A STUDY OF UNDERPREPARED COLLEGE ALGEBRA STUDENTS AND TEST ANXIETY: THE IMPACT OF USING EXPRESSIVE WRITING ON TEST PERFORMANCE

by

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I dedicate this dissertation to my children, Lily Anita and Pax Robert,

who bring so much joy into my life and remind me of the important things in life.

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ABSTRACT

Ramirez and Beilock (2011) found that highly test-anxious, ninth-grade Biology students who wrote expressively about their feelings and emotions about their impending final examination outperformed students who wrote objectively about a topic they did not think would appear on the examination. The current study not only extends existing knowledge from Ramirez and Beilock's (2011) research to underprepared College Algebra students over the course of a semester, but it also provides greater depth of knowledge by examining how the students react to writing immediately before their tests.

The quantitative component of this mixed-methods study was quasi-experimental, using Mann-Whitney U tests to compare group means. The qualitative component utilized triangulation and the systemic approach to grounded theory to analyze the participants' written responses to the writing prompts, their written responses to a questionnaire, and the interviews of some purposefully selected participants.

The study found no statistically significant differences on test performance. In regard to what participants did when asked to write, some participants did not write before every test, and some of those who did write did not always follow the directions. Those who did write expressively often wrote about why they were anxious or were not anxious. A common reason for being anxious was not having studied well, and a common reason for not being anxious was having studied well. In regard to what participants thought about the experience, the majority of those who wrote expressively did not feel a decrease in their test anxiety before starting their tests. The researcher concluded if these students were not prepared for the test, then expressive writing would have little if any effect on their test performance. Implications for educators are: (1)

evaluate how the institution is teaching students study skills, and (2) reserve the intervention of expressive writing for students who come to the test well-prepared but still anxious. Future studies should include a scale that measures students' study habits to see how that might correlate with test anxiety and test performance.

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CHAPTER I

INTRODUCTION

This dissertation is a report of a mixed-methods study examining test anxiety and whether expressive writing before tests can improve the test performance of underprepared College Algebra students. This chapter describes the prevalence of tests and test anxiety in America, presents the research problem and research questions, specifies the significance of the study, and provides an overview of the methodology.

The Prevalence of Tests and Test Anxiety in America

Testing is woven into the fabric of the American educational system. At the K-12 level, placement tests sort students into ability groups. Quizzes, unit tests, and final examinations affect a student's overall grade for a course, which in turn affects both course credit and grade point average (GPA). Course credit affects the timing of graduation, and GPA affects eligibility for college admission and scholarships. Other factors determining eligibility for college admission and scholarships are college entrance examinations (e.g. American College Test, Scholastic Aptitude Test). Also, students who take an Advance Placement (AP) course in high school can earn college credit for that course but only if they achieve a given score on the AP examination.

Once in college, the whole testing process begins again. At the college level, placement tests determine which mathematics course, for instance, a student can take. Again, quizzes, unit tests, and final examinations affect a student's overall grade for a course, which again affects both course credit and GPA. Course credit affects the timing of graduation, and GPA affects whether or not a student can keep a scholarship. GPA also affects eligibility for admission into graduate or professional school. Additionally,

there are the entrance examinations for graduate and professional schools (e.g. Graduate Record Examination, Miller Analogies Test, Law School Admission Test, Medical College Admission Test).

The tests listed above are only the ones that have a direct effect on an individual student's future. High-stakes standardized tests, while they certainly play a role in an individual student's future, also play a role in the future of school funding and teacher evaluation. In 1984, Hill and Wigfield warned:

> The increased use of test scores to evaluate educational programs and greater public pressure for high levels of skill learning and achievement in schools create a more pressure-laden atmosphere. This pressure also should result in more children experiencing strong debilitating anxiety. If these trends continue, the problem of anxiety may become even more serious. (p.107)

Test anxiety will be discussed further in Chapter 2, but briefly, test anxiety can manifest itself in a variety of ways: restlessness, higher pulse rate, higher blood pressure, flushing of the skin, perspiration, muscle tension, higher rate of breathing, dizziness, headache, nausea, doubts about one's ability to perform well, thoughts about the possible consequences of failing, musings about how other people are doing on the test, lack of concentration, and lack of recall (Casborro, 2003; Huberty, 2009; Morris & Liebert, 1970; I. Sarason & Stoops, 1978). In 1997, Naveh-Benjamin, Lavi, McKeachie, and Lin, who studied university students, stated as much as 35% of the student population was affected by test anxiety. But this estimate is likely low now as it pre-dates the passing of some key legislation.

The No Child Left Behind Law of 2001 (NCLB, 2002) was an attempt by the federal government to ensure that all students are proficient in reading and mathematics by the year 2014, including those who typically get *left behind* – students from every major racial or ethnic group, students from economically disadvantaged families, students with limited English proficiency, and students with disabilities. It also made a stipulation about schools making *adequate yearly progress* (NCLB, 2002) on state-defined assessments. Extreme cases may find:

> After five years of failing to make progress, in year six the district must develop a plan for significant alternative governance actions, such as allowing state takeover, hiring a private management contractor, or converting to a charter school. The district must implement the plan in year seven. (Learning First Alliance, 2002, p. 8)

As a result, there is much pressure on schools to show adequate yearly progress, which trickles down to the teachers and then the students (Cizek & Burg, 2006). Casborro (2003) testified to this when his daughter, a strong student, could not sleep the night before the new state test because she was worrying about it so much. He explained to readers in his book:

> With higher and more rigorous standards came greater accountability. With greater accountability came more tests. With more tests came more anxiety. We 'raised the bar,' developed high stakes testing, and created one of the most stress-filled learning environments in history – all in the name of higher standards. We wanted to raise achievement, but in the process we raised anxiety which, as you

will see, actually produces the opposite effect. (Casborro, 2003, p. xvi)

This confirmed Hill and Wigfield's (1984) prophecy.

In addition to the demands of NCLB, new pressures have emerged from rules and statutes at the state level regarding students' end-of-course examinations and teachers' yearly evaluations. In 2008, the Tennessee State Board of Education, for example, clarified that starting with the 2009-2010 school year:

> End-of-course examinations will be given in English I, English II, English III, Algebra I, Geometry, Algebra II, U.S. History, Biology I, Chemistry and Physics. Further, the results of these examinations will be factored into the student's grade at a percentage determined by the State Board of Education in accordance with T.C.A. §49-1-302 (2). The weight of the end-of-course examination on the student's second semester grade for the course is as follows for entering 9th graders:
>
> (i). fall of 2009 and 2010 - 20%
>
> (ii). fall of 2011 and 2012 - 25%
>
> (iii). fall of 2013 and thereafter - 25% (pp. 25-26)

The students do not have to pass these end-of-course examinations in order to graduate, as they did with the "Gateway" examinations in Algebra I, Biology I, and English II earlier in the decade (Rules of the Tennessee State Board of Education, 2012), but a single test determining 25% of a semester grade and therefore course credit and GPA could be an added burden on these students.

In regard to teachers' annual evaluations, Tennessee, as an example again, in its bid to receive money from the federal government, passed the Tennessee First to the Top

Act of 2010. Beginning with the 2011-2012 school year, 35% of a teacher's annual evaluation is tied directly to his/her students' growth measures on standardized tests (Tennessee Department of Education, 2010). In Florida, 50% of teachers' annual evaluations and consequently teacher pay are tied to students' growth measures on standardized tests (Isensee & Butrymowicz, 2011). From the 2011 report by Isensee and Butrymowicz:

> 'Depending on the age and level of students, they may not realize that their test score has a connection to a teacher's salary, but they are going to feel the effects indirectly in their schooling,' said Elisabeth Cramer, an education professor at Florida International University who has studied the effects of testing on students. 'Now that that there is going to be added emphasis from the teacher's perspective of performing well on these examinations, students are going to feel that extra pressure.' (Forecasting the Future section, para. 9)

To summarize, tests proliferate the American educational system, starting from elementary school and continuing into college. For a variety of reasons, a lot of weight is placed on test performance, and students feel this pressure.

Research Problem

As stated above, many students suffer from high test anxiety (Naveh-Benjamin, Lavi, McKeachie, & Lin, 1997). Past studies, discussed further in Chapter 2, have shown a negative correlation between test anxiety and test performance (Deffenbacher, 1977; Doctor & Altman, 1969; Hill & S. Sarason, 1966; Morris & Liebert, 1970; Rana & Mahmood, 2010; I. Sarason, 1957; I. Sarason, 1963; S. Sarason & Mandler, 1952). Fortunately, there are several interventions, which will be discussed in Chapter 2, that

both teachers and students can employ to try to alleviate students' anxiety (Beilock, 2010; Casbarro, 2003; Hill & Wigfield, 1984; Ramirez & Beilock, 2011; Zeidner, 1998). One of the newer interventions is expressive writing. In an expressive writing prompt, students are asked to write about their feelings and emotions (Pennebaker, Colder, & Sharp, 1990). The benefits of expressive writing in general will be explained in Chapter 2, but it was a series of studies by Ramirez and Beilock (2011) in particular – and their use of expressive writing immediately before a test – that prompted the present study. Details of their study will be provided in Chapter 2, but in summary, highly anxious, ninth-grade Biology students who wrote expressively about their feelings and emotions before their final examination outperformed other highly anxious students who wrote objectively (i.e. in a factual manner) about a topic from the unit they did not think would appear on the test.

