensitization in this study) in this type of student resulted in a reduction in test anxiety as well as improvement in academic functioning (Naveh-Benjamin, 1991). However, this work did not include any measurement of emotional characteristics of the student apart from test anxiety and it is unknown whether these variables

may have explained the experienced interference. Furthermore, information about students' perceptions of their academic skills was not included in this work.

A second type of highly test-anxious student, according to Naveh-Benjamin (1991), is characterized by problems with encoding and organizing information; thus, for these individuals test anxiety *begins* with a more academic type of problem. When these individuals are trained in study skills, thus facilitating successful encoding of information during the learning process, test anxiety is reduced and academic performance improves (Naveh-Benjamin, 1991). Again, the measurement here reflects actual demonstrated academic skills rather than student perceptions or beliefs about their academic skills.

Limitations of the Existing Models

Although offering viable explanations of test anxiety and its relationship with reduced academic performance, this area of the literature did not take into account emotional characteristics that may explain the interference that can impair academic functioning. Furthermore, these three models do not attempt to explain the processes contributing to the non-academic, emotional sequelae associated with test anxiety. In light of individual differences, it is considered unlikely that any one-dimensional theory would explain how test anxiety operates in all students. An information-processing or "hybrid" model, which posits that *both* academic deficits and cognitive interference explain the academic deficits associated with test anxiety, may represent the most plausible framework for understanding the academic side of test anxiety (e.g., Cassady & Johnson, 2002). The emotional side of test anxiety may be best understood by incorporating findings from the clinical literature examining the relationship of test anxiety with other anxiety disorders and general or trait-level anxiety (e.g., Zeidner, 1998).

The aforementioned models relating test anxiety to academic deficits, along with the literature on emotional and academic correlates of test anxiety, will inform the understanding of

mechanisms operating in the experience of test anxiety in adolescents. Corresponding to the information-processing (i.e., hybrid) model linking test anxiety to detrimental academic outcomes, both academic variables and emotional variables will be examined as they relate to test anxiety and may be applicable at various points in specified models. The following section will review in greater detail the specific academic and emotional variables of interest that may shape the development and continued experience of test anxiety.

Interference and Deficits: Understanding Test Anxiety with Academic and Emotional Variables

Correlates and Predictors of Test Anxiety

One of the challenges and limitations in test anxiety research is determining which variables tend to precede versus which variables tend to follow or co-occur with test anxiety. Researchers have described the relationship among test anxiety and its correlates as a "negative spiral" (e.g., McDonald, 2001) in which unsuccessful test-taking experiences result in increased anxiety followed by more negative test-taking experiences, making it difficult to disentangle where the cycle originated. It remains unclear how this "cycle" or developmental pattern of test anxiety may differ across individuals, and it is likely that some inter-individual variations in developmental sequences may occur. The following section will discuss specific variables that have a demonstrated relationship with test anxiety in previous research.

Emotional Variables

Emotional considerations are relevant to understanding how test anxiety relates to academic impairments (e.g., Swanson & Howell, 1996) as well as understanding test anxiety in individuals *without* reduced academic performance (Sarason, Sarason, & Bierce, 1990; Zeidner, 1998). Thus, emotional variables pertain to test anxiety in students with or without academic impairments. In students showing evidence of academic difficulties , emotional characteristics

may play a role in the experience of detrimental cognitive interference (e.g., worry and doubt resulting in diversion of cognitive resources) (Cassady & Johnson, 2002). In students experiencing primarily social-emotional effects of test anxiety without obvious academic impairment, emotional variables may reveal more pervasive forces operating to drive the experience of test anxiety (e.g., Beidel and Turner, 1988).

Differences in the breadth and pervasiveness of anxious symptoms experienced may facilitate the understanding of core predictors of test anxiety in individual students. Some—but not all—students experiencing test anxiety may have a clinically significant anxiety disorder (e.g., Biedel & Turner, 1988) or an intrinsically and persistently anxious personality (e.g., Biedel et al., 1994; King, Mietz, Tinney, & Ollendick, 1995). However, other individuals may experience anxiety solely related to test-taking and academic evaluation with minimal anxiety related to non-evaluative situations.

Emotional variables can inform the understanding of test anxiety. For example, when reflecting upon test results, students with high levels of test anxiety make more external attributions and report higher feelings of helplessness (Cassady, 2004). The following emotional characteristics and experiences have been linked to the experience of test anxiety.

Psychopathology. Although not specified as its own diagnosis by the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev. [*DSM-IV-TR*]; American Psychiatric Association, 2000) test anxiety is sometimes considered a highly specific type or feature associated with the broader group of anxiety disorders (McDonald, 2001). Beidel and Turner (1988) found that from a sample of test-anxious students between the ages of 8 and 12, approximately 60% met diagnostic criteria for an anxiety disorder. Indeed, many school-aged children who experience test anxiety may have symptoms of other disorders, the most common

of which are what was previously termed overanxious disorder (OAD) (now referred to as Generalized Anxiety Disorder; GAD) or social phobia (SP) (Beidel, 1991; King, et al., 1995). Compared to the non-test-anxious peers, adolescents with higher levels of test anxiety also reported greater amounts of anxiety on self-report instruments of general anxiety such as the Revised Children's Manifest Anxiety Scale (RCMAS; C.R. Reynolds & Richmond, 1978) and on the trait subscale of the State-Trait Anxiety Inventory for Children (STAIC; Spielberger, 1973) (King et al., 1995). In addition, high-test-anxious adolescents reported higher levels of depression on the Children's Depression Inventory (CDI; Kovacs, 1983) (King et al., 1995). King and colleagues concluded that highly test-anxious students often experience a "global state of emotional distress… or 'negative affectivity'," (p. 52).

Indeed, children with diagnosable anxiety disorders such as GAD and SP are more likely to experience worries during evaluative situations (Beidel, 1991). Children who exhibit impairing levels of general anxiety may be especially sensitive to pressures in the environment such as those sometimes propagated in evaluative and testing situations (e.g., Zeidner, 1998). A significant limitation here is that much of the literature examining the overlap between test anxiety and other anxiety disorders fails to account for academic variables that may operate in the development of test anxiety.

Trait anxiety. Spielberger (1966) referred to the notion of some students having a higher "baseline" anxiety in his distinction between trait-level anxiety—that is, anxiety that remains somewhat stable similar to a personality trait—and anxiety that exists as a more transitory experience in response to a threatening situation, or *state* anxiety. Test anxiety is often conceptualized as a situation-specific personality trait, or a disposition to react with excessive anxiety in evaluative situations (Sarason, 1984; Spielberger, 1975; Stober, 2004). Thus, children

with a general inclination to exhibit anxious reactions to stressful stimuli are naturally more inclined to have an anxious reaction in test-taking situations. In elementary school children, test-anxious students had significantly higher levels of trait anxiety than those without test anxiety (Beidel, et al., 1994). Interestingly, some data has linked slightly elevated trait anxiety with higher performance outcomes in adults, while elevated test anxiety alone resulted in impaired performance (Fletcher, Lovatt, & Baldry, 1997). These authors interpreted this data as indicating that modest increases in trait anxiety can facilitate higher performance across areas of functioning (Fletcher et al., 1997). A limitation of these studies is the failure to consider variables such as initial skills and abilities (e.g., academic ability and experiences) which may reveal a different pattern of experiences contributing to test anxiety.

In additional studies of persistent anxious qualities, highly test anxious students score significantly higher on the Psychasthenia scale on the Minnesota Multiphasic Personality Inventory-Version 2 (MMPI-2) than do non-test-anxious students (Lufi et al., 2004). According to Graham (1990) individuals who score high on this scale, “tend to be very anxious, tense, and agitated. They worry a great deal, even over very small problems, and they are fearful and apprehensive. High strung and jumpy, they report difficulties in concentrating and often receive anxiety disorder diagnoses,” (p. 74). Thus, researchers have concluded that a trait-like component of anxiety seems to exist within test anxiety (Lufi et al., 2004). Once again, however, studies that acknowledge the emotional variables operating in the experience of test anxiety appear to omit the consideration of academic abilities and experiences.

Although a general inclination towards anxiety may explain test anxiety for some individuals, it does not account for test anxiety in individuals *without* high levels of trait anxiety

or specific forms of anxiety disorders. Other emotional characteristics merit consideration as individual differences that may reveal valuable insights about the experience of test anxiety.

Perfectionism. Perfectionism can serve an adaptive function that motivates students to excel academically or a maladaptive function that is associated with test anxiety and fear of not meeting standards (Blatt, 1995). For the purposes of this discussion, *maladaptive* perfectionism will be the focus, as it is more closely linked with test anxiety. In general, perfectionism is characterized by excessively high standards for one's own performance (Stober & Joorman, 2001). In addition, maladaptive perfectionism includes overly critical evaluations of one's own actions, worries about making mistakes, and doubt in actions taken (Frost, Marten, Lahart, & Rosenblate, 1990). This conceptualization of perfectionism was found to have three major dimensions, including worry about mistakes and doubt in one's actions, parental expectations and criticism, and elevated personal standards (Stober, 1998). Not surprisingly, individuals higher in perfectionism also worry significantly more, which is thought to explain the relationship between perfectionism and test anxiety (Stober & Joorman, 2001). When worry is controlled for, the relationships of anxiety to perfectionism and to procrastination approach zero (Stober & Joorman, 2001). An additional conceptualization of perfectionism distinguishes between self-oriented perfectionism, which relates to one's expectations for self-perfection versus socially-prescribed perfectionism, which entails the belief that others require or expect perfection (e.g., Hewitt & Flett, 1991). Although in adults anxiety relates more strongly to socially-prescribed perfectionism, anxiety in children relates to both self-oriented and socially-prescribed forms of perfectionism, suggesting a more complex interplay among social expectations and a child's own high standards for performance (Hewitt, Caelian, Flett, Sherry,

Collins, Flynn, 2002). Indeed, parental perfectionism and school-wide pressures may play a role in shaping children's beliefs about their own needs for achievement.

Academic Variables

With regard to the deficit component of the information-processing model of test anxiety, academic variables are most relevant. Several factors relating to a students' academic performance play a role in the experience of test anxiety.

Achievement. Although some forms of test anxiety may be experienced by students of all achievement and intellectual levels, academic skills appear to play a role in test anxiety for many students. Specifically, students with higher academic skills tend to experience less test anxiety than students with lower abilities (Hembree, 1988). Likewise, test anxious students earn lower grades than their less anxious peers of comparable ability (King, Ollendick, & Gullone, 1992).

Various indicators of student achievement have been utilized in the test anxiety literature. In high school and college students, a negative relationship between test anxiety and grade point average (GPA) has been identified such that higher-achieving students experience lower levels of test anxiety (Hembree, 1988; Naveh-Benjamin, 1991). However, GPA does not appear to represent a "pure" measure of academic skills. Pintrich and De Groot (1990) found that in a sample of seventh-grade students, test anxiety negatively predicted to overall grades and performance on important tests but not performance on measures of daily performance or written essays that are also reflected in GPA. In a sample of 4,000 undergraduate and 1,414 graduate students, a small inverse relationship was identified between test anxiety and cumulative GPA (Chapell et al., 2005).

In addition to grades in school, studies have examined the connection between test anxiety and performance on high-stakes tests. Scholastic Aptitude Test (SAT) scores have been found to negatively correlate with test anxiety in both males and females (Cassady & Johnson, 2002;

Spielberger, 1980). Additional high stakes tests have been examined as they are affected by test anxiety. Drawing from a large sample of 1,908 adolescents in Australia, Matters and Burnett (2003) found that test anxiety predicted students' tendency to omit or not respond to test items on a high stakes test, therefore resulting in lower scores.

Grades in school and high-stakes test performance represent frequently used indicators of academic performance examined in conjunction with test anxiety. However, no studies have differentiated students' actual performance on daily academic tasks (e.g., GPA), standardized test performance (e.g., SAT or other important test), and individual beliefs and perceptions of academic skills as they relate to test anxiety. Student perceptions of their academic skills may be a particularly relevant consideration in understanding how academic skills relate to a cognitive and emotional experience such as test anxiety (e.g., McDonald, 2001). Although no known studies examined students' perceptions of their own skills specifically, previous researchers have identified student perceptions of test difficulty as playing a role in test anxiety and academic performance (Hong, 1999).

Although it is unclear whether deficient academic skills precede the experience of test anxiety (e.g., Paulman & Kennelly, 1984) or if test anxiety actually results in deficient academic performance (e.g., Eynsenck, 1985; Sarason, 1980), a negative relationship between overall academic skills and test anxiety has been consistently identified in the literature (e.g., Cizek & Burg, 2006; Hembree, 1988; Zeidner, 1998).

Intellectual ability. A negative relationship between general intelligence (*g*) and test anxiety is supported in the literature. In a meta-analytic review of 135 studies, Ackerman and Heggestad (1997) found a significant negative correlation between *g* and test anxiety (r = -.33). Although lower-ability students may indeed experience higher levels of test anxiety in general,

the picture becomes more complicated when additional factors are considered. For example, students of above-average intellectual ability can experience test anxiety as well (Zeidner & Schleyer, 1999; Preckel, Zeidner, Goetz, & Schleyer, 2008). A considerable limitation of the current literature is that studies of academic and intellectual variables tend to omit the consideration of emotional variables such as trait anxiety.

A study of self-concept and test anxiety in gifted adolescents (ages 12 to 15) demonstrated that IQ alone does not predict test anxiety; rather, achievement and academic experiences may play a more important role (Van Boxtel & Monks, 1992). Specifically, "underachieving" gifted students who still performed academically in the average to above-average range but below the expected level based on superior IQ scores often exhibited poorer self-concepts and higher levels of test anxiety (Van Boxtel & Monks, 1992). Thus, neither intellectual ability nor academic performance may predict test anxiety, but the perception of a discrepancy between expected and actual achievement. Studies linking test anxiety to learning disabilities (LD) support this notion (Swanson & Howell, 1996; Whitaker Sena, Lowe, & Lee, 2007).

In addition to general intellectual abilities, a relationship between test anxiety and specific areas of cognitive ability may exist. For example, from a sample of college students identified with LD, those experiencing test anxiety had, on average, significantly lower Verbal IQ scores than their non-test-anxious LD peers (Lufi, Okasha, & Cohen, 2004). Total IQ scores were not significantly different for test-anxious LD and non-test-anxious LD individuals. These authors posited that this significant relationship between test anxiety and reduced Verbal IQ could be explained by (a) the reduced academic performance associated with test anxiety or (b) the results of the emotional difficulties associated with test anxiety interfering specifically with verbal abilities (Lufi et al., 2004). However, as this particular study did not consider academic

performance apart from the LD diagnosis, the extent to which conclusions about the relationship between specific areas of cognitive ability and test anxiety can be drawn is limited. Intellectual ability does not uniquely explain test anxiety for students; therefore, academic performance is thought to represent a more useful variable as it relates to test anxiety. Overall, it appears that academically-related variables play a central role in many students' experience of test anxiety.

Educational experiences and classification. Related to ability level, a student's past educational experiences and identification for Exceptional Student Education (ESE) services may relate to the experience of test anxiety. In college students identified with learning disabilities (LD), test anxiety was reported as of primary concern, followed by concentration, frustration, and remembering information. The role of learning difficulties and ESE status has also been examined in children and adolescents, although not as extensively as in college populations. Children with learning disabilities and behavior disorders experience higher levels of test anxiety than their typically-developing peers (e.g., Bryan, Sonnefeld, & Grabowski, 1983; Whitaker Sena, Lowe, & Lee, 2007). This higher level of test anxiety in high school students identified for ESE services has been explained by two major factors: more cognitive interference (e.g., task-irrelevant thoughts) and lower study skills (Swanson & Howell, 1996). In addition, this study also supported a negative relationship between scores on standardized tests such as SAT and test anxiety in students with learning disabilities or behavior disorders (Swanson & Howell, 1996). Indeed, students with high levels of test anxiety were consistently outperformed by those with lower levels of test anxiety (Cassady & Johnson, 2002).

A respectable body of literature from educational research links test anxiety with academic deficits and underachievement. Indeed, students with a pattern of unsuccessful test-taking experiences may experience test anxiety in evaluative situations. However, as highlighted in the

emotional variables discussed above, this may not be the case for all individuals. Test anxiety has also been approached as a more psychosocial problem, with a body of studies stemming from a more clinical standpoint. Very little work has examined academic and emotional variables together as they relate to test anxiety, and this study is designed to address this limitation.

Integrating Academic and Emotional Contributors to Test Anxiety

Given the wide body of empirical evidence regarding the symptom domains in which test anxiety symptoms can be manifested (e.g., academic, cognitive, emotional, behavioral), along with numerous studies of academic and emotional factors related to test anxiety, it naturally follows that individual differences would exist with regard to how symptoms are experienced across each of these dimensions (Stober, 2004). Furthermore, it is likely that differences in each of these domains also shape the development of test anxiety. McDonald (2001) noted that, "Although all evaluative situations will be accompanied by some emotional reactions, it is the individual's past experiences and beliefs, that have been shaped by a multitude of factors, that will mould their unique reactions to a test situation," (p. 92). Based on two major theoretical stances in the test anxiety literature—that is, test anxiety as an academic problem and test anxiety as an emotional problem—processes related to both academic and emotional variables likely play a central role in the experience of test anxiety in individuals. Furthermore, students' perceptions and beliefs about their academic skills may represent an important link between academic and emotional considerations. Understanding which academic and emotional variables may predict test anxiety in adolescents is a central goal of this study. By adapting the aforementioned information-processing or hybrid model and incorporating emotional variables, student perceptions of academic skills, and various indicators of academic performance, a more thorough understanding of the experience of test anxiety can be obtained. The following section

will review how the academic and emotional variables discussed here can operate in light of the predominant existing conceptualizations.

The "Academic Approach" to Test Anxiety

Much of the literature focuses on the academic variables operating in the experience of test anxiety (e.g., Goetz, Preckel, Pekrum, & Hall, 2007). As discussed previously, two traditional models explain the reduced academic performance associated with test anxiety: the deficit model, indicating that deficits in learning information precede poor performance and test anxiety, and the interference model, which explains reduced academic functioning as a result of cognitive distraction associated with worry and doubt during testing and preparing for the test (Cassady & Johnson, 2002; Cassady, 2004; Sarason, Sarason, & Pierce, 1996). The information-processing approach essentially synthesizes these two explanations (Naveh-Benjamin, 1991). Much theoretical and empirical support for the information-processing model exists (e.g., Bodas & Ollendick, 2005; Naveh-Benjamin, 1991; Zeidner, 1999). The current literature supports that some students' test anxiety relates to a history of academic struggles or skills deficits specific to studying and test-taking. Studies linking test anxiety to a history of learning difficulties supports the role of academic variables in the processes surrounding test anxiety (Fisher et al., 1996; Swanson & Howell, 1996). In addition, studies linking test anxiety to deficient study skills (e.g., Paulman & Kennelly, 1984) and demonstrating a decrease in test anxiety following an academically-oriented intervention (Beidel et al., 1999) both support the deficit-relevant academic variables operating in the experience of test anxiety. Unsuccessful test-taking experiences and self-perceptions of poor academic skills may represent additional predictors of test anxiety in adolescent students. Supporting the interference component of the information-processing model linking test anxiety to impaired academic functioning, test-anxious students

perform worse in high-pressure testing situations despite having sufficiently learned information previously (e.g., Cassady & Johnson, 2002; Sarason et al., 1996).

No known studies have integrated the information-processing model with a more emotional or clinical approach to test anxiety to examine how both emotional and academic mechanisms operate. Furthermore, the role of student perceptions of academic skills represents a key variable that may be particularly relevant to the integration of academic and emotional variables (McDonald, 2001). The extent to which academic and emotional variables may explain test anxiety in adolescents at various grade levels merits further investigation.

The "Emotional Approach" to Test Anxiety

The literature supports that emotional characteristics operate in the experience of test anxiety. Support for the existence of test-anxious students in whom emotional variables play a central role stems from literature regarding the relationship of test anxiety with anxiety disorders, perfectionism, and trait anxiety. Many students with test anxiety meet diagnostic criteria for an additional anxiety disorder (e.g., Beidel & Turner, 1988; Sarason, 1975). In addition, students with high levels of perfectionism worry more and are more test anxious (Stober & Joorman, 2001), and test-anxious students have significantly higher trait anxiety than do non-test-anxious students (Beidel et al., 1994). Einat (2000) posited that severe test anxiety is caused primarily by "high personal standards of persons who expect maximum success and are afraid that they cannot meet their own standards," (p. 177; as cited in Lufi et al., 2004). Indeed, it logically follows that students who exhibit higher levels of anxiety as a trait-like disposition are also more likely to experience test anxiety (e.g., Sarason, 1984). However, some otherwise non-anxious students exhibit significant test anxiety specific to academic or test-taking situations, and the literature including emotional mechanisms driving test anxiety largely does not account for

academic variables. The present study integrates the academic focus of the information-processing model with emotional characteristics to better explain the operation of test anxiety.

Existing Integrations of Academic and Emotional Factors and Test Anxiety

Some recent work has addressed the dearth of research on students' emotions during the learning and testing processes that occur in schools. Drawing from a sample of sixth-grade students in Germany, consistent relationships were identified between students' ability levels and the specific emotional states experienced during testing. Students of higher abilities experienced more positive emotions such as enjoyment, and students of lower abilities experienced more anger and anxiety (Goetz et al., 2007). Although studies of this sort explain the emotional outcome of test anxiety, once again they rely on an academically-oriented variable to explain the emotional experiences, without fully considering the role of emotional tendencies that also can facilitate an understanding of how test anxiety operates.