The researcher of the present study was pleased to see Ramirez and Beilock's (2011) results with ninth-grade Biology students on a final examination but was curious to know if similar results would be seen with a sample of college students in mathematics over the course of a semester. In fall 2012, the researcher conducted a pilot study with College Algebra students (Sefton, 2013), the results of which will be shared in Chapter 2. In spring 2013, the researcher conducted the current study with underprepared College Algebra students. Underprepared college students will be described more in Chapter 2, but briefly, they are students who begin college underprepared for college-level work (The National Center of Educational Statistics, 2003). As will be shown in Chapter 2, underprepared college students embody many of the characteristics that can lead to the development of test anxiety. In fact, the original sample of underprepared College

Algebra students in the current study, $N_C = 108$, had a higher mean of cognitive test anxiety than the original sample of regular College Algebra students in the pilot study, $N_P = 41$. Though the groups failed Levene's test for equality of variances, $p = .040$, the independent samples *t*-test was statistically significant, $M_C = 66.41$, $SD_C = 16.30$, $M_P = 60.95$, $SD_P = 11.62$, $t(101) = -2.28$, $p = .025$. Additionally for the current study, the researcher was interested in learning how the students would react to the intervention of expressive writing before their tests. To state the research problem explicitly, can expressive writing as an intervention for test anxiety work with students who are underprepared for College Algebra?

Research Questions

This study sought to address the research problem above by answering the research questions below:

(1) Will underprepared students who write expressively about their feelings and emotions about their impending College Algebra test outperform other underprepared students who write objectively about a topic from the unit they do not think will appear on the test?

(2) How do the students react to the writing prompts? That is, what do they do when asked to write, and what do they think about the experience?

Significance of the Study

This study extends existing knowledge from Ramirez and Beilock's (2011) and Sefton's (2013) research by using expressive writing with underprepared College Algebra students immediately before their unit tests throughout the semester and before their final examination. There is a dearth of research on using expressive writing with this

population. The study also provides greater depth of knowledge about this particular intervention by examining how students react to the use of the writing prompts before their tests.

Overview of the Methodology

This section gives a brief overview of the methodology, explained fully in Chapter 3, used to answer the research questions. The research perspective was mixed methods, as it was quantitative to address the first research question and qualitative to address the second. The quantitative type was quasi-experimental, using Mann-Whitney U tests. The qualitative type was "grounded theory" in order to generate assertions, grounded in the data collected from the participants, about how they reacted to the process of writing immediately before their tests (Creswell, 2007). The participants came from six sections of College Algebra designed specifically for students who are underprepared for college-level mathematics. The six sections were taught by three instructors with two sections each: one in the intervention group (responding to the expressive writing prompt) and one in the comparison group (responding the objective writing prompt). The procedures were as follows:

- Participants completed a test anxiety measure,
- Participants did not respond to writing prompts before their first unit test,
- Each instructor's sections were randomly assigned to the intervention (expressive writing prompt) group or the comparison (objective writing prompt) group, and then they responded to their respective writing prompts immediately before all subsequent unit tests and the final examination,
- Every participant responded to a questionnaire immediately after the final

examination,

- Eighteen purposefully selected participants (three from each of the six sections) were interviewed by the researcher.

For the quantitative analyses, with each instructor individually, the researcher compared group means of achievement on instructor-made unit tests between the intervention group and the comparison group as well as between each anxiety subgroup (e.g. high anxiety subgroup from intervention group compared to high anxiety subgroup from comparison group). The three intervention sections from Instructors 1, 2, and 3 were not collapsed into one large intervention group – and likewise, the three comparison sections were not collapsed into one large comparison group – until the departmental final examination that was common to all sections. Also with each instructor individually, the researcher examined the relationships between test anxiety and test performance for each pairing of groups and anxiety subgroups. To analyze all three sets of qualitative data – the written responses to the writing prompts, the written responses to the questionnaire, and the interviews – the researcher employed triangulation and, when necessary, open coding, axial coding, and selective coding to generate a grounded theory about how the participants experience the process of writing immediately before their tests (Creswell, 2007).

Overview of the Chapters of the Study

Chapter 2 will review literature related to underprepared college students, test anxiety, and expressive writing. Chapter 3 will explain the methodology in detail. Chapter 4 will present the results of the study. Chapter 5 will summarize the results and discuss the findings.

CHAPTER II

LITERATURE REVIEW

This chapter begins by reviewing literature on the sample solicited for this study – underprepared college students. The chapter then reviews literature on the effects of test anxiety on performance and some possible strategies for dealing with test anxiety. Lastly, the chapter describes a newer intervention for test anxiety – expressive writing – and how it has been used to benefit a variety of participants thus far.

Underprepared College Students

At the university where the present study was conducted, students needing College Algebra credit for their programs of study might take the course through the Department of Mathematical Sciences or they might take it through the Department of University Studies. If a student had two years of high school algebra and either an ACT mathematics score greater than 18 or a passing score on the university placement test, then that student can take what is commonly referred to as "regular" College Algebra through the Department of Mathematical Sciences. Otherwise, the student enrolls in "prescribed" College Algebra (or perhaps a lower mathematics course) through the Department of University Studies. The prescribed College Algebra course covers the same topics and has the same final examination as the regular College Algebra course, but it meets for longer class periods. The Department of University Studies was previously known as the Department of Developmental Studies. Therefore, this section on underprepared college students includes literature on developmental or remedial education.

Definition of Developmental Education

According to Boylan (1999), many high school students do not take college preparatory courses, and of those who do, many pass the courses without learning everything they should. In regard to nontraditional (i.e. older) college students, they might not have been required to take college preparatory courses when they were in high school, and if they were, a lot of time has passed since they graduated from high school, which might lead to a reduction of what they remember from those courses (Boylan, 1999).

In the fall of 1999, a survey was conducted to create a statistical profile of 251,217 college freshmen entering 452 two-year and four-year postsecondary institutions (This Year's Freshmen, 2000). Over twenty-five percent (25.6%) felt they would need special tutoring or remedial work in mathematics (This Year's Freshmen, 2000). The National Center of Educational Statistics (NCES, 2003) defines remedial or developmental education as "courses in reading, writing, or mathematics for college-level students lacking those skills necessary to perform college-level work at the level required by the institution" (p. 1). Boylan and Bonham (2007) – the director and the senior researcher, respectively, for the National Center for Developmental Education (NCDE) – define developmental education as the "broad range of courses and services organized and delivered in an effort to help retain students and ensure the successful completion of their postsecondary goals" (p. 2). Ultimately, developmental education is a stepping stone between high school mathematics and college-level mathematics and is often required of underprepared colleges students before they can enroll in a college-level mathematics course.

Prevalence of Developmental Education

In the fall of 2000, NCES (2003) sent questionnaires to 1,242 postsecondary institutions, including public and private two-year and four-year institutions, to gauge the current status of developmental education. According to the 1,186 who responded, 76% of all postsecondary institutions offered developmental education, including 98% of public two-year institutions and 80% of public four-year institutions (NCES, 2003). These rates are high because 28% of entering freshmen enrolled in one or more developmental education course, 22% in mathematics (NCES, 2003). About two-thirds of students in developmental education attend two-year institutions, while about one-third attend four-year institutions (Boylan, 1999).

Referrals to Developmental Education

Sixty-one percent of postsecondary institutions use a placement test as their primary method for referring students to developmental education (NCES, 2003). About one-fifth of the students referred to developmental education do not enroll in any developmental course within three years (Bailey, 2009). But 81% of postsecondary institutions require their referrals to enroll in developmental courses (NCES, 2003). Four percent of postsecondary institutions give *mathematics* credit for their developmental courses, ten percent give *elective* credit, 77% give *institutional* credit – where the credits count only for housing and financial aid purposes – and ten percent give no credit at all (NCES, 2003). Seventy-two percent of the postsecondary institutions provide the developmental courses through a traditional academic department, 19% provide the courses through a developmental education department, and seven percent provide developmental education through a learning center (NCES, 2003).

Demographics of Students in Developmental Education

Hagedorn, Siadat, Fogel, Nora, and Pascarella (1999) compared students in developmental courses with students in non-developmental courses from 23 colleges (N = 1,780) and found that developmental courses had significantly more women, $\chi^2 = 13.602$, $p < .0001$, and minority students, $\chi^2 = 52.674$, $p < .0001$. In their discussion, the authors wondered if these two groups were not taking mathematics classes in high school to prepare them for college-level mathematics.