Another area in which the literature has integrated emotional and academic factors in test anxiety is in considering students' ways of coping with different components of test anxiety (Stober, 2004). For example, university students appear to cope differently with worry (i.e., the cognitive component of test anxiety) than with emotional symptoms of test anxiety (Stober, 2004). Once again, however, this type of research does not provide information about any underlying factors that may explain the components of test anxiety.

Hypotheses and Research Questions

Test anxiety represents a specific academic and mental health concern that is relevant to multiple domains of functioning in the lives of adolescents today. Despite its timeliness as a genuine problem plaguing students in schools, much of the literature on test anxiety is dated and lacks a comprehensive view of both the academic and emotional variables that may be operating.

By clarifying the predictors of test anxiety, intervention procedures can potentially be tailored to the most relevant variables for adolescent students.

Despite evidence that both emotional and academic factors may play a role in the experience of test anxiety, no known study examines the roles of both emotional and academic sources of test anxiety in youth**.** Furthermore, beliefs and perceptions of academic skills have not been examined as it relates to academic and emotional variables. Based on this review of the extant literature, it is hypothesized that both academic performance and general anxiety play distinct yet interrelated roles in the expression of test anxiety in adolescent students. The guiding research questions for this study include:

1. What is the relationship of general anxiety and academic indicators with test anxiety?
2. To what extent do general anxiety, academic indicators, and demographic variables predict test anxiety in adolescents?
3. Beyond the established academic and emotional predictors of test anxiety, does student perception of academic skills contribute significantly to test anxiety?
4. What is the relationship of general anxiety and academic indicators with test anxiety in males and female adolescents?
5. How do general anxiety and indicators of academic performance predict test anxiety in male and female adolescents?

CHAPTER 2
METHOD

Test anxiety represents a multifaceted experience that intersects the social-emotional and academic domains of functioning. Extending the existing hybrid model of test anxiety (Cassady & Johnson, 2002; Naveh-Benjamin, 1991) to include both emotional and academic variables should improve our understanding of the processes operating in test-anxious students. Previous studies have supported the role of both academic and emotional variables in the operation of test anxiety (e.g., Beidel & Turner, 1988; Cassady & Johnson, 2002). However, how these key variables may act together to affect test anxiety and each other had not been investigated. In addition, recent research examining the pervasiveness of test anxiety has been lacking (Cizek & Berg, 2006; McDonald, 2001). Furthermore, although both emotional and academic variables have been established as having a significant relationship to test anxiety, how these variables may operate in the experience of test anxiety for male and female adolescent students has not been addressed. The purpose of the present study was to examine the relationship among test anxiety, emotional variables, and academic variables in adolescent students. The guiding research questions for this study were:

1. What is the relationship of general anxiety and academic indicators with test anxiety?
2. To what extent do general anxiety, academic indicators, and demographic variables predict test anxiety in adolescents?
3. Beyond the established academic and emotional predictors of test anxiety, does student perception of academic skills contribute significantly to test anxiety?
4. What is the relationship of general anxiety and academic indicators with test anxiety in males and female adolescents?
5. How do general anxiety and indicators of academic performance predict test anxiety in male and female adolescents?

This chapter will describe the procedures followed for participant recruitment and selection, data collection procedures, and the instrumentation of relevant variables. In addition, descriptive information regarding sample characteristics on variables of interest will be provided.

Participants

Research Setting

Participants were recruited from P.K. Yonge Developmental Research School (PKY), a unit in UF's College of Education that was established in 1934 as a center of educational innovation for K-12 education. PKY's primary goal relates to the development, evaluation, and dissemination of exemplary education programs. It is a public school district that serves the state of Florida by conducting research on teaching and learning, often in collaboration with UF researchers. Instructional practices are investigated through formal studies, faculty directed action research, and graduate student research projects. The school's primary research goal is to enhance instruction in reading, mathematics, and science, in programs supported by state of the art educational technology.

Based on data from the No Child Left Behind School Public Accountability Reports (2007-2008), 1162 students attended P.K. Yonge during the 2007-2008 academic year. The student body was comprised of 49.7 percent females and 50.3 percent males, with a racial/ethnic distribution as follows: 52.9 percent White, 24.6 percent Black, 14.9 percent Hispanic, 2.5 percent Asian, 0.4 percent American Indian, and 4.6 percent Multiracial (Florida Department of Education [FLDOE], 2008). According to the 2008 data, 9.6 percent of the students were classified with a disability and 22.3 percent of the student body was considered economically disadvantaged.

Sample: Recruitment and Demographics

The total sample consisted of 104 students in grades seven through nine at PKY. Following approval from the University of Florida Institutional Review Board (IRB) and school administration, seventh- and eighth-grade students were recruited through required elective classes in Physical Education (P.E.) and Art. Ninth grade students were recruited through required English classes. Specific class selection was based primarily on teacher cooperation and willingness to allow student participation. Parents of students in grades seven through nine in participating classes were provided with basic information about the nature of the study and given the opportunity to provide consent for their child to participate in the study. Consent forms described the goals of the study, measures that were administered, and potential contributions of the study. Students with parental consent were eligible for participation in this study. Recruitment and data collection took place over several weeks in Spring 2008. No immediate incentives were provided to participants in this study.

Of the participating students, 53.8% were female (n=56). The sample was comprised of 38.5% seventh-grade students, 31.5% eighth-graders, and 29.8% ninth-graders. A comparison of the race of participants in the sample to the characteristics of the schoolwide population revealed similar percentages of participants in each category: White (52.9 % schoolwide, versus 61.2% in this sample), Black (24.6 % schoolwide, versus 23.3% in this sample), Hispanic (14.9% schoolwide, 12.6% in this sample); Asian (2.5 % schoolwide, 1.9% in this sample). Table 2-1 provides a more complete description of the total number and percentage of male and female participants for each grade level and race/ethnicity.

Design & Procedure

This study used a cross-sectional survey design to investigate demographic differences in test anxiety and the relationship of test anxiety with emotional and academic variables. Data was

obtained in two phases. In the first phase of data collection, students provided self-report data on rating scale measures. In the second phase of data collection, archival data was obtained from the school regarding participants' scores on the Florida Comprehensive Assessment Test (FCAT) and GPA.

Data Collection Procedures

Prior to data collection, a field test of compiled measures was administered to three adolescents to check for general comprehension and feasibility of length. These individuals reported that the questionnaires were an appropriate length and straightforward in meaning; therefore, feedback from initial trials suggested no need to adapt the questionnaires. Data was collected during the spring semester of 2008. Either before or after school, or during school hours with parent and teacher permission, students completed self-report measures consisting of scales measuring test anxiety (Test Anxiety Inventory; TAI), general anxiety (Multidimensional Anxiety Scale for Chidlren; MASC), and academic competence (Academic Competence Evaluation Scales; ACES). Students completed measures in small groups with the researcher. Group composition was based on class assignment and when consent forms were received. No more than six or seven same-grade students were included in each group. Students were taken to a separate room (e.g., school library) and each provided with a packet of the three measures included. The order in which the three measures were presented was counter-balanced with each possible order of measures equally represented among participants. Students were spaced apart to help ensure the privacy of their responses on rating scales. In addition, they were asked to not talk about their answers during the administration. Once each student provided assent to continue their participation in the study, directions were read aloud to the group. If an individual student had a question about the directions, the researcher was available to clarify procedures for marking their answers. If a student was unsure about how to answer a particular item, he or she

was encouraged to respond with what most described him or her. Students were reminded to not leave items blank. When the three measures were completed, students were instructed to place them in a blank, unidentifiable envelope and return the entire packet to the researcher. The majority of participants took approximately 25-30 minutes to complete all scales.

At the time of survey completion, each student's name was matched with an identification number. Upon entering information into the database, students' names and identifying information were removed, and data from each individual were associated only by the assigned identification number. Archival data regarding each participant's academic performance (2008 year-end GPA) and standardized testing performance (2008 FCAT scores) were also obtained from the school with student information matched using identification code numbers. Specifically, the school was provided with a list of participating students matched with identification numbers. School-based professionals then provided GPA and FCAT scores for each student using only identification numbers such that no names were entered in the database. Only a master list with identification numbers linked each student with collected data, and this information was destroyed once all data was received from the school and entered in the database.

Inclusion and Exclusion Criteria

Assenting students in the targeted grade levels and participating classes with parental consent were eligible to participate in this study. Data reflecting any obvious, invalid patterns of responses (e.g., answering each question the same or following an obvious pattern of answers) or missing data points were not utilized. However, this was not an issue given the small group setting in which measures were administered. If students left items blank on the rating-scale measures, for example, clarification was provided and students were asked to provide their best approximation. Given these procedures, missing data was not an issue.

Instrumentation of Relevant Variables

Due to the nature of the research questions, the following variables were of interest in understanding how test anxiety operates in adolescents. This section will provide an overview of each of the variables of interest and describe instrumentation in the present study.

Test Anxiety

The Test Anxiety Inventory (TAI) is a norm-referenced, self-report measure of test anxiety developed by Spielberger and colleagues (1980). It represents perhaps the most widely used and extensively evaluated measure of test anxiety in the literature and the only norm-referenced measure that has been used specific to test anxiety (e.g., Cizek & Berg, 2006; Zeidner, 1999). The TAI provides subscales for both worry and emotionality components of test anxiety, as well as a total test anxiety scale (Spielberger, 1980). Confirmatory factor analyses have established the two-factor structure (e.g., emotionality and worry) of the TAI for both males and females (Everson, Millsap, & Rodriguez, 1991). In this study, data analyses will use the total test anxiety score provided by the TAI. This instrument has been described as a “trait measure scale” that reflects an individual’s proneness to experience anxiety in situations specific to test-taking (Anastasi, 1988; Sapp, 1999).

Based on responses on twenty questions using a Likert-type format (e.g., almost never, sometimes, often, almost always), the TAI provides information about the frequency of test anxiety symptoms occurring before, during, and after tests (Spielberger, 1980). Scores on the TAI range from 20 to 80 which represent the minimum and maximum experience of test anxiety based on reported frequency of symptoms (Spielberger, 1980). Regarding its psychometric soundness, Spielberger (1980) obtained validity coefficients of .82 for males and .83 for females. Test-retest reliability coefficients ranged from .80 to .81 for 3-week and one-month intervals, respectively (Spielberger, 1980). Unlike the data provided from many test anxiety measures, raw

scores from the TAI can be converted into t-scores, allowing for normative comparison (Sapp, 1999); however, given the dated nature of the available normative data, this study did not utilize provided t-scores.