Walker and Plata (2000) studied 489 students at a four-year postsecondary institution who lacked basic algebra skills – 199 male, 290 female, 322 Caucasian, 167 African American. All participants took the first placement test – the Mathematical Association of America's basic algebra test. Those who scored above a benchmark were assigned to non-developmental courses, those who scored in the middle were assigned to Intermediate Algebra, and those who scored below another benchmark were administered a second/computation test. Those who scored above the benchmark on the computation test were assigned to Elementary Algebra, while those who scored below the benchmark were assigned to Fundamental Mathematics. Based on the proportion of African Americans in their sample – 167/489 mentioned above – the authors found that more than the expected number of African Americans took the second/computation test, $\chi^2 = 5.48$, $p < .02$ (For the benefit of the reader, when the observed count in the data does not match the expected count, a chi-square statistic will be large; if the chi-square value is large enough, then p will be less than .05; De Veaux, Velleman, & Bock, 2012). Fewer than the expected number of younger African Americans took Intermediate Algebra, while more than the expected number of younger African Americans took Elementary Algebra

and more than the expected number of older African Americans took Fundamental Mathematics, $\chi^2 = 18.88$, $p < .01$. In regard to the grades earned in these courses, African Americans had fewer As and more Cs and Ds than expected in both Fundamental Mathematics and Elementary Algebra, $\chi^2 = 15.39$, $p < .01$, $\chi^2 = 12.07$, $p < .02$, respectively. With regard to pass/fail frequencies, more than the expected number of African Americans failed Elementary Algebra, $\chi^2 = 23.23$, $p < .001$. Also, more than the expected number of females failed Elementary Algebra and Intermediate Algebra, $\chi^2 = 14.80$, $p < .05$.

The National Education Longitudinal Study of 1988 (NELS:88) followed 6,879 students who were eighth graders in the spring of 1988 until the year 2000 (Attewell, Lavain, Domina, & Levey, 2006). Attewell, Lavain, Domina, and Levey (2006) reported that when this sample entered college in the fall of 1992, 28% enrolled in developmental mathematics courses – 61% of the African Americans in the study and 35% of the Caucasians. Bailey, Jenkins, and Leinbach (2005) also reported from NELS:88 that at two-year postsecondary institutions, 76% of the African American students and 78% of the Hispanic students took developmental courses, compared to 55% of their Caucasian counterparts. At four-year postsecondary institutions as well, African American students and Hispanic students were more likely to take developmental courses than Caucasian students (Bailey, Jenkins, & Leinbach, 2005).

According to a report by Bettinger and Long (2005), public postsecondary institutions in Ohio use Computerized Adaptive Placement Assessment and Support Systems (COMPASS) by ACT, Inc. for determining referrals to developmental courses. The cutoff scores vary from institution to institution, but in the fall of 1998,

approximately 55% of the freshmen entering two-year public postsecondary institutions enrolled in developmental mathematics courses. Similar to the NELS:88 study reported above, over 75% of the African Americans at two-year public postsecondary institutions took developmental mathematics courses, compared to 55% of the Caucasians. Also, 62% of the women placed in developmental mathematics courses, compared to 54% of the men. The authors examined the students' past educational records and found that those enrolled in developmental mathematics courses had had fewer semesters of high school mathematics, lower GPAs in high school mathematics, and lower ACT sub-scores in mathematics than those enrolled in the college-level courses.

Student Success with Developmental Education

In the report by Bettinger and Long (2005), roughly two-thirds of the students actually completed their first developmental courses, and those who did complete them had had more semesters of high school mathematics, higher GPAs in high school mathematics, and higher ACT sub-scores in mathematics than those who did not complete the courses. Almost 40% of the developmental education students never took a subsequent mathematics course (Bettinger & Long, 2005). In regard to the average amount of time that students spent in developmental education, 60% of the postsecondary institutions surveyed in 2000 said less than one year, which was down from 67% in 1995; 35% said one year, which was up from 28% in 1995; and five percent said more than one year (NCES, 2003). Developmental courses can prolong a student's time in college, firstly because they have to be taken before a student can register for a college-level course and secondly because they might need to be re-taken (Bonham & Boylan, 2011).

Donovan and Wheland (2008) examined freshmen entering postsecondary institutions in Ohio in the fall of 2003 and found that 33% enrolled in developmental education. If the students' ACT sub-score in mathematics was 20 or lower, they took the COMPASS test to determine if their first mathematics class would be Basic Math I, Basic Math II, or Intermediate Algebra. The authors noticed that students taking Intermediate Algebra in the fall semester had higher COMPASS scores than those taking Intermediate Algebra in the spring semester, and students placed directly into Intermediate Algebra had a higher success rate in Intermediate Algebra than those who had been placed into a Basic Math course first. The authors also discovered that females had lower COMPASS scores than males, but females had higher success rates in Intermediate Algebra than males. Therefore, the authors concluded, students taking Intermediate Algebra in the spring semester, especially males, needed special attention.

According to Bailey (2009), only 31% of those referred to developmental education actually complete their full sequence of developmental mathematics courses. Bahr (2010) examined 63,147 developmental education students who entered 104 colleges in California in the fall of 1995 and found that within six years, only one-third of the Asians, one-fourth of the Caucasians, one-fifth of the Hispanics, and one-ninth of the African Americans attained college-level mathematics skills. Bahr (2010) observed that the lower the initial mathematics skills, then the lower the probability of successful remediation, and the lower the grade in the first mathematics course, then the lower the probability of successful remediation. According to Rosemary Karr, former president of the National Association for Developmental Education (NADE), in an interview with Diaz (2010), a study in Texas found "if a student enrolls in College Algebra immediately

after completing developmental mathematics, there is a 70% chance of success. If there is even a 1-semester delay, the rate falls to 50%" (p. 21).

Penny and White (1998) studied a sample of 1,475 developmental education students and their 44 instructors from three southern U.S. universities from the fall of 1992 through the spring of 1994. These researchers found that being a Caucasian student was positively related to student performance both when they took their last developmental course and when they took College Algebra, $r = .33$, $p < .01$, $r = .29$, $p < .01$, respectively. Being African American was negatively related to performance in both classes, $r = -.35$, $p < .01$, $r = -.32$, $p < .01$, respectively. Being a part-time student while taking the last developmental course was negatively related to performance in College Algebra, $r = -.21$, $p < .01$. Penny and White (1998) also studied faculty characteristics. Having male instructors was negatively related to student performance in both classes, $r = -.21$, $p < .01$, $r = -.11$, $p < .01$, respectively. Additionally, having a part-time instructor while taking the last developmental course was positively related to performance in the developmental course but negatively related to performance in College Algebra, $r = .35$, $p < .01$, $r = -.11$, $p < .01$, respectively. This implies that having a full-time instructor while taking the last developmental course was negatively related to performance in the developmental course but positively related to performance in College Algebra. Penny and White (1998) concluded that "part-time teachers had easier grading practices than full-time teachers" and "part timers may not have known the content of college algebra courses and, consequently, may not have emphasized content which students need in college algebra" (Effects of Teacher Attributes section, para. 5). The strongest correlation of all was between the two dependent variables – student performance in the

last developmental course and student performance in College Algebra, $r = .54$, $p < .01$. Penny and White (1998) concluded that developmental education students are most likely to be successful in College Algebra if they are Caucasian, are enrolled full-time, have full-time female instructors, and performed well in the last developmental mathematics course.

According to Attewell, Lavain, Domina, and Levey (2006), within 8.5 years, only 28% of the NELS:88 developmental education students in two-year postsecondary institutions had graduated, compared to 43% of those not in developmental education. From the same report, 52% of the NELS:88 developmental education students in four-year postsecondary institutions had graduated, compared to 78% of those not in developmental education (Attewell, Lavain, Domina, & Levey, 2006). Bailey, Jenkins, and Leinbach (2005) calculated that of the NELS:88 developmental education students in two-year public postsecondary institutions, within eight years 6.2% had earned a Certificate, 12.2% had earned an Associate's degree, 11.7% had earned a Bachelor's degree, 8.2% were still pursuing a degree at the same institution, 11.8% were still pursuing a degree at a different institution, and 50.1% were no longer enrolled anywhere. With non-developmental education students at two-year institutions, 4.7% had earned a Certificate, 15.6% had earned an Associate's degree, 20.0% had earned a Bachelor's degree, 6.3% were still pursuing a degree at the same institution, 10.1% were still pursuing a degree at a different institution, and 43.3% were no longer enrolled anywhere. Of the NELS:88 developmental education students in four-year public postsecondary institutions, within eight years 2.6% had earned a Certificate, 5.5% had earned an Associate's degree, 44.1% had earned a Bachelor's degree, 9.1% were still pursuing a

degree at the same institution, and 38.7% were no longer enrolled anywhere. With the non-developmental education students at four-year institutions, 1.7% had earned a Certificate, 2.4% had earned an Associate's degree, 70.6% had earned a Bachelor's degree, 4.6% were still pursuing a degree at the same institution, and 20.7% were no longer enrolled anywhere. As this section has shown, the success rate of students in development education is low, and there is much room for improvement.