A review of the literature regarding test anxiety in adolescent populations indicates that numerous studies, both assessment- and intervention-oriented, have utilized the TAI to measure test anxiety in high school and college students (Cizek & Berg, 2006; Lufi & Cohen, 2004). One major application of the TAI has been in cross-cultural test anxiety research. Several international adaptations—including German (Hodapp, 1995), Hebrew (Zeidner, Nevo, & Lipschitz, 1988), Chinese (Rocklin & Ren-Min, 1983), and Hindi (Sharma, Sud, & Spielberger, 1983), among others—have been developed and utilized to examine test anxiety across and within various populations (Peleg-Popko, 2004; Bodas & Ollendick, 2005). The TAI has also been utilized as a pre- and post-intervention measure in practical research. For example, Orbach, Lindsay, and Grey (2007) recently used the TAI as a major indicator of change in evaluating an internet-based cognitive-behavioral therapy (CBT) intervention. These researchers found the TAI to be more sensitive to longitudinal changes in test anxiety than their own, recently-developed test anxiety measure (Orbach et al., 2007). The TAI has been the assessment tool of choice in numerous doctoral dissertations as well. Overall, the TAI has been regarded by researchers as an acceptable measure of test anxiety in adolescent populations. In this study, the TAI was used as the criterion or dependent variable for multiple regression analyses.

Regarding its technical adequacy in this sample, the TAI appeared to represent an adequate form of measurement. Cronbach's alpha for the total TAI score (TAI Total) in this study was .928. For the worry and emotionality subscales, Cronbach's alpha was .848 and .857, respectively. , Despite previous researchers' finding that Worry and Emotionality represented

distinct subscales in older adolescents and university students (e.g., Everson, Millsap, & Rodriguez, 1991; Stober, 2004), in this exclusively younger sample, these subscales did not offer a valid indication of separate subtypes of test anxiety. Given the developmental changes in adolescents' self-awareness and possible limitations in their ability to differentiate cognitive and physiological symptoms of test anxiety, the emotionality and worry subscale scores were not used in addressing the guiding research questions in this study.

For participants in the present study, the mean raw score for total test anxiety was 38.74 (SD=12.29). This is consistent with the mean obtained in previous research using the same instrument in adolescent and young adult students (e.g., Putwain, 2007). As normative data for students below high school grades is not available, the percentage of participants reporting total test anxiety of more than two standard deviations above the local mean was calculated. Three participants (2.8%) responded with total test anxiety scores at or above this level (raw score greater than 63).

General Anxiety

The Multidimensional Anxiety Scale for Children (MASC) is a 39-item self-report anxiety measure used for children and adolescents ages 8 through 19. An empirically-derived instrument, the MASC yields scores across four domains of anxiety: Physical Symptoms, Harm Avoidance, Social Anxiety, and Separation Anxiety/Panic (March, Parker, Sullivan, Stallings, & Conners, 1997). The Social Anxiety domain consists of two subscales assessing Humiliation/Rejection and Performance Fears, as well as a Total Social Anxiety scale. Each item on the MASC is scored along a four-point, Likert-type scale (0=never, 1=almost never, 2=sometimes, 3=often) (March et al., 1997). The MASC has demonstrated excellent internal reliability for all factors and subfactors in both males and females (March et al., 1997), as well as excellent test-retest reliability over a three-week period (March et al., 1999).

In a review of rating scales for internalizing problems, Myers & Winters referred to the MASC as a "preferred anxiety rating scale in both clinical and research settings," (2002; p.648). The MASC has been used with both school-based and clinical samples, with slightly higher reliabilities obtained for school-based samples (March et al., 1999). School-based intervention research has used the MASC as a screening measure for anxiety disorders and as a measure of post-treatment outcomes (e.g., Bernstein, Layne, Egan, & Tennisan, 2005). Compared to other established self-report anxiety rating scales, the MASC has demonstrated excellent divergent and convergent validity and is considered superior to the RCMAS (Dierker et al., 2001). Notably, the MASC was determined to have good utility in discriminating symptoms of anxiety from other forms of psychopathology, namely depressive symptoms, in both school-based and pediatric psychiatric samples (Dierker et al., 2001; Rynn et al., 2006). The MASC represents a highly regarded screening instrument for multidimensional symptoms of anxiety. In this study, the MASC was of central importance to the research question regarding the extent to which general anxiety, grades, student ratings of academic skills, and statewide achievement test scores predict test anxiety. In addition, the MASC was considered for the research questions related to gender differences.

For the sample included in this study, the MASC appeared to have solid technical adequacy overall. Regarding internal consistency for all 39 items, Cronbach's alpha was .927. This is highly consistent with data in previous studies (March et al., 1997; Muris, Merckelbach, Ollendick, King, & Bogie, 2002). The mean total raw score on the MASC for participants in this study was 38.23. This is highly consistent with previous findings with a non-clinical sample of students this age (Muris et al., 2002). For general forms of anxiety indicated on the MASC, 6.38 percent of male participants reported general anxiety in the clinically significant range (at least

two *SD*s above the normative sample mean for males), and 10.63 percent reported general anxiety at least one SD above the normative mean. For females, 5.35 percent of participants had MASC scores within the clinically significant range, or 2 *SD*s above the normative sample mean for females, and 8.92 percent fell at least 1 *SD* above the mean. In a variable with a normal distribution, approximately 95% of participants would typically report scores within two standard deviations of the mean. For both males and females in this sample, slightly more individuals reported the highest levels of anxiety.

Perceived Academic Competence

The Academic Competence Evaluation Scale (ACES) represents a body of rating scales designed to measure students' academic competence based on teacher, student, or parent report (DiPerna & Elliott, 2000). Specifically, ACES provides information about Academic Skills (including Mathematical, Reading, and Critical Thinking skills) and Academic Enablers (including Interpersonal Skills, Motivation, Engagement, and Study Skills) using a 5-point, Likert-type scale (DiPerna & Elliot, 2000). The term "academic enablers" refers to the behaviors and attitudes that influence the extent to which a student participates and benefits from instruction in the classroom (DiPerna & Elliott, 2000). The ACES yields a total score for academic skills as well as a total score for academic enablers. The scale provides qualitative interpretive guidelines corresponding to specified ranges for both Skills and Enablers, including "Developing," "Competent," and "Advanced."

All scales and subscales of the ACES have established strong validity and reliability for elementary through high school students (DiPerna & Elliott, 1999; DiPerna, Volpe, & Elliot, 2005). In addition, the authors found high internal consistency coefficients ranging from .92 to .98. Adequate test-retest reliability was obtained (.81 to .92) for all scales. The ACES has been found to correlate moderately-to-highly with large-scale achievement tests and measures of

social skills in known groups of students with and without disabilities (DiPerna & Elliott, 2000). Since a student's perception of his or her academic competence is thought to play the most central role in shaping his or her beliefs and expectations about test-taking, this study utilized the student self-report form of the ACES. The ACES Academic Skills Total Score and Academic Enablers Total Score were utilized as an academic indicator of central interest in the third research question.

In the sample for this study total scores for ACES Skills ranged from 85 to 150 (*M* = 119.60). The majority of students (68.3%) reported overall academic skills within the "Competent" range based on the more conservative cutoffs provided for grades 6-8. Based on the qualitative interpretive guidelines provided on this scale, 23.1% of the total sample reported having total Academic Skills within the "Advanced" range. In addition, 8.6% of the total sample reported Academic Skills within the "Developing" (or lower) range.

The ACES Enablers total scores ranged from 67 to 190 in the sample for this study (*M* = 151.39). Based on the interpretive guidelines for the Enablers scale, 17.3% of the sample reported total Academic Enablers in the "Advanced" range (based on ranges for grades 6-8), 70% within the "Competent" range, and 12.5% within the "Developing" range.

Additional Variables of Interest

Demographic information. Gender represented a central variable of interest in the guiding research questions. Information about students' grade level was relevant for obtaining an adequate sample size across grades seven to nine. Data from student standardized test scores provided information regarding participants' racial/ethnic background which were used to further describe the sample.

Grades in school. Participants' 2008 year-end grade point average (GPA), based on school records, was used as an indicator of students' academic performance in school. This

number reflects students' grades based on the PKY established grading scale (A= 4.0, B=3.0, C=2.0, D=1.0). School policy allows the option of calculating weighted GPAs—in which advanced level courses yield more points at each letter grade—for high school students only. Unweighted GPAs were used in this study in order to ensure a comparable grading system across middle and high school students. In order to protect student's identities and maintain confidentiality of school records, this information was provided by school personnel to the researcher using coded identification numbers that were not linked to each student's identity in the database.

Standardized Test Performance. In addition to students' GPA, performance on the Spring 2008 Florida Comprehensive Achievement Test (FCAT) was obtained as an additional indicator of academic skills and performance. The FCAT was developed by school district curriculum content committees in conjunction with commercial contractors commissioned by the Florida Department of Education (Florida Department of Education, [FDOE] 2008). It is administered annually to students in grades 3-11 statewide as part of the efforts to increase student achievement through higher standards and accountability (FDOE, 2008). The FCAT includes a criterion-referenced portion assessing reading that yields a "Sunshine State Standard" (SSS) score ranging from 100 to 500, which translates to levels one (lowest score) through five (highest score) (FDOE, 2008). For the purpose of this study, SSS Reading scores were utilized as indicators of students' academic skills and test performance. As with GPA, this information was provided by school professionals using coded identification numbers to protect student identities and maintain the confidentiality of school records.

Many prior studies have used student performance on statewide high-stakes achievement tests as a dependent variable in research (e.g., Martindale, Pearson, Curda, & Pilcher, 2005). Few

previous studies have utilized student's scores on standardized, statewide achievement tests as a predictor variable for internalizing problems (Ackerman, Izard, Kobak, Brown, & Smith, 2007). FCAT data represents an academic variable in the correlations and regression analyses used to answer each of the research questions.

The mean FCAT Reading Scaled Score for all participants in the present sample was 330.10. For the entire state of Florida, the mean FCAT Reading Scaled Scores were 315, 310, and 313 for grades 7, 8, and 9, respectively (Florida Department of Education, 2008). Therefore, the FCAT reading performance in this sample was slightly higher than the state average.

Table 2-1. Sample Demographics: Number (and %) of Male and Female Participants for Each Grade and Race

	Gender		
	Male	Female	Total
Grade 7	22 (55.0%)	18 (45.0%)	40
Grade 8	17 (51.5%)	16 (48.5%)	33
Grade 9	9 (29.0%)	22 (71.0%)	31
White	29 (44.6%)	36 (55.4%)	65
Black	10 (41.7%)	14 (58.3%)	24
Hispanic	8 (61.5%)	5 (38.5%)	13
Asian	1 (50.0%)	1 (50.0%)	2

CHAPTER 3
RESULTS

The purpose of this study was to investigate the relationship of test anxiety with academic performance and general anxiety in a sample of adolescent students. In addition, this study considered the relationship of test anxiety with academic variables and general anxiety in male and female students. Students' self-ratings of individual academic skills represented an additional variable of interest.

Chapter 3 will present the results of this study. First, key variables of interest will be examined for differences across demographic categories including gender, race, and grade level. With regard to the research questions and corresponding hypotheses, data and relevant statistical analyses will be described. Correlational findings will be presented followed by the results of multiple regressions. A general exploratory forced-entry multiple regression was utilized to examine the role of several included predictor variables. Next, a hierarchical regression was conducted to test a specific hypothesis about the role of student perceptions of academic skills in predicting test anxiety. Finally, the results of separate regression equations for males and females are provided.