Mathematics Anxiety

Richardson and Suinn (1972), the first to study mathematics anxiety, defined mathematics anxiety as "tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations" (p. 551). As to how mathematics anxiety can affect developmental education students, Paul Nolting, a national expert on developing learning strategies for student success in mathematics, stated in an interview with Boylan (2011):

> Math phobia and math anxiety can also influence the completion of developmental math courses. Students who have phobias or anxiety may avoid retaking a math course they failed and never get to the next level math course. This delay in taking math courses can have a negative effect on course success. Also, some students may not pass the math course due to anxiety even though they actually know the material. (p. 21)

Hembree's (1990) meta-analysis of 151 studies on mathematics anxiety discussed the correlation between mathematics anxiety and test anxiety and concluded:

> The corresponding coefficient of determination r^2 is 0.37; thus, only 37 percent of one construct's variance is predictable from the variance of the other. The

> remaining 63 percent must be attributed to other sources, factors attending one construct that are absent at the other. Hence, it seems unlikely that mathematics anxiety is purely restricted to testing. Rather, the construct appears to comprise a general fear of contact with mathematics, including classes, homework, and tests. (p. 45)

Not included in Hembree's (1990) meta-analysis, Green (1990) worked with 132 students taking remedial mathematics from three instructors at the same university and examined the influence of five predictors – student score on the mathematics portion of the SAT, student score on the university's Mathematics Placement Test (MPT), student score on the Mathematics Anxiety Scale (MAS), student score on the Test Anxiety Scale (TAS), and instructor comments on student tests – on students' final grade for the course. The researcher found the prediction equation with all five variables to be statistically significant, $R = .42$, $R^2 = .17$, $F = 3.48$, $p < .01$, indicating that:

> These variables combined accounted for 17 percent of the variability in course grades. The standardized beta weights indicated that the relative contributions of these variables in predicting course grade were as follows: The test anxiety pretest scores contributed 28 percent (Beta = -.28, $T = -2.73$, $p < .01$); MPT scores contributed 17 percent (Beta = .17, $T = 1.50$, $p > .05$); teacher comments contributed 14 percent (Beta = .14, $T = 1.31$, $p > .05$); MAS scores contributed 13 percent (Beta = -.13, $T = -1.31$, $p > .05$); and SAT-Mathematics scores contributed only 2 percent (Beta = .02, $T = .196$, $p > .05$). The test anxiety pretest scores were the best predictor of course grade. (Green, 1990, p. 329)

To summarize all of the information above on mathematics anxiety, it can affect underprepared mathematics students' completion of mathematics courses, but it is not limited to testing situations, and it does not affect course grades as much as test anxiety does. If an intervention for test anxiety could improve the test performance of underprepared college students, then maybe they would exhibit higher rates of course completion, retention, and graduation. Because the present study is focused on an intervention immediately before tests, the researcher did not make mathematics anxiety a focal point of this study.

Test Anxiety

The Origins of Research on Test Anxiety

Researchers have been studying the relationships between test anxiety and test performance for over 60 years. The first study to examine the relationships between test anxiety and test performance was published in 1952 (Mandler & S. Sarason). In the first meeting, 154 participants, who were students in an introduction to psychology course, completed a researcher-made questionnaire about how they felt before and during testing situations. The researchers used only the 101 questionnaires of nonveteran sophomores and juniors, took the 21 highest anxiety scores and the 21 lowest anxiety scores, and placed those participants into two groups – high anxiety (HA) and low anxiety (LA). Approximately three-and-a-half months later, all but nine of the 42 participants completed a series of intelligence tests a total of six times. In all six trials of Kohs Block Design Test (Design No. 13), the high anxiety group (n_{HA} = 18) exhibited a slower mean response time in seconds and larger variability in response time than the low anxiety

group (n_{LA} = 15) with statistical significance in the fourth trial, M_{HA} = 76.2, SD_{HA} = 35, M_{LA} = 58.9, SD_{LA} = 12, $t(31) = 1.86$, $p = .04$.

The same researchers published another study that year (S. Sarason & Mandler, 1952). They gave the same questionnaire on test anxiety to 492 participants, most of whom were students in an introduction to psychology course, and put the lower 30% of scorers in the low anxiety group and the upper 29% of scorers in the high anxiety group. The researchers then gathered several pieces of data from the participants' university files. In their investigation, the researchers found that, compared to the participants with low anxiety (n_{LA} = 146), those with high anxiety (n_{HA} = 141) had a lower mean score on their university's Mathematics Aptitude Test, M_{HA} = 579.6, M_{LA} = 602.8, $t(285) = 2.21$, $p = .02$, and a lower mean score on the Scholastic Aptitude Test, M_{HA} = 553.5, M_{LA} = 577.9, $t(285) = 2.44$, $p = .01$.

Other studies further investigated the associations between test anxiety and test performance. I. Sarason (1957) administered the Test Anxiety Questionnaire (TAQ; S. Sarason & Gordon,1953) to 305 participants, who were liberal arts undergraduates, and found a weak but negative correlation between the participants' TAQ scores and their scores on the university's Mathematical Aptitude Test, $r = -.20$, $p < .05$. In a later study, I. Sarason (1963) administered his Test Anxiety Scale (TAS; I. Sarason, 1958) to twelfth grade males (n_{12M} = 110), eleventh grade males (n_{11M} = 122), twelfth grade females (n_{12F} = 131), and eleventh grade females (n_{11F} = 97) and found more negative correlations, including moderate and strong ones, between the participants' TAS scores and their scores on the School and College Ability Test, $r_{12M} = -.27$, $p < .01$, $r_{11M} = -.27$, $p < .01$, $r_{12F} = -.36$, $p < .01$, $r_{11F} = -.55$, $p < .01$.

More research revealed that not only do postsecondary and secondary students exhibit the negative relationships between test anxiety and test performance, but so do elementary students. Hill and S. Sarason (1966) administered the Test Anxiety Scale for Children (TASC; I. Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960) to 179 girls in the fourth grade (G4) and later the sixth grade (G6) as well as 168 boys in the fourth grade (B4) and later the sixth grade (B6) and found moderate negative correlations between the participants' TASC scores and their test scores on the arithmetic concepts portion of the Iowa Test of Basic Skills, $r_{G4} = -.28$, $p < .001$, $r_{G6} = -.33$, $p < .001$, $r_{B4} = -.30$, $p < .001$, $r_{B6} = -.35$, $p < .001$.

By the end of the 1960s, researchers had established that there is a negative correlation between test anxiety and test performance, observed with participants at the elementary, secondary, and postsecondary levels. Later research focused more on understanding what highly anxious participants experience during testing situations and finding strategies to cope with the test anxiety.

Description of Test Anxiety

Liebert and Morris (1967) were the first to classify test anxiety into the categories of worry and emotionality; worry being the cognitive preoccupation with one's own thoughts and emotionality the bodily arousal. Multiple studies have now shown that it is worry, or cognitive test anxiety, and not emotional test anxiety that is related to test performance (Deffenbacher, 1977; Doctor & Altman, 1969; Hembree, 1988; Morris & Liebert, 1970; Rana & Mahmood, 2010; I. Sarason, 1984; Wine, 1971).

As to what happens during testing situations, Wine (1971) summarized her review of literature this way:

> Evaluative testing conditions have opposite effects on the attentional focuses of high- and low-test-anxious persons. When being evaluated, the high-test-anxious person turns his attention inward while the low-test-anxious person focuses more fully on the task. The implication is that the high-test-anxious person attends to fewer task cues than does the low-test-anxious person. (pp. 96-97)

This was supported by both Zatz and Chassin (1985), who found that high test-anxious participants reported significantly more negative self-evaluations and more off-task thoughts than low test-anxious participants, and Beilock (2010), who explained that worries can deplete working memory capacity that would otherwise be available to focus on the task at hand.

Possible Reasons for the Development of Test Anxiety

In his book, *Test Anxiety: The State of the Art,* Zeidner (1998) gives a thorough review of the literature on test anxiety. Among the many possible reasons Zeidner (1998) lists as to why some students might develop test anxiety:

- the student already has a general anxiety disorder,
- the student already has an attention-deficit disorder,
- the student has poor study skills,
- the student is a perfectionist with unrealistic expectations,
- the parents impose unreasonable expectations,
- the school and/or teacher has placed pressure to perform well on high-stakes standardized tests,
- the testing environment is distracting,
- the test is poorly constructed,

- the test is timed,
- the student has poor test-taking skills,
- the student has performed poorly in the past,
- the student has low self-esteem,
- the student has low self-efficacy,
- the student succumbs to stereotype threat(s) (e.g. females perform lower than males, or African Americans and Hispanics perform lower than Caucasians),
- the student constantly compares himself to his peers,
- the student is unmotivated, and/or
- the student feels helpless.

As shown earlier in this chapter (e.g. Bahr, 2010; Donovan & Wheland, 2008; Penny & White, 1998; Walker & Plata, 2000), underprepared college students succumb to the stereotype threats mentioned by Zeidner (1998).

Possible Strategies for Coping with Test Anxiety

Before listing some strategies that students can try for coping with test anxiety, there are several actions that teachers can take to try to optimize testing conditions. What follows in this section is a sample; the list is not exhaustive. Hill and Wigfield (1984) suggest that teachers first identify which students have high test anxiety, which can be done with one of several test anxiety measures available in the literature. They also suggest that teachers use a test format that is familiar to the students, be clear with instructions and expectations, and remove or at least alleviate time pressure (Hill & Wigfield, 1984). Zeidner's (1998) review of literature adds to that list: provide a comfortable testing environment, allow memory supports (e.g. books or notes), list test

items in order of difficulty, allow student choice on some questions (e.g. select two of the three options to answer), and allow students to write comments on the test. Paul Nolting, in his interview with Boylan (2011), also suggests teachers give practice tests and allow students with high test anxiety to take their test in a room separate from the rest of the class.

In regard to strategies that students can try for coping with test anxiety, there are several options that can be tried before or during testing situations. Zeidner (1998) lists training in study skills, training in test-taking skills, using relaxation techniques, using systematic desensitization, and employing positive self-talk. Casbarro (2003) adds to that list: exercising, deep breathing, meditating, and visualizing. Beilock (2010) suggests taking practice tests under similar testing conditions and, rather than trying to keep everything in the student's head, writing down intermediate steps to reduce cognitive load and increase working memory capacity. Beilock (2010) also suggests that students write about their feelings and emotions about a test immediately before the test begins.

Expressive Writing

The act of expressing emotions has been beneficial to both physical health and mental health (Smyth, 1998). One way to express emotions is through writing (Smyth, 1998).

Early Research on How Expressive Writing Affects the Body

Citing previous work by Pennebaker and O'Heeron (1984) and Pennebaker and Hoover (1986), Pennebaker and Beall (1986) assumed that suppressing thoughts and feelings over a long period of time can increase stress and stress-related diseases and therefore hypothesized that confronting thoughts and feelings, perhaps through writing,

could decrease stress and stress-related diseases. Pennebaker and Beall (1986) assigned subjects to one of four writing conditions and examined long-term effects on health. The writing sessions occurred for 15 minutes each evening for four consecutive evenings. Subjects in the control condition (n_c = 12) described as objectively as possible: their living room at home, the shoes they were wearing, a tree, and the room they were currently sitting in. Subjects in the other three conditions all wrote about a personal trauma but in three different ways. Subjects in the trauma-fact condition (n_{tf} = 11) described the event as objectively as possible without including any emotions. Subjects in the trauma-emotion condition (n_{te} = 12) described their feelings surrounding the event without describing the event itself. And subjects in the trauma-combination condition (n_{tc} = 11) described both the event and their feelings about the event. The subjects in the trauma conditions could write about the same event in each writing session or different events. Four months later, the changes in the number of illnesses reported by subjects in the trauma-emotion condition (M_{te} = -0.73) and the trauma-combination condition (M_{tc} = -0.60) were both significantly different ($p < .05$) from the changes reported by subjects in the trauma-fact condition (M_{tf} = 0.10) and the control condition (M_c = 0.18). The subjects also answered the question "Looking back on the experiment, do you feel it has had any longlasting effects?" (Pennebaker & Beall, 1986, p. 279). One trauma-combination subject replied with, "If one writes down things that worry one, there is a tendency to feel better," and one trauma-emotion subject said, "It helped to write things out when I was tense, so now when I'm worried I sit and write it out…later I feel better" (Pennebaker & Beall, 1986, p. 279).

Smyth (1998) conducted a research synthesis of 13 studies and concluded, "participants assigned to write about any trauma (past or current) had physiological outcomes superior to those of participants assigned to write about only past traumas" (p. 181). In a similar fashion, "participants writing about only current traumas had well-being outcomes superior to those of participants instructed to write about any trauma (either past or current)" (Smyth, 1998, p. 181).

One example of a current trauma for college freshmen is the process of leaving home and starting college. Pennebaker, Colder, and Sharp (1990) asked one group of college freshmen to write expressively – that is, write about their feelings and emotions – in regard to leaving home and coming to college. The researchers had another group of college freshmen write about their day as objectively as possible without any feelings or emotions. The writing sessions occurred for 20 minutes each day for three consecutive evenings. Within the five months after the writing sessions, those who had written expressively about their feelings and emotions about starting college had fewer illness visits to the health center than those in the other group with marginal significance, $F(1, 116) = 3.84$, $p = .05$.

Pennebaker and Francis (1996) also asked one group of college freshmen to write expressively about leaving home and coming to college and another group to write about any object or event of their choosing as objectively as possible. The writing sessions occurred for 20 minutes each day on three consecutive days. Two months after the writing sessions ended, those who had written expressively about their feelings and emotions about college again had fewer illness visits to the health center than those in the other group, this time with statistical significance, $t(70) = 2.21$, $p < 0.05$.

Later Research on How Expressive Writing Affects the Mind

Not only has expressive writing shown positive results with physical health, but it has also shown positive results with cognitive function. Cameron and Nicholls (1998) asked one group of college freshmen to write expressively about coming to college and another group to write about their day as objectively as possible, as well as a third group to first write expressively about starting college and secondly list three coping strategies for dealing with any problems mentioned. The writing sessions occurred early in the semester for 15-20 minutes each day for three days spaced a week apart. The researchers found that the mean semester GPA (with SAT scores entered as a covariate) for the first group ($M = 2.99$, $SD = 0.53$) was significantly higher than the mean GPAs for the second ($M = 2.68$, $SD = 0.60$) and third ($M = 2.54$, $SD = 0.65$) groups, $F(2, 115) = 5.66$, $p < .01$.

Klein and Boals (2001) also asked college freshmen to either write expressively about leaving home and coming to college or write about their day as objectively as possible. The writing sessions occurred for 20 minutes each day for three days spaced about a week apart. Seven weeks after writing, the participants who had written about their feelings and emotions showed improvements in working memory capacity compared to the participants who had written objectively, $F(1, 63) = 7.49$, $p < .01$. In a second experiment, Klein and Boals (2001) again conducted writing sessions for 20 minutes each day for three days spaced about a week apart and found that participants who had written about their feelings and emotions in regard to a negative experience showed improvements in working memory capacity after eight weeks compared to both participants who had written about their feelings and emotions in regard to a positive

experience and participants who had written about their day objectively, $F(2, 90) = 3.30$, $p < .04$.

Yogo and Fujihara (2008) also conducted writing sessions with college freshmen for 20 minutes each day for three days spaced about a week apart. Five weeks after the third writing session, the researchers found the participants who had written expressively about coming to college showed improvements in working memory capacity compared to both participants who had written about their day objectively and participants who had written about their best possible selves, $F(4, 222) = 2.44$, $p < .05$.

Frattaroli, Thomas, and Lyubomirsky (2011) found that pre-medicine and pre-law students who, nine days prior to taking the MCAT or LSAT, had written expressively about their upcoming examination performed better ($M = 58^{th}$ percentile and $M = 43^{rd}$ percentile, respectively) than participants who had written about their day objectively ($M = 46^{th}$ percentile and $M = 23^{rd}$ percentile, respectively), p = .024.

Ramirez and Beilock (2011) found first in a laboratory that participants who, immediately before taking a test on modular arithmetic, had written expressively about the impending test performed better than both participants who did not write at all and participants who had written about their previous day objectively, $F(2,44) = 5.56$, $p < .01$. These researchers later found in the field that ninth grade Biology students with high cognitive test anxiety (CTA) who, immediately before taking their final examination, had written about their feelings and emotions about the impending examination performed better than other students with high CTA who had written objectively about a topic they did not think would be covered on the examination, $t(52) = 2.08$, $p < .05$. Students with low CTA performed similarly, regardless of their writing group, $t(50) = .09$, $p = .93$.

Also, when examining the relationship between CTA and test performance, there was a strong, negative correlation within the group who had written objectively about a topic not on the test, $r(56) = -.51$, $p < .01$, but no correlation within the group who had written expressively about their feelings and emotions, $r(50) = -.14$, $p = .33$. As to why there was a difference in correlations, the authors concluded:

> If [expressive] writing alleviates the impact of worries on performance . . . then writing about one's worries may allow those higher in test anxiety to perform up to the level of low-test-anxious students, eliminating the relation commonly seen between test anxiety and performance (p. 213).

The last study listed by Ramirez and Beilock (2011) intrigued this researcher. If expressive writing helped highly test-anxious, ninth-grade Biology students in one session, could similar results be achieved with highly test-anxious College Algebra students in multiple sessions? In fall 2012, the researcher conducted a pilot study with two sections (i.e. classes) of regular College Algebra taught by the same instructor at a large, public university in the southeastern United States (Sefton, 2013). For the first unit test, neither section did any writing beforehand. Before the second and third unit tests, one section, called Writing Group A ($n_A = 16$), responded to an expressive writing prompt that asked them to write as openly as possible about their feelings and emotions about their impending unit test. The other section, called Writing Group B ($n_B = 15$), responded to an objective writing prompt that asked them to write in a factual manner about a topic from the unit they did not think would be covered on the test. Table 1 displays the mean scores for the unit tests by writing group. Test scores were not normally distributed for Writing Group A or Writing Group B on Unit Test 1 or Unit Test

3, as assessed by Shapiro-Wilk's test of normality, $p < .05$. Therefore, groups were compared with Mann-Whitney U tests. Groups did not differ on CTA, $M_A = 58.88$, $SD_A = 11.11$, $M_B = 61.27$, $SD_B = 9.98$, $p = .654$. Table 2 displays the Spearman's correlations between CTA and test performance.

Table 1
Mean scores for unit tests by writing group

	All		High Anxiety		Low Anxiety	
	A	B	A	B	A	B
Test	(*n*=16)	(*n*=15)	(*n*=8)	(*n*=8)	(*n*=8)	(*n*=7)
1	79.94	80.33	75.13	75.63	84.75	85.71
	(13.29)	(12.07)	(16.92)	(14.83)	(6.27)	(4.46)
2	74.88	70.87	67.88	65.38	81.88	77.14
	(16.21)	(20.92)	(13.41)	(24.33)	(16.46)	(15.64)
3	76.81	78.80	72.88	73.50	80.75	84.86
	(12.93)	(14.39)	(15.97)	(17.60)	(8.23)	(6.47)

Note. A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B

Table 2
Spearman's correlations between CTA and test performance

	A	B
Test	(*n*=16)	(*n*=15)
1	-0.217	-0.358
2	-0.319	-0.186
3	-0.252	-0.241

Note. CTA = cognitive test anxiety; A = group responding to Writing Prompt A; B = group responding to Writing Prompt B.