Descriptive Statistics across Demographics

The total sample included 104 participants: 56 females and 48 males. Means and standard deviations of all major variables for males, females, and the total sample are listed in Table 3-1. An independent samples t-test revealed no significant differences in total test anxiety (TAI Total) across males and females, $t(102) = -.807$, $p = .417$. Similarly, no significant gender differences emerged from t-tests comparing TAI Emotionality and TAI Worry, $t(102) = -.149$ and $t(102) = -.928$, respectively (one-tailed). One-way analyses of variance (ANOVAs) also indicated no

differences in total test anxiety (TAI Total) across grade levels, $F(2, 101) = .011$, $p = .989$, or race/ethnicity, $F(3, 100) = .896$, $p = .446$.

Independent samples t-tests were also conducted to examine the significance of gender differences across other major variables and subscales. For the Multidimensional Anxiety Scale for Children (MASC) total score, t-tests revealed no significant differences in mean total anxiety score for males and females, $t(102) = -1.15$, $p = .25$. Additional independent samples t-tests conducted for subscales from the MASC, including Physical Symptoms, Harm Avoidance, Social Anxiety, Separation/Panic, and the Anxiety Disorder Index, all revealed no significant gender differences.

Possible gender differences on the Academic Competence Evaluation Scales (ACES) Student Form (DiPerna & Elliot, 2005) were also examined. No significant differences were revealed on either of the two major subscales, Academic Skills Total Score, $t(102) = -.516$, $p = .607$, or Academic Enablers Total Score, $t(102)$ $-.950$, $p = .344$. Subscales comprising the Academic Skills score on the ACES, including students' self-ratings of skills specific to Reading, Math, and Critical Thinking, also revealed no significant gender differences. Subscales pertaining to Academic Enablers, including Interpersonal Skills, Engagement, Motivation, and Study Skills, were also checked for potential differences between males and females. Females reported significantly higher Interpersonal Skills ($M = 42.50$, $SD = 6.11$) than males ($M = 39.95$, $SD = 5.69$), $t(102) = -2.167$, $p = .033$.

For GPA, t-tests revealed no significant gender differences, $t(102) = -.720$, $p = .473$. Males in this sample had slightly higher FCAT reading scaled scores ($M = 337.29$, $SD = 35.32$) than females ($M = 323.20$, $SD = 34.20$), approaching statistical significance, $t(102) = 1.956$, $p =$

.053. This is equivalent to a small-to-medium effect size (r =.190) (Field, 2005; Rosenthal, 1991).

Inferential Statistics: Correlations and Multiple Regressions

Prior to conducting additional analyses, distributions of scores on each measure were examined for normality, skewness, kurtosis, and homogeneity of variances. Distributions of most variables approximated a normal distribution. To address modest violations in assumptions, data transformations were conducted. For the MASC Total Score, a square root transformation best approximated normality. For the TAI Total Score, a natural log transformation was used to improve normality and reduce kurtosis and skewness prior to regression analyses. Throughout this chapter, data pertaining to MASC scores will reflect the square root transformation, and TAI Total score will reflect the natural log transformation.

For all regression equations, residual plots were examined for patterns indicative of violations of homoscedasticity, linearity, and normality. No obvious shapes or patterns were visible upon close examination of residual plots. In addition, statistics and diagnostics checked for collinearity (Field, 2005). Variance influation factor (VIF) and tolerance statistics were calculated to check for problems regarding multicollinearity. For all regression analyses presented in this chapter, VIF values remained around 1.0 while tolerance values ranged from 0.653 to .964. Therefore, assumptions regarding no multicollinearity in the model were met (e.g., Myers, 1990).

Research Questions

The following research questions will guide the presentation of results.

Research question 1

What is the relationship of general anxiety (MASC Total Score) and academic indicators (GPA, FCAT, and ACES Skills & Enablers), with test anxiety (TAI)? Based on

previous studies, scores reflecting academic performance and engagement including GPA, FCAT reading score, and ACES skills are expected to relate negatively to test anxiety. It was hypothesized that general anxiety would correlate positively with test anxiety.

The relationships between Test Anxiety, MASC total score, GPA, FCAT Reading Scale Score, ACES Skills, and ACES Enablers were calculated using Pearson correlations. Table 3-2 presents correlations among variables of interest based on the entire sample.

Significant positive correlations were found between a number of variables. The strongest correlations were found between total scores on the TAI and the MASC (r =.451, p <.01). In addition, the TAI total score had significant negative correlations with academic indicators including ACES Skills (r = -.273, p <.01), FCAT Score (r = -.390, p <.01), and GPA (r = -.264, p <.01). ACES Enablers scores were not significantly correlated with TAI total scores.

Research question 2

To what extent do general anxiety (MASC Total Score), academic indicators (GPA, FCAT, and ACES Skills & Enablers), and demographic variables (race, gender) predict test anxiety (TAI) in adolescents? A series of multiple regression analyses were conducted to examine the predictive utility of academic performance variables along with general anxiety while statistically controlling for demographic differences (race and gender) and the relationship among variables. Due to the narrow range of grade levels included in the sample and the insignificant differences in test anxiety across grade levels, this variable was not included in the regression analyses. Race was included in the regression equation using dummy-coded variables (e.g., Field, 2005).

An initial multiple linear regression analysis using forced-entry procedures examined the relationship of GPA, MASC, ACES Skills, ACES Enablers, FCAT, gender, and race as predictors of test anxiety. A simultaneous regression was selected due to the exploratory nature

of including all of these variables jointly (Field, 2005). This model indicated that these predictor variables jointly accounted for 41.2% of the variance in test anxiety, $R^2 = .412$, F (8, 95) = 8.313, $p < .000$. Table 3-3 presents regression coefficients, standard error, standardized β weights, and *t*-values and significance for each variable.

Based on these initial regression analyses, FCAT and MASC scores were determined to be significant predictors in the equation when controlling for GPA, ACES Skills, ACES Enablers, gender, and race. Therefore, other predictors included in the regression model did not additionally contribute to the variance in test anxiety.

Subsequent hierarchical regression analyses built upon these two key variables to test an additional hypotheses based on the literature (e.g., McDonald, 2001) and theory.

Research question 3

Beyond the established academic and emotional predictors of test anxiety, does student perception of academic skills explain additional variance in test anxiety? It was hypothesized that beyond general anxiety and academic performance, students' perceptions and beliefs about their academic skills would account for an additional portion of the variance in test anxiety. The initial simultaneous regression analyses used a forced-entry procedure given the exploratory nature of including all of these variables jointly in the prediction of test anxiety. In order to test this specific hypothesis about the importance of student perceptions of skills beyond actual test performance and general anxiety, a hierarchical procedure was utilized. Given the hypothesis that the model would improve by including student ratings of academic skills, a hierarchical multiple regression procedure was utilized to examine the effect of this additional predictor in the model (Petrocelli, 2003).

A two-step hierarchical regression was run with MASC (square root transformation of MASC Total score) and FCAT Reading Scale Score forced into step 1 and ACES Skills entered at step 2. Previous analyses indicated that MASC and FCAT scores accounted for the largest amount of variance in total test anxiety; therefore, these were entered into the first step (Field, 2005; Petrocelli, 2003). ACES Skills total was selected for Step 2.

Table 3-4 presents the coefficients and standardized beta weights for hierarchical regression analyses. At the first step of the regression equation, MASC and FCAT jointly accounted for 37.7% of the variance in total test anxiety. At step two, when ACES Skills entered the model, 41.1% of the variance in test anxiety was accounted for. This was a significant improvement in the model (R^2= .411; ΔR^2= .035, $F\Delta$= 5.868, p =.017).

Research question 4

What is the relationship of general anxiety and academic indicators with total test anxiety in male adolescents and in female adolescents? It was hypothesized that general anxiety (MASC) would positively correlate to test anxiety in both males and females. In addition, it was hypothesized that academic indicators (GPA, FCAT scores, ACES skills, ACES enablers) would negatively correlate to test anxiety in males and females. To examine possible differences in the relationship of academic and emotional variables with test anxiety and its two components in males versus females, separate Pearson correlations of variables were calculated for males and females. Table 3-5 provides correlations between major variables and level of significance for both males and females separately.

As expected, general anxiety (MASC total score) positively correlated to total test anxiety (TAI total) in both males and females. In males, total test anxiety significantly negatively correlated to self-ratings of academic skill, academic enablers, and GPA. In females, total test

anxiety did not significantly correlate with self-ratings of academic skills, academic enablers, or GPA. FCAT Reading Scale had a significant negative relationship with total test anxiety in both males and females.

Research question 5

How do academic indicators and general anxiety predict test anxiety in male and female adolescents? It was hypothesized that general anxiety and FCAT score would differentially predict test anxiety in male and female adolescents. Using the data-splitting feature of SPSS to separate the sample by gender, MASC and FCAT Reading Scaled Score were entered into a regression equation using forced-entry procedure. For males, this model accounted for 37.8 percent of the variance in test anxiety; for females, it explained 36.7 percent of the variance in test anxiety. Table 3-6 presents coefficients and standardized beta weights for MASC and FCAT scores in both males and females. When comparing two populations for the same variable, unstandardized coefficients should be examined to best represent differences across groups (Algina, 2005). This comparison is possible because the units are the same. Comparing the slopes for males versus females, the slope for FCAT did not change; however, the slope for MASC scores was slightly higher for females. Examining the standardized beta values within the model for males, FCAT Reading Scaled Score appeared to have a slightly higher predictive value for test anxiety than MASC score. Examining standardized beta values within the model for females, general anxiety had a slightly heavier weight in predicting total test anxiety than did FCAT scores.

Follow-up Analyses

Although previous analyses indicated that test anxiety is significantly correlated with general anxiety as reflected by the MASC total score, how subscales and subtypes of anxiety reflected on the MASC may relate to test anxiety was unknown. Previous research has identified

test anxiety as often associated with Generalized Anxiety Disorder (GAD) and social phobia (SP) in children (Beidel, 1991; King, et al., 1995). Therefore, follow-up analyses were conducted to examine the relationship of subscales of the MASC with test anxiety in this adolescent sample (see Table 3-7). Subscales specific to physical symptoms and social anxiety correlated most strongly with test anxiety.

Table 3-1. Descriptive statistics of measures for males, females, and total sample

Variable	Males		Females		Total Sample	
	M	*SD*	*M*	*SD*	*M*	*SD*
TAI_{Total}	37.67	(13.21)	39.64	(11.48)	38.73	(12.29)
TAI_{Worry}	13.87	(5.62)	15.85	(5.07)	15.40	(5.33)
$TAI_{Emotionality}$	15.35	(6.08)	15.51	(4.94)	15.44	(5.47)
MASC	36.02	(18.49)	40.12	(17.80)	38.23	(18.15)
ACES- Skills	118.72	(15.79)	120.34	(15.84)	119.60	(15.76)
ACES-Enablers	149.11	(22.52)	153.30	(22.16)	151.39	(22.31)
GPA-Unweighted	3.05	(.63)	3.13	(.62)	3.098	(.62)
FCAT-ReadScaled	337.29	(35.32)	323.93	(34.20)	330.10	(35.20)

Table 3-2. Matrix of correlations for entire sample

	TAI_T	TA_W	TA_E	MASC	$ACES_S$	$ACES_E$	FCAT	GPA
TAI_T	1.00							
TA_W	.934**	1.00						
TA_E	.926**	.798**	1.00					
MASC	.451**	.428**	.447**	1.00				
$ACES_S$	-.273**	-.289**	-.159	-.069	1.00			
$ACES_E$	-.150	-.202*	-.062	-.145	.620**	1.00		
FCAT	-.390**	-.414**	-.326**	-.025	.282**	-.013	1.00	
GPA	-.264**	-.305**	-.188*	-.060	.343**	.269**	.521**	1.00

*indicates significant at the .05 level (1-tailed)
** indicates significant at the .01 level (1-tailed)

Table 3-3. Forced-entry regression of test anxiety regressed onto predictor variables

Predictor	*B*	*SEB*	β	*t*	*p*
(Constant)	4.611	.357		12.928	.000
MASC**	.097	.018	.442	5.509	.000
GPA	-.009	.053	-.018	-.176	.860
FCATRS**	-.003	.001	-.358	-3.376	.001
ACESskills	-.004	.002	-.196	-1.805	.074
ACESenablers	.000	.002	.010	.112	.911
Gender	-.010	.054	-.015	-.130	.897
Race					
Dummy1[a]	-.017	.073	-.023	-.240	.811
Dummy2[b]	.003	.081	.003	.032	.974

R^2 =. 412, Adj.R^2 = .362; F (8, 95) = 8.313, p < .0001.
** $p < .001$
[a]Dummy Coded Variable for White versus Black; [b]Dummy-coded variable for Caucasian versus Hispanic

Table 3-4. Hierarchical regression

	B	*SEB*	β	*t*	*p*
Step 1					
(Constant)	4.266	.265	--	16.113	.000
MASC Total	.099	.017	.451	5.746	.000
FCAT RS	-.004	.001	-.410	-5.219	.000
Step 2					
(Constant)	4.593	.292	--	15.742	.000
MASC Total	.097	.017	.440	5.728	.000
FCAT RS	-.003	.001	-.356	-4.456	.000
ACES Skills	-.004	.002	-.194	-2.422	.017

Step 1: R^2 = .377, Adj. R^2=.364, $p < .001$; Step 2: ΔR^2 = .035, R^2 = .411 , Adj. R^2=.393, $F\Delta$= 5.868, p = .017.

Table 3-5. Matrix of Pearson correlations among major variables for males, females

	TAI_T	TA_W	TA_E	MASC	$ACES_S$	$ACES_E$	FCAT	GPA
TAI_T								
Male	1.00							
Female								
TA_W								
Male	.953**	1.00						
Female	.913**							
TA_E								
Male	.926**	.852**	1.00					
Female	.907**	.742**						
MASC								
Male	.451**	.474**	.435**	1.00				
Female	.459**	.372**	.467**					
$ACES_S$								
Male	-.350**	-.341**	-.267*	-.102	1.00			
Female	-.209	-.254*	-.051	-.052				
$ACES_E$								
Male	-.247*	-.303*	-.132	-.255*	.576**	1.00		
Female	-.071	-.125	.008	-.071	.655**			
FCAT								
Male	-.434**	-.445**	-.406**	-.144	.302*	.057	1.00	
Female	-.332**	-.367**	-.249*	.126	.293*	-.041		
8. GPA								
Male	-.353**	-.385**	-.326*	-.201	.124	.247*	.594**	1.00
Female	-.190	-.246*	-.046	.051	.525**	.280*	.504**	

*indicates significant at the .05 level (1-tailed)
** indicates significant at the .01 level (1-tailed)

Table 3-6. Forced-entry regression model for males, females

		B	*SEB*	β	*t*	*P*
Male						
	(Constant)**	4.445	.445	––	9.980	.000
	MASC*	.092	.027	.400	3.380	.002
	FCAT**	-.004	.001	-.422	–3.559	.001
Female						
	(Constant)**	4.161	.334	––	12.475	.000
	MASC**	.107	.023	.504	4.573	.000
	FCAT**	-.004	.001	-.409	–3.712	.000

For Males, R^2 = .378, Adj.R^2 = .350, $F = 13.652$, $p < .001$; For Females, R^2 = .367, Adj.R^2 = .343 for Females; F = 15.380, $p<.001$.
* $p < .005$, ** $p < .001$

Table 3-7. Correlations among MASC subscales and TAI

	TAI_T	$MASC_T$	PhysS[a]	HarmAvd[b]	SocAnx[c]	SepAnx[d]	ADI[e]
TAI_T	1.00						
$MASC_T$	.451**	1.00					
PhysS[a]	.494**	.880**	1.00				
HarmAvd[b]	.110	.635**	.338**	1.00			
SocAnx[c]	.410**	.877**	.758**	.366**	1.00		
SepAnx[d]	.400**	.801**	.610**	.465**	.599**	1.00	
ADI[e]	.443**	.926**	.797**	.589**	.838**	.731**	1.00

*indicates significant at the .05 level (1-tailed)

** indicates significant at the .01 level (1-tailed); [a]Physical Symptoms; [b]Harm Avoidance; [c]Social Anxiety; [d]Separation Anxiety; [e]Anxiety Disorder Index.

CHAPTER 4
DISCUSSION

A multitude of findings from several decades of research have supported the role of academic variables and emotional variables as important correlates of test anxiety. Using a multifaceted conceptualization of test anxiety, this study integrated academic and emotional understandings of test anxiety in an adolescent sample.

In the academic-related research pertaining to test anxiety, three major models have attempted to explain the connection between test anxiety and impairments in academic achievement (Bodas & Ollendick, 2005): the cognitive interference model, skill-deficits model, and an information-processing model, which represents an integration of the others. The cognitive interference model proposes that the diversion of cognitive resources from the academic tasks (e.g., worrying and fears about test outcomes) interferes with encoding and retrieval during the learning and test-taking process (Morris, Davis & Hutchings, 1981; Sarason & Stoops, 1978; Wine, 1971). Within this particular framework, the worry component of test anxiety—but not the emotionality component—has been linked to detrimental academic achievement in both adolescents (Williams, 1991) and college students (Bandalos, Yates, & Thorndike-Christ, 1995; Cassady & Johnson, 2002). The skill-deficits model proposes that the connection between test-anxiety and academic struggles stems from underlying academic deficits and poor studying and test-taking skills (Beidel, Turner, & Taylor-Ferreira, 1999; Culler & Hollahan, 1980; Ergene, 2003). Finally, the information-processing or “hybridized” model posits that students with test anxiety experience both cognitive interference and academic or study skill deficits (Naveh-Benjamin, 1991).

A major limitation of existing academically-oriented models is the omission of emotional variables such as general or trait-level anxiety that also may represent an influential variable and

an associated outcome. Indeed, emotional variables are relevant to understanding how test anxiety relates to academic impairments (e.g., Swanson & Howell, 1996) and the experience of test anxiety in students not exhibiting reduced academic performance (Sarason et al., 1990; Zeidner, 1998). Based on the literature, higher levels of test anxiety relate to more general anxiety as reported on general measures of anxiety such as the Revised Children's Manifest Anxiety Scale (RCMAS; C.R. Reynolds & Richmond, 1978). Students' perceptions and beliefs about one's academic skills were identified as a variable of particular interest as it related to both academic and emotional considerations.

This study examined the relationship among academic indicators and general anxiety with test anxiety. Unlike previous research, this study integrated academic and emotional understandings of test anxiety while also including other potentially relevant variables. Another feature of the present study was consideration of students' self-ratings of academic skills and academic enabling behaviors. In addition, demographic variables including race and gender were examined. The following text will summarize major findings, as well as interpret and explain results related to the guiding research questions. In addition, how findings relate to previous research, limitations, and future directions will be discussed.

Demographics and Descriptive Findings

Gender

In this study, males and females reported similar levels of overall test anxiety and emotionality and worry components of test anxiety on the Test Anxiety Inventory (TAI). Based on the literature, females were expected to report more test anxiety than males (e.g., Hembree, 1988; Stober, 2004). Males and females also reported similar levels of general anxiety. Subtypes of anxiety included in subscales of the Multidimensional Anxiety Scale for Children (MASC) also revealed no gender differences. This was unexpected given the large body of literature that

has documented that females exhibit higher levels of anxiety across all subtypes of anxiety (e.g., Somers, Goldner, Waraich, & Hsu, 2006). Despite this well-documented gender difference, these authors noted that the magnitude of the observed gender difference varies quite a bit across studies (Somers et al., 2006). Furthermore, van Gastel and Ferdinand (2008) recently indicated that although the MASC offers a valid indication of anxiety symptoms, it does not adequately screen for specific diagnosable anxiety disorders. Had this study used a clinical interview to obtain more detailed information about symptoms of specific anxiety disorder diagnostic criteria, perhaps gender differences would have emerged. Also, as discussed in earlier chapters, slightly more students than expected reported clinically significant levels of general anxiety as reflected by a total anxiety score more than two standard deviations above the normative sample mean. Thus, this sample may have included slightly more anxious youth than expected for both genders.

Regarding males' and females' self-ratings of academic skills and academic enabling behaviors, as measured on the Academic Competence Evaluation Scales (ACES), no differences were found on the two major scales (Skills and Enablers). The only subscale within the Enablers scale that reflected gender differences was the Interpersonal Skills scale, on which females reported higher levels. Specific items on this subscale relate to getting along well with teachers and peers, following rules, cooperating, and communicating effectively. It is unclear whether this reflects a true gender difference in this sample or simply a reporting difference in which females were more inclined to report socially-pleasing behaviors. Elliot, DiPerna, Mroch, and Lane (2004) did not find statistically significant gender differences pertaining to overall academic enabling behaviors based on student self-reports; however, a medium effect size was reported for the Interpersonal Skills subscale with females reporting higher levels. In addition, teacher

ratings on the teacher version of the ACES suggested that female adolescents exhibit higher enabling behaviors overall, including interpersonal skills (Elliot et al., 2004). Considering the convergent support from both teacher-ratings and student self-ratings in previous research, the present findings may reflect more pervasive differences in the demonstration of interpersonal skills in female and male adolescents.

Grade level

Total test anxiety was found to be similar for students across the three grade levels included in the study. However, as this study drew from a narrow range of grade levels (7-9) with a limited number of participants in each grade, the nonexistence of grade level differences should be interpreted with caution. No known studies have examined anxiety specific to test-taking developmentally by making direct comparisons across different age groups.

Race/Ethnicity

No differences in students' self-report of total test anxiety were indicated across racial/ethnic groups. Results of a previous meta-analyses indicated that African American and Hispanic students exhibit higher levels of test anxiety during elementary school but that these differences were no longer evident in high-school students (Hembree, 1988). Perhaps any existing differences in test anxiety associated with race have dissipated by the time students reach 7th, 8th, and 9th grade. Given that Hembree's research analyses were conducted over 20 years ago, it is possible that his findings are no longer applicable due to changing demographics, beliefs, and practices in the United States.