Though not statistically significant, the expressive Writing Group A did achieve a higher average than the objective Writing Group B on the first use of the writing prompts before

Unit Test 2. One possible reason for the lack of statistical significance could be the small sample size. Perhaps the expressive writing prompt lost its effect in its second use before Unit Test 3, but with a small sample size, it was difficult to conclude decisively.

Chapter Summary

As presented in this chapter, some reasons why students develop test anxiety include: the student has performed poorly in the past, the student has low self-esteem, the student has low self-efficacy, the student succumbs to stereotype threat(s) (e.g. females perform lower than males, or African Americans and Hispanics perform lower than Caucasians), the student constantly compares himself to his peers, and/or the student feels helpless (Zeidner, 1998). Additionally, prior research used expressive writing to improve physical health and mental processes, including test performance. However, there is a dearth of research using expressive writing to improve test performance with underprepared college students. If expressive writing can help underprepared college students perform better on their tests, then perhaps grades, retention rates, and graduation rates will improve. Chapter 3 will describe the methodology in detail.

CHAPTER III

METHODOLOGY

The literature review in Chapter 2 included descriptions of previous studies using expressive writing before tests, namely the work of Ramirez and Beilock (2011) and the pilot study conducted by this researcher (Sefton, 2013). The Ramirez and Beilock study did not address a college-age population, and this researcher's pilot study did not have a large sample or any qualitative data. Therefore, the research questions for this study, as stated in Chapter 1, follow:

(1) Will underprepared students who write expressively about their feelings and emotions about their impending College Algebra test outperform other underprepared students who write objectively about a topic from the unit they do not think will appear on the test?

(2) How do the students react to the writing prompts? That is, what do they do when asked to write, and what do they think about the experience?

This chapter describes in detail the methodology used to address the above research questions. It first explains the research design, followed by descriptions of the research site, participants, instruments, data collection, and data analyses.

Research Design

The research perspective was mixed-methods. It was primarily quantitative to address the first research question of whether the intervention group (sections responding to expressive Writing Prompt A) would outperform the comparison group (sections responding to objective Writing Prompt B). Due to violations in normality, as well as the presence of outliers, groups were compared with Mann-Whitney U tests. It was

secondarily qualitative to address the second research question of how students react to the writing prompts: What do they do when asked to write, and what do they think about the experience? The qualitative data also provided support for why the intervention did or did not work with this sample. Due to the context of the study, the participants could not be randomly selected for the sample; rather, it was a sample of convenience. Therefore, the quantitative research type was quasi-experimental with a subtype of nonequivalent groups. The qualitative research type was grounded theory in order to generate assertions, grounded in the data collected from the participants, about how they reacted to the process of writing immediately before their tests (Creswell, 2007).

Research Site

The study took place in spring 2013 at a large, public university in the southeastern United States. At one time, the university offered institutional credit for developmental courses in mathematics, reading, writing, and study skills through a Department of Developmental Studies (M. S. Lucas, personal communication, February 21, 2014). But in 2005, the department decentralized. Therefore, faculty from the Department of Developmental Studies met with faculty from the appropriate academic departments and designed new courses called “prescribed” courses. The prescribed courses in writing and reading were initially taught by faculty from the English Department, but recently the prescribed course in reading returned to its former department, now called the Department of University Studies. Faculty members in the Department of University Studies also teach the prescribed courses in mathematics and in study skills. In regard to the prescribed courses in mathematics, the course called Basic Mathematics, which was formerly taught by the university’s faculty, is now taught by

only community college faculty. Instead of offering Elementary Algebra, the university designed a new course called Essentials of Mathematics. Instead of offering Intermediate Algebra, the university started offering prescribed versions of Mathematics for General Studies and College Algebra (and later Applied Statistics). These prescribed versions cover the same topics as the regular versions, but they meet for longer class periods.

According to the university's Office of Institutional Effectiveness, Planning, and Research, in spring 2013, the university had a total of 23,022 students. Females made-up 54% of the entire student body, and males made-up 46%. The ethnic make-up of the entire student body was 68.8% White, 18.6% African American, 4.1% Asian, 3.8% Hispanic, 0.3% American Indian, and 0.1% Pacific Islander. Two and five-tenths percent specified "two or more races," and 1.8% did not specify anything. The average age of all students was 25 with 20.6% being under 21 and 79.4% being 21 or over. Full-time students made-up 71.8% of the entire student body, and part-time made-up 28.2%.

According to the university's Department of University Studies (M. S. Lucas, personal communication, February 19, 2014), in spring 2013, the university had 1,384 students enrolled in prescribed courses. Females made-up 54% of the students enrolled in prescribed courses, and males made-up 46%. According to the 1,158 who reported their ethnicity, the ethnic make-up of the students enrolled in prescribed courses was 41% White, 33% African American, and 26% other. As to the age distribution of the students enrolled in prescribed courses, 58% were under 21 and 42% were 21 or over. Full-time students made-up 87% of the students enrolled in prescribed courses, and part-time students made-up 13% of the students enrolled in prescribed courses.

Participants

The researcher wanted each instructor involved in the study to have one section of prescribed College Algebra in the intervention (expressive writing) group and one section of prescribed College Algebra in the comparison (objective writing) group. Therefore, the study involved instructors who had two sections of prescribed College Algebra. Finding sufficient instructors with two sections of prescribed College Algebra to participate in the study was a challenge.

The sections used in the pilot study were regular College Algebra classes. But regular College Algebra classes taught at this university typically meet on either (a) Mondays, Wednesdays, and Fridays for 55 minutes each day or (b) Tuesdays and Thursdays for 85 minutes each day. Because the researcher wanted to give the participants ten minutes to respond to the writing prompts, and because the researcher did not want to cut into the test time of these Monday/Wednesday/Friday classes, they were not an option for this study. And at the time the study was being designed, the tentative schedule had only one or two instructors on Tuesday/Thursday with two sections of regular College Algebra.

The prescribed College Algebra classes taught at this university typically meet on either (a) Mondays, Wednesdays, and Fridays for 75 minutes each day or (b) Tuesdays and Thursdays for 110 minutes each day. In either case, a 10-minute writing prompt would not cut into test time. At the time the study was being designed, the tentative schedule had eight instructors with two sections of prescribed College Algebra. After contacting all eight, three of them agreed to participate in the study. Therefore, the sample for this study consisted of three instructors teaching two sections each – one in

the intervention (expressive writing) group and one in the comparison (objective writing) group – or six sections total – three in the intervention group and three in the comparison.

In the third week of classes, the researcher met with all six sections of prescribed College Algebra involved in the study to explain the study and to invite students to participate. When the researcher met with each section, the researcher told the students that their instructor would administer a ten-minute writing prompt to all the students before their unit tests and final examination. Different classes would be responding to different writing prompts, and the researcher was interested in comparing class averages after each test to see if there were any differences. But the instructor could not share the students' test scores with the researcher unless the students granted permission to do so. The students could grant permission by signing a consent form. The researcher reiterated that every student in the section would already be responding to a 10-minute writing prompt before tests regardless; the consent form was simply granting permission for the instructor to share the student data with the researcher. The researcher also told them that the students' names would be removed from the data. The researcher gave every student a consent form to read and allowed time for students to ask the researcher questions about the study. The instructor then collected the papers from every student, whether the consent form was signed or unsigned, and gave the researcher only the consent forms that were signed. Therefore, the "participants" of this study were the students who signed the consent form, giving permission for their instructor to share their data with the researcher. Of the 138 students enrolled in these six sections, only 108 signed the consent form. Therefore, the original sample size was $N = 108$, but 19 participants did not complete the course. The complete participant flow will be fully explained in

Chapter 4, but the demographics of the 89 participants who completed the course are provided in Table 3. As with the pilot study, each instructor had one section designated as the intervention group to respond to expressive Writing Prompt A (see Appendix B), which asked the students to write as openly as possible about their feelings and emotions about their impending test. The instructor's other section was designated as the comparison group responding to objective Writing Prompt B (see Appendix C), which asked the students to write objectively about a topic from the unit they did not think would be covered on the test. The designation of the participants as being in the expressive Writing Group A or the objective Writing Group B hinged on which section they were in and therefore which prompt they received, not how they actually wrote in response to the prompts.