Another consideration with regard to obtained similar levels of test anxiety across race and ethnic groups is the processes of stereotype threat as they may serve to activate the experience of test anxiety at specific times. Marx and Stapel (2006) suggested that stereotype threat increases anxiety specifically before taking a major test—during the exact time the stereotype threat is

activated. After tests, students affected by stereotype threat reported higher levels of frustration but not anxiety (Marx & Stapel, 2006). Therefore, students' self-report of test anxiety at a time when a specific stereotype threat is not activated would not necessarily reflect the level of test anxiety experienced just prior to the test, for example.

Correlates of Test Anxiety

Academic Indicators

Consistent with previous research, test anxiety negatively correlated with various indicators of academic performance. Grade point average (GPA), Florida Comprehensive Achievement Test (FCAT) (Reading Scaled Score), and student self-ratings of academic proficiencies (ACES Skills) negatively correlated with total test anxiety. Student ratings about their academic enabling behaviors (ACES Enablers) did not significantly relate to total test anxiety. A large literature base supports the inverse relationship between academic performance and test anxiety (Hembree, 1988; Cassady & Johnson, 2002); however, the strength of association with various types of academic indicators and test anxiety has not been examined within the same study. Performance on a high-stakes achievement test (FCAT Reading Scaled Score) appears to have a slightly stronger relationship with test anxiety than both GPA and self-ratings of academic skills. One possible explanation is that test anxiety is particularly salient during high-stakes academic achievement tests such as the FCAT, whereas GPA reflects performance over multiple occasions that may not be as anxiety-provoking as a major test that contributes to educational decisions. Another consideration is that performance on standardized, state-wide achievement tests could in some represent a more "pure" measure of academic skills in a high-stakes context while GPA may reflect differences in course or teacher demands, effort and engagement, and other intra-individual variables (e.g., conscientiousness, organizational skills, task completion) in addition to basic academic skills. Furthermore, several items on the

test anxiety inventory (TAI) refer to “important tests,” and “important exams,” (Spielberger, 1980). The FCAT represents one such “important test” that may be particularly salient to students in the state of Florida; therefore, it is possible that the wording of this measure led students to more automatically cognitively link this measure to the FCAT as they were completing the questionnaire. In general, items on the TAI do not assess academic anxiety in general, but specifically refer to test-taking situations.

Relationship among Various Academic Indicators

This study found that although student ratings of their own pro-academic behaviors (ACES Enablers) related to GPA, there was no apparent connection between self-reports of academic enablers and FCAT scores. Conceptually, academic enabling behaviors (ACES Enablers) such as study skills, engagement, motivation, and interpersonal skills logically could influence GPA but are not necessarily as pivotal in standardized achievement test scores. On the other hand, given the correlational nature of this study, the opposite may be true: students who tend to receive high grades in school could internalize academic feedback and develop beliefs about themselves as a “good student.” Finally, the validity of student ratings on the ACES could potentially be limited by social desirability biases or potentially rushed responding on a long (68-item) questionnaire.

Gender differences were also observed with regard to the relationship between various academic indicators. For females, GPA strongly related to self-ratings of academic skills (ACES Skills); however, no significant connection between grades in school and self-ratings of academic skills was obtained for male students. In this study, grades in school positively related to self-reports of academic enabling behaviors (ACES Enablers) in both males and females. No known previous studies have examined this type of gender pattern in adolescent students; however, evidence from a sample of college students has suggested that academic enablers may

relate more strongly to current GPA while academic skills may relate more to cumulative GPA (DiPerna, 2004). Perhaps adolescent males are more inclined to cognitively separate their classroom performance from their actual abilities (e.g., “Just because I don’t get good grades in English does not mean I can’t read and write effectively,”). To examine this possible explanation, partial correlations were calculated controlling for academic enabling behaviors (ACES Enablers). Although the strength of relationship between GPA and ACES Skills decreased slightly for both males and females when partialing out the variance associated with ACES Enablers, no changes in statistical significance were obtained for either gender. The role of various academic indicators—and the relationship among them—represents an important topic for educational research.

Test Anxiety and Other Forms of Anxiety

In addition to academic correlates, general anxiety positively correlated with test anxiety. Although previous studies of test anxiety in youth have not used the Multidimensional Anxiety Scale for Children (MASC), other researchers reported a direct relationship between test anxiety and broader forms of anxiety as measured on the Revised Children’s Manifest Anxiety Scale (RCMAS; Reynolds & Richmond 1978) and the State-Trait Anxiety Inventory for Children (STAIC; Spielberger, 1973) (King et al., 1995). A consideration and potential limitation with regard to this association between general anxiety and test anxiety is that both of these measures relied exclusively on self-report. Therefore, part of the strong correlation between test anxiety and general anxiety could partly reflect the shared variance associated with using similar self-report rating scales with parallel Likert-type formats. For academic variables, external indicators (FCAT and GPA) were used in addition to self-report measures (ACES).

Follow-up analyses explored the relationship among test anxiety and its components with subscales of the MASC. Total test anxiety related most to the scales measuring physical

symptoms, followed by social anxiety. This is consistent with Beidel and colleagues' (1988) suggestion that test anxiety represents a subtype of social anxiety.

Test Anxiety and Gender

General anxiety and FCAT scores correlated with total test anxiety in both males and females. In female adolescents, total test anxiety was not significantly related to GPA or self-ratings of academic skills and enablers. In males, however, higher levels of test anxiety were associated with lower GPA, lower FCAT, and lower self-ratings of academic skills and enablers. Although it is possible that test anxiety in males actually has a stronger relationship with academic indicators than in females, Pearson correlations also reflect variation around the mean and measurement error in addition to valid relationships between variables (Algina, 2005). Therefore, gender differences in observed correlations should be interpreted with caution.

The finding that total test anxiety negatively correlated with all additional academic indicators (ACES Skills, ACES Enablers, GPA) in male students but not in females may have interesting implications regarding gender differences in academic functioning and test anxiety in adolescents. Considering the pervasiveness of negative correlations of test anxiety with various academic indicators, one possible explanation is that deficient academic skills truly are more important in explaining test anxiety specifically in males, such as proposed within the traditional skill-deficit model of test anxiety (Culler & Hollahan, 1980). Given the correlational nature of the findings, these data may also lend support to the idea that test anxiety could impair academic performance on tests and daily evaluative tasks, as proposed by the interference model (Sarason, 1984). Furthermore, the information-processing or "hybridized" model also fits the findings for males, given the limits of correlational data (Naveh-Benjamin, 1991). However, none of these existing models linking test anxiety to reduced academic performance consider the differences among daily academic performance (e.g., GPA), performance in a major test or exam, and

individual perceptions of academic skills. This will be discussed further in the next section of this text regarding predictors of test anxiety.

For females, the only academic indicator significantly related to test anxiety was performance on a high-stakes statewide achievement test. Interpreted from the perspective of the skill-deficits model of test anxiety—which holds that test anxiety relates to deficient study and test-taking skills—this could suggest that for girls, GPA does not represent a pure indication of underlying academic skills but in fact reflects several enabling behaviors such as motivation, study skills, and academic engagement. Interestingly, females' self-report of academic skills strongly related to GPA. This could suggest that girls internalize GPA as a reflection of their academic skills. Perhaps test anxiety does not affect the daily academic engagement and performance reflected to GPA in female adolescents.

An additional consideration is that perhaps female adolescents do exhibit more academic enabling behaviors regardless of test anxiety, which could also account for the lack of significant correlation between GPA and test anxiety in adolescent girls. Indeed, Elliot et al. (2004) found that teacher-ratings of academic enabling behaviors were higher for female adolescents than male adolescents. Again, measurement error and slightly unequal variance observed between males and females particularly on the TAI may account for this apparent gender variation in the relationship of test anxiety with academic variables.

Predicting Test Anxiety

No known studies have investigated the predictive utility of academic variables along with general anxiety and demographics as they relate to test anxiety. Accounting for GPA, ACES Skills and Enablers, gender, and race, a major finding of this study was that two significant predictors of test anxiety were general anxiety (MASC Total Scores) and performance on state-wide achievement testing (FCAT Score). When entered jointly into the model (forced entry

procedures), none of the other variables made significant contributions. However, when variables were entered into the model using a hierarchical procedure, ACES Skills emerged as an additional significant predictor.

This finding supports the need for the proposed expansion of existing Information-Processing Model linking test anxiety to academic impairments in order to jointly account for the influence of general anxiety and experiences of adolescent students—namely, those related to broader forms of anxiety. Furthermore, it supports that solely viewing test anxiety as a "subtype" of anxiety without consideration of academic skills represents too narrow of an understanding. In addition to lower academic skills that relate to test anxiety, self-reported general anxiety also plays an important role in the experience of test anxiety, even when controlling for gender and other academic indicators. This basic model offers a parsimonious and logical conceptualization of test anxiety: general anxiety and performance on major tests represent key variables in understanding and predicting test anxiety. In addition, this model met statistical assumptions without concerns.

Further hierarchical regression analyses revealed that beyond these two key predictors, the inclusion of students' perceptions of academic skills (ACES Skills) significantly improves the initial model. Thus, student ratings of academic skills explain a portion of the variance in test anxiety beyond that accounted for by FCAT and MASC scores. In the initial forced-entry regression model, the unique variance associated with student perceptions of academic skills may have been undetected due to the reduction in power associated with including more predictor variables.

Theoretically, student perceptions of academic skills should account for some of the variance in test anxiety. For example, if a student possessed extremely deficient academic skills

and performed poorly on major tests but perceived having typical or average skills, she or he may not experience as much test anxiety as a student with similar academic performance on major tests along with perceptions of weak academic skills. Although the test anxiety literature supports that student perceptions play an important role, it primarily considers students perceptions about the demand of academic material (e.g., Hong, 1999) and peer comparisons rather than self-report of skills (Swanson & Howell, 1996).

Predictors of Test Anxiety in Males and Females

Given that FCAT score and MASC Total score were identified as the primary predictors of test anxiety in the entire sample, these two variables were jointly entered into regression models conducted separately for males and females. Although standardized slopes (beta values) should be examined to compare relative influence among variables entered within a single model in order to account for different units of measurement, non-standardized slopes should be examined when comparing slopes of the same variables across populations (Algina, 2005). For both males and females, the slope for FCAT score was the same. However, MASC score appeared to be slightly more important for females than for males.

Comparing relative predictive value within the model for males, FCAT score appeared to be a slightly more important predictor than MASC score. Conversely, for females, general anxiety appeared to be slightly more important than FCAT score. A significant limitation of these gender-specific regression models is the omission of other relevant variables. However, by splitting the sample between males and females, the sample size for each group was majorly reduced and therefore fewer predictor variables could be examined within each model to maintain adequate power.