Table 3

Demographics of participants who completed the course

	1		2		3		All		
	A	B	A	B	A	B	A	B	Total
Gender									
Male	5[a]	4	7	7	14	9	26	20	46
	38.5[b]	50.0	53.8	50.0	60.9	50.0	53.1	50.0	51.7
Female	8	4	6	7	9	9	23	20	43
	61.5	50.0	46.2	50.0	39.1	50.0	46.9	50.0	48.3
Ethnicity									
White	5	5	6	6	11	11	22	22	44
	38.5	62.5	46.2	42.9	47.8	61.1	44.9	55.0	49.4
African	8	2	4	6	12	7	24	15	39
American	61.5	25.0	30.8	42.9	52.2	38.9	49.0	37.5	43.8
Asian	0	0	3	1	0	0	3	1	4
	0.0	0.0	23.1	7.1	0.0	0.0	6.1	2.5	4.5
Hispanic	0	1	0	1	0	0	0	2	2
	0.0	12.5	0.0	7.1	0.0	0.0	0.0	5.0	2.2
Mean Age	22	27	22	21	19	21	21	22	21
Mean CTA	65.38	59.50	60.62	65.86	70.13	68.56	66.35	65.80	66.10

Note. 1 = Instructor 1; 2 = Instructor 2; 3 = Instructor 3; A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B; CTA = cognitive test anxiety.

[a]Raw counts.

[b]Percentages.

Instruments

Quantitative

To measure each participant's level of cognitive test anxiety (CTA), the researcher used the Cognitive Test Anxiety Scale (CTAS), published fully by Cassady in 2004 (see Appendix A). Cassady and Johnson (2002) showed that the CTAS is both reliable and valid. Cassady (2001) also found that, without any interventions, cognitive test anxiety stays relatively stable over the course of a semester. Therefore, it does not

need to be administered on the first day of class and can be administered a few weeks into a semester.

The sources of the test scores were instructor-made unit tests and the departmental final examination. Though it would have been more consistent for the three instructors involved in the study to use the same unit tests and administer them on the same day, the researcher honored their academic freedom to create their own unit tests and administer them when they saw fit. The researcher was still able to compare means between each instructor's sections. Then with the departmental final examination, the researcher combined all the intervention sections into one large intervention group and all the comparison sections into one large comparison group.

The writing prompts used immediately before the tests were adaptations of the writing prompts used by Ramirez and Beilock (2011) (see Appendices B and C). In all analyses, the data from the intervention/expressive sections are labeled with the letter A, and the data from the comparison/objective sections, B. Consequently, the intervention sections received Writing Prompt A, which asked them to write as openly as possible about their feelings and emotions about their impending test, and the comparison sections received Writing Prompt B, which asked them to write objectively about a topic from the unit they did not think would be covered on the test. But the prompts were not labeled with any letter when the students received them.

Qualitative

The writing prompts not only served as the independent variable for the quantitative analyses, but the participants' written responses to the prompts were analyzed as well. These artifacts served as part of the qualitative data collected to see

how the participants reacted to the writing prompts. Another part of the qualitative data collected to see how the participants reacted to the writing prompts was a questionnaire administered to all participants after their final examination (see Appendix D). The last piece of qualitative data collected to see how the participants reacted to the writing prompts was transcriptions of audio-recorded interviews (see Appendix E) with some purposefully selected participants. From each section, the researcher interviewed the participant with the highest CTA, the participant with the lowest CTA, and the participant with the median CTA.

Data Collection

Quantitative

Cognitive test anxiety measures. As stated above, the researcher visited the six sections of prescribed College Algebra involved in the study during the third week of classes. Before explaining the details of the study, the instructor administered a so-called "survey" – the CTAS – to all the students. After the students had completed the survey, the researcher displayed the consent form on an overhead projector, one paragraph at a time, and discussed it with the students. The researcher explained that their instructor would administer the following to all the students: (a) a survey regarding test anxiety, which by this point they had already completed, (b) a 10-minute writing prompt immediately before the second and subsequent unit tests and before the final examination, and (c) a questionnaire immediately after the final examination. The instructor would not administer a writing prompt before the first unit test. The researcher also explained to the students that for this study, the researcher was seeking their consent to access and analyze their data (i.e. their demographics, their responses to the test

anxiety survey, their responses to the writing prompts, their scores on the unit tests and final examination, and their responses to a questionnaire), as well as ask a few of them for interviews after the final examination, so that the researcher could study the effects of responding to writing prompts before tests in prescribed College Algebra. The researcher reiterated to the students that the instructor would administer the writing prompts and the questionnaire to all the students, as had already been done with the survey that day, but the researcher would analyze the data of only those who sign the consent form. The researcher assured the students that the names of those who sign the consent form, a.k.a. the "participants" of the study, would be removed from all their data to keep their participation in the study confidential. The researcher then opened the floor for questions as the researcher distributed blank consent forms to all the students. After the students finished asking the researcher questions, the instructor walked around the room and collected each student's survey and consent form, whether signed or unsigned. In an effort to maintain the confidentiality of which students signed the consent form to share data with the researcher and which did not, the researcher asked the students to place the consent form underneath the survey as they submitted their documents. The instructor then gave the researcher the consent forms and surveys of only the participants (i.e. the students who had signed the consent form to share their data).

Test scores. After meeting with both sections taught by a particular instructor, the researcher flipped a fair coin, under the supervision of a witness, to determine which of an instructor's sections would be in the intervention group. The researcher then put all the participants' names into a spreadsheet that could be used by the instructor to send the researcher scores after the unit tests and final examination. Next, the researcher created

another spreadsheet of the participants' names and randomly assigned numbers to each participant. The researcher also created a spreadsheet that listed the participants' numbers in one column and all their categorical and quantitative data in the following columns (i.e. their demographics, their CTAS measures, and, as the semester went on, their scores from the unit tests and final examination).

Qualitative

Written responses to the writing prompts. The researcher provided enough hardcopies of both writing prompts for every instructor so that each instructor could administer the appropriate writing prompt to all the students in the appropriate section immediately before the second and subsequent unit tests and before the final examination. On each test day, the students were given 10 minutes to respond to the writing prompts. The students then submitted their responses to their instructor and received the unit test or final examination. The instructor later pulled-out the responses of only the participants in the study and mailed those papers to the researcher.

Written responses to the questionnaire. The researcher also provided enough hardcopies of the questionnaire for every instructor so that each instructor could administer the questionnaire to all the students in each section immediately after the final examination. The instructor later pulled-out the responses of only the participants in the study and mailed those papers to the researcher.

Interviews. Prior to the week of final examinations, the researcher selected the interviewees by identifying which three participants in each section had the highest CTA, the lowest CTA, and the median CTA, as measured by the CTAS earlier in the semester. If there was a tie within a section for the highest CTA, the lowest CTA, or the median

CTA, then the interviewee for that category was selected by a coin toss. The researcher emailed these participants – three from each of the six sections for a total of eighteen interviewees – a week before examination week to request a short interview after leaving the classroom on examination day, for which they would receive a five-dollar gift card. One potential interviewee officially declined due to the need to leave for work immediately after the examination and questionnaire. A few potential interviewees never responded to the initial or follow-up invitations, so the researcher moved to the next closest person on the list of CTA measures until the researcher received a response of acceptance. This led the "highest" CTA from section 1B to be a 64, which was actually *below* the full sample median of 65.5. The "median" CTA from this section was a 58. Similarly, the lack of responses from section 2A led the "lowest" CTA to be a 65. The "median" CTA from this group was a 69.

On examination day but before the examination started, the researcher found a quiet area near the classroom to later conduct the interviews, and on the classroom whiteboard the researcher wrote a general note to the interviewees, explaining where they could find the researcher after leaving the classroom. As each interviewee found the researcher, the researcher administered the interview protocol, making an audio recording of the interview, and the researcher later transcribed the interview. For some reason, none of the interviewees from section 2A could find the researcher, even though the researcher had already had success with the same location for sections 3A and 3B. Therefore, the researcher emailed the interview protocol to the interviewees from section 2A, they emailed their responses to the researcher, and the researcher emailed electronic gift cards to them. Before the final examination for section 2B, the researcher made

certain to explain to Instructor 2 where those interviewees could find the researcher, and they did.

Data Analyses

Quantitative

For each instructor after each unit test, the researcher found the group mean of the participants in each section and compared the two group means. That is, for Instructor 1 after Unit Test 1, the researcher found the mean of the scores of the participants in Section A, found the mean of the scores of the participants in Section B, and compared the two group means. The researcher repeated the process for all instructors and for all unit tests. After the departmental final examination, the researcher found the mean of the scores of the participants in all the A sections, found the mean of the scores of the participants in all the B sections, and compared the two group means. For each pairing listed above, the researcher included further comparisons of participants with high CTA scores in Section A to participants with high CTA in Section B and participants with low CTA in Section A to participants with low CTA in Section B.

Also for each instructor's section after each unit test, the researcher examined the relationship between the participants' CTA measures and the participants' test scores and compared A sections with B sections. After the departmental final examination, the researcher examined the relationship between the participants' CTA measures and the participants' test scores for the participants in all the A sections and for the participants in all the B sections and compared.

Qualitative

With the qualitative data – the written responses to the writing prompts, the written responses to the questionnaire, and the interviews – the researcher employed triangulation to look for common themes. In the *Encyclopedia of Social Science Research Methods*, Bryman (2003) explains, "Triangulation has come to assume a variety of meanings, although the association with the combined use of two or more research methods within a strategy of convergent validity is the most common" (p. 1143). Bryman (2003) gives the use of a questionnaire and an observation as an example of the "between-method" version of "methodological triangulation" (p. 1142). Additionally, the researcher used the systematic approach for analyzing data in grounded theory: first open coding, then axial coding, and lastly selective coding (Creswell, 2007). With open coding, a researcher codes the data for its major categories. Axial coding is choosing one open coding category to focus on – referred to as the core phenomenon – and returning to the data to find categories that center around the core phenomenon. In selective coding, the researcher connects the categories from the axial coding together and develops a theory in the form of a narrative statement or a set of hypotheses. This researcher will fully explain the details of her systematic approach in the following chapters.