Implications of Findings

Theoretical Implications

A central implication of this study is that both academic and emotional variables relate to test anxiety when controlling for demographics, grades in school, and self-ratings of academic skills and enablers. Likewise, when all these factors are considered together, the other variables do not account for a significant amount of the variance in test anxiety. In this study, score on high-stakes achievement test represented the most important academic indicator in terms of its relationship with test anxiety.

Beyond test performance and general anxiety, student beliefs and perceptions of academic skills also play a role in test anxiety. The role of individual perceptions of academic skills as a relevant predictor of test anxiety has important theoretical implications as well. Drawing from cognitive-behavioral conceptualizations of other, non-academic types of childhood anxiety (e.g., Kendall, 1993; Roblek & Piacentini, 2005), students' beliefs about their own skills and preparedness to engage in a given task (e.g., social interactions, academic evaluations) represent a crucial link between actual experienced difficulties with that task and the experience of anxiety pertaining to the activity. This suggests that student perceptions of academic skills should be considered as an important variable to be incorporated into the existing information-processing model linking test anxiety to impaired academic performance.

In addition to highlighting the joint importance of both academic and emotional factors in terms of predicting test anxiety, the model offered in this study may help explain test anxiety in students without academic deficits. Indeed, Tobias (1985) noted concerns about explaining test anxiety in students with strong or adequate academic skills and study skills. This study may imply that with sufficient levels of general anxiety, a student may experience test anxiety regardless of academic skills. Likewise, even if a student is not generally anxious, he or she may

experience anxiety about test-taking if academic skills deficits—and the perception of such—are present.

Implications for Research

The finding that "not all indicators of academic performance are created equal" has important implications for educational research. Particularly as these variables relate to each other and test anxiety, GPA, FCAT Score, and ACES Skills and Enablers do not appear to measure the exact same construct. While past literature has at times focused solely on GPA, test scores, or student ratings of academic skills, future research should consider using more than one of these academic indicators or at least consider the limitations associated with solely relying on one academic measure. It would also be interesting to examine these variables along with student performance on individually-administered standardized measures of achievement. Finally, the consideration of student perceptions of academic skills represents an important link between academic achievement and many relevant social-emotional experiences (e.g., motivation, self-efficacy).

Implications for Practice

Consistent with former intervention studies (e.g., Beidel, Turner, & Taylor-Ferreira, 1999), these findings imply that intervention strategies exclusively focusing on emotional aspects of test anxiety (e.g., relaxation) may be less promising approaches to intervention than a more comprehensive approach also including academic components. Including cognitive-behavioral strategies to cope with general anxiety (e.g., elements of cognitive restructuring, behavioral exposure) along with academic strategies (e.g., remediating skill deficits and teaching study skills and test-taking strategies) may be optimally beneficial for some students. This study implies that for some individuals, underlying symptoms of general anxiety and academic difficulties must be addressed in order to overcome the experience of test anxiety.

Study Limitations

Several limitations surround the design and nature of this study. Regarding internal validity and potential for attributing causality, the relational nature of the data represents a key limitation. Without any experimental manipulation, causality cannot be as clearly determined. Although regression analyses were able to control for several academic indicators and demographic variables, several potentially-relevant social-emotional variables were not controlled for in this particular study. Therefore, another limitation of this study is the omission of potentially relevant predictor variables. For example, the literature supports that perfectionism (Stober & Joorman, 2001) trait anxiety (Beidel et al., 1994), and related personality characteristics (Lufi et al., 2004) relate to test anxiety. Recently, Ciani and colleagues found that an individual's self-efficacy also may play a role in determining whether autonomic arousal (e.g., increased heart rate) is interpreted as a pleasant or unpleasant experience, particularly as it relates to test anxiety (Ciani, Easter, Summers, Posada, 2009). Although the ACES Skills measure may have tapped into some aspects of participants' self-efficacy, this may be an important variable in terms of how the physiological aspects of test anxiety are actually interpreted by a student, which comprises a large portion of the test anxiety measure used in this study. Other possibly relevant variables that were omitted from this study include information regarding stressful life events and experiences, parental anxiety, and cognitive ability. Including these or similar variables may have further clarified the relationship among test anxiety, academic performance, general anxiety, and demographic variables. Including more of these variables along with a much larger sample size would have improved the validity of overall conclusions drawn by this regression model without compromising power.

Several possible limitations of this study stem from method biases. Several common method biases were introduced by the fact that the TAI, MASC, and ACES scales each rely on a

similar self-report rating scale format and were measured at the same point in time, in the same setting (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Perhaps one of the biggest flaws in the overall design of this study relates to common rater effects; that is, several of the predictor variables and the criterion variable came from the same source (Podsakoff et al., 2003). This introduces possible sources of systematic error including respondents' tendency to try to maintain consistency in their responses (i.e., "consistency motif,") which may be particularly problematic due to the construct similarities between test anxiety and other types of anxieties (Podsakoff et al, 2003). In other words, regardless of whether a student experienced a specific subtype of anxiety, he or she may have responded in a way that is perceived as consistent with earlier answers. The effect of this bias would be to inflate the obtained correlation between general anxiety and test anxiety. Additional potential biases associated with rater effects include social desirability and potential implicit theories (Podsakoff et al., 2003). For example, if a student developed his or her own implicit theory that test anxiety is associated with lower academic skills, this may have influenced responses on rating scale measures to support this theory. By including GPA and FCAT scores as independently-obtained data in this study, the relationship of academic variables with test anxiety is not threatened by this particular type of bias. However, the relationship among emotional-behavioral variables (e.g., test anxiety and other forms of anxiety) may be compromised by this problem. Overall, the overreliance on self-report measures represents a considerable limitation to this study, potentially posing a serious problem with regard to conclusions surrounding the relationship among rating scale data.

Although obtaining academic information about GPA and FCAT from a separate source reduced the threats associated with common method bias, this particular methodological decision may have caused a tradeoff for another threat to the validity of the information obtained.

Specifically, this required that some identifying information be provided from participants in order to link their self-report with archival data, which possibly reduced their perceptions of anonymity. Perceiving limits to their anonymity may have introduced another realm of biases, particularly in adolescent students providing self-report information in a school setting. For example, social desirability biases may have been more salient due to the apparent limited of anonymity.

Another limitation associated with the correlational nature of this study was the passage of time between taking a major test and completing self-report questionnaires. Collecting information about test anxiety immediately after or even during a test-taking situation may have yielded more a more accurate depiction of students' symptoms during the test. The passage of time may have led students to have inconsistent awareness or memory of specific symptoms of test anxiety. For example, students may be more inclined to remember major physiological symptoms (e.g., feeling noticeably nauseous) over more subtle or comfortable sensations (e.g., increased heart rate). Also related to issues of timing, the self-report data in this study was collected towards the end of the academic year, a few weeks prior to final exams. It is unclear whether students would report similar levels of test anxiety at different times in the school year and with varying temporal proximity to major evaluations (e.g., FCAT, final exams).

Limitations also exist with regard to external validity. It is unknown whether these findings would fully generalize to students outside the relatively narrow range of grade levels included in the sample. For example, test anxiety may operate slightly different in older adolescents or elementary-aged children. Academic skills or emotional characteristics may be more important depending upon age. Furthermore, it is unknown whether these findings would generalize to students in other cultures, school environments, or cohorts. The emphasis on high-stakes testing

that characterizes most U.S. school systems in recent decades may have shaped standardized-test scores (FCAT) as being particularly relevant to test anxiety. However, in cultures, schools, or decades without this major emphasis on educational accountability and test-taking, performance on a major academic achievement test may not be nearly as salient in the experience of test anxiety. In some states, performance on statewide tests has varying degrees of importance in terms of academic promotion and graduation. Finally, the academic climate of the university-affiliated developmental research school from which this sample was drawn may be more rigorous and achievement-oriented than other schools in the state of Florida. Given the strong emphasis on best practices in education and frequency with which educational research is conducted at this school, students' self-ratings of academic skills and enabling behaviors also may be slightly elevated than those obtained by other 7th- through 9th-graders. In addition, unlike most public schools, this setting requires families to initiate application for enrollment and agree to provide a child's transportation to and from school on a daily basis. Thus, the population of this school includes students whose parents have self-selected their enrollment, a criteria that is significantly different from the enrollment process in most non-choice public schools. Despite its similar demographic composition, a school requiring choice enrollment likely differs from typical public schools.

In addition to differences associated with being a choice school, the research setting spans kindergarten through grades twelve, which is considered a relatively uncommon feature in public school systems. Therefore, the majority of the participants in this study likely had attended the same school for several years. Changing schools introduces an additional potential source of anxiety. In typical ninth-grade students who had recently entered a new high school, anxiety may

be higher. Conversely, the affiliation with an achievement-oriented university potentially could introduce additional pressure for students to achieve academically.

Another consideration with regard to generalizability pertains to the use of the FCAT Reading score specifically. It is unknown whether high-stakes testing specific to other subject areas would have the same relationship with test anxiety as did reading. Reading may be particularly important since important tests in other subject areas (e.g., history, science, and even math) tend to require reading skills.

With regard to measurement, the reliance on self-report data for many important variables represents a significant limitation. In addition, students' self-report about test anxiety may have drawn largely from each individuals' knowledge of one's past test performance (e.g., FCAT) rather than reflecting a pure indication about their experience of anxiety. This represents a significant limitation in the self-report information obtained on the TAI. Ideally, an external, observable measure of test anxiety would have also been used to avoid this overreliance on individuals' self-report and provide information regarding the convergent validity about students' self-report. The TAI—although widely used in the literature—does not appear to represent the best possible instrument with which to measure test anxiety. For one, it only includes 20 items. Particularly given its importance as the key variable of interest in this study, test anxiety should have been measured using a longer rating scale as well as observable, external information such as teacher or parent ratings and physiological data (e.g., heart rate, galvanic skin response) collected during test-taking situations.

Summary & Future Directions

Overall, both general forms of anxiety and academic indicators appear relevant to the experience of test anxiety in adolescent students. High-stakes test performance and general

anxiety represent the strongest predictors when controlling for the effects of other academic indicators and demographic characteristics.

Future studies should further examine the predictors of test anxiety specific to certain subject areas (e.g., reading, math) in adolescents. Examining the relationship among students' self-report of skills within a specific academic domain with their anxiety specific to that subject would provide further support for the role of perceptions and beliefs about one's skills as an additional predictor of test anxiety. Although subject-specific subtypes of test anxiety have been studied in college students and graduate students, few studies have looked at this in younger students.

Developmental changes in the expression of test anxiety should also be further explored. In younger students, would other characteristics more strongly predict test anxiety? It may be that early environmental and early school experiences play a more important role in younger children's test anxiety. For example, if a student had not had strong early literacy experiences prior to beginning kindergarten, he or she may experience more test anxiety than same-aged peers. The construct of "test" anxiety may be different in younger children, too, given the changing expectations for assessment and evaluation. For example, in Florida and many other states, students do not take state-wide achievement tests until the third grade.

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BIOGRAPHICAL SKETCH

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