Chapter Summary

This chapter presented the methodology of the study. It began by describing the research design and the research site. It then described the study's participants, instruments, data collection, and data analyses. Chapter 4 will present the results of the study.

CHAPTER IV

RESULTS

This study examined how expressive writing before tests in prescribed College Algebra classrooms affected test performance. The results, reported in this chapter, are organized around the two research questions:

(1) Will underprepared students who write expressively about their feelings and emotions about their impending College Algebra test outperform other underprepared students who write objectively about a topic from the unit they do not think will appear on the test?

(2) How do the students react to the writing prompts? That is, what do they do when asked to write, and what do they think about the experience?

The quantitative results addressing question one are reported first. The qualitative results related to the participants' reactions to the writing prompts based on their written responses to the writing prompts, written responses to the questionnaires, and interviews are reported second.

Quantitative

Quantitative data were collected to address the first research question (Will underprepared students who write expressively about their feelings and emotions about their impending College Algebra test outperform other underprepared students who write objectively about a topic from the unit they do not think will appear on the test?). The quantitative results are reported in this section.

Sample Size

The original sample for this study was *N* = 108. As shown in Table 4, the final sample in regard to analyzing test performance became *N* = 64.

Table 4

Participant flow in regard to test performance

Writing Group	Eligible	Gave Consent	Stopped Attending	Had Missing Test Score(s)	Did Not Respond to Writing Prompt(s)	Final Sample
1A	22	18	5	3	0	10
1B	24	13	5	2	0	6
2A[a]	22	18	5	1	5	7
2B[a]	23	16	2	2	0	12
3A[b]	25	23	0	7	2	14
3B[b]	22	20	2	1	2	15
Total	138	108	19	16	9	64

Note. 1 = Instructor 1; 2 = Instructor 2; 3 = Instructor 3; A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B.

[a]Instructor 2's Unit Test 5 was not included in the quantitative analysis. See text for explanation.

[b]Instructor 3 accidentally switched the writing prompts on Unit Test 4, but not all participants noticed the change in instructions. See text for explanation of subgroups.

As shown in Table 4, 19 participants stopped attending their prescribed College Algebra classes. Of those, three officially withdrew from the course through the university's withdrawal process and received grades of *W*, which did not affect the students' GPAs. The other 16 did not officially withdraw and therefore received grades of *F*, which did affect the students' GPAs. Some of the participants who remained in the course had one or more missing test scores due to being absent on test days and never making-up the

tests because their instructor either dropped the lowest test grade completely or replaced the lowest test grade with the grade from the final examination if higher. Some other participants did take the tests but for unknown reasons did not always respond to the writing prompts beforehand. Participants with missing test scores or missing responses to the writing prompts were excluded from the analyses conducted on test performance so that the final groups included only those participants who had completed all the tests and also responded to all the writing prompts beforehand.

Issues with Two Particular Unit Tests

Instructor 2's Unit Test 5 was a take-home test. Instructor 2 included copies of the writing prompts with the tests with the understanding that the participants would complete the writing prompts before completing the tests. But about one-third of the participants taking Instructor 2's Unit Test 5 did not respond to the writing prompt at all or did so *after* the test or received the wrong prompt. Due to the nature of the testing environment at home being different from the testing environment in class and due to the inconsistencies listed above, Instructor 2's Unit Test 5 was excluded from the quantitative analyses on test performance.

Instructor 3 accidentally switched the writing prompts before Unit Test 4. That is, the group that had been responding to Writing Prompt A received Writing Prompt B instead, and vice versa. But not everyone noticed the difference in instructions; nine "3A" participants, who had written about their feelings and emotions before Unit Test 2 and Unit Test 3, continued to write about their feelings and emotions before Unit Test 4, despite receiving instructions to write objectively about a topic from the unit they did not think would be on the test. Likewise, three "3B" participants, who had written

objectively about a topic from the unit before Unit Test 2 and Unit Test 3, continued to do so before Unit Test 4, despite receiving instructions to write about their feelings and emotions. Therefore, in the quantitative analyses for Instructor 3's Unit Test 4, presented in Table 7 and Table 10, the researcher compared: (1) the usual groupings for 3A and 3B, (2) the accidental groupings that occurred on this test (i.e. everyone who wrote about feelings and emotions were grouped together as "A" no matter which section they were in), and (3) the subset of participants who wrote about the same thing throughout the entire semester. Instructor 3 did administer the writing prompts to their usual groups before Unit Test 5, Unit Test 6, and the final examination.

Test Scores

For research question one (Will underprepared students who write expressively about their feelings and emotions about their impending College Algebra test outperform other underprepared students who write objectively about a topic from the unit they do not think will appear on the test?), the null hypothesis was H_0: $\mu_A = \mu_B$, and based on prior research (Ramirez & Beilock, 2011; Sefton, 2013), the alternative hypothesis was H_A: $\mu_A > \mu_B$. Tables 5, 6, and 7 display the mean scores for each instructor's test by writing group. Test scores were not normally distributed for Instructor 1's Writing Group A on Unit Test 6 or Instructor 3's Writing Groups A or B on Unit Test 6, as assessed by Shapiro-Wilk's test of normality, $p < .05$. Due to these violations in normality, as well as the presence of outliers, groups were compared with Mann-Whitney U tests. Also, it should be noted that there were no statistically significant group differences in cognitive test anxiety (CTA) with any pairings of writing groups, $M_{1A} = 66.20$, $SD_{1A} = 13.07$, $M_{1B} =$

62.83, SD_{1B} = 18.56, p = .713, M_{2A} = 65.43, SD_{2A} = 25.66, M_{2B} = 67.75, SD_{2B} = 14.02, p = .837, M_{3A} = 69.00, SD_{3A} = 12.16, M_{3B} = 69.33, SD_{3B} = 16.29, p = .747.

Table 5

Mean scores for Instructor 1's tests by writing group

Instructor 1's Test	A (n=10)	B (n=6)
Unit Test 1*	89.50 (14.30)	63.67 (26.82)
Unit Test 2	77.90 (7.02)	65.33 (19.45)
Unit Test 3	72.10 (15.70)	66.67 (24.11)
Unit Test 4	73.10 (15.05)	67.00 (22.67)
Unit Test 5	73.10 (20.07)	59.17 (27.49)
Unit Test 6	95.00 (9.08)	77.50 (24.76)
Final Exam[a]	61.75 (11.73)	55.42 (13.73)

Note. A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B.

[a]The Final Exam was a departmental examination common to all sections of this course.

*p < .05, two-tailed.

Table 6

Mean scores for Instructor 2's tests by writing group

Instructor 2's Test	A (*n*= 7)	B (*n*= 12)
Unit Test 1	88.71 (13.50)	89.33 (9.20)
Unit Test 2	82.43 (9.27)	82.50 (12.36)
Unit Test 3	77.14 (24.12)	84.67 (12.75)
Unit Test 4	66.00 (22.49)	78.50 (14.30)
Unit Test 6[a]	102.64 (8.65)	96.71 (9.77)
Final Exam[b]	58.21 (11.79)	61.46 (17.82)

Note. A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B.

[a]Instructor 2's Unit Test 5 was not included in the quantitative analysis. See text for explanation.

[b]The Final Exam was a departmental examination common to all sections of this course.

Table 7

Mean scores for Instructor 3's tests by writing group

Instructor 3's Test	A (n=14)	B (n=15)
Unit Test 1	76.21 (14.33)	77.27 (19.25)
Unit Test 2	74.57 (15.53)	83.47 (10.84)
Unit Test 3	75.50 (16.35)	81.13 (17.80)
Unit Test 4[a]		
usual grouping (n_A = 14, n_B = 15)	74.86 (15.72)	77.00 (20.98)
grouping on test (n_A = 21, n_B = 8)	74.71 (17.15)	79.25 (22.05)
same grouping (n_A = 9, n_B = 3)	71.78 (13.00)	77.33 (29.70)
Unit Test 5	64.43 (18.25)	71.13 (21.05)
Unit Test 6	85.29 (21.41)	91.07 (12.07)
Final Exam[b]	60.18 (12.50)	64.33 (14.03)

Note. A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B.

[a]Instructor 3 accidentally switched the writing prompts on Unit Test 4, but not all participants noticed the change in instructions. See text for explanation of subgroups.

[b]The Final Exam was a departmental examination common to all sections of this course.

With Writing Group A collapsed among all three instructors and Writing Group B likewise collapsed, the mean scores on the Final Exam by writing group were M_A = 60.24, SD_A = 11.77, M_B = 61.67, SD_B = 15.34, p = .652. As seen in Tables 5, 6, and 7 and in the previous statement, the only statistically significant difference in group means was found with Instructor 1's groups on Unit Test 1 when no writing prompts were used. Therefore, the null hypothesis is not rejected.

Tables 8, 9, and 10 examine the high anxiety and low anxiety subgroups. Participants were divided into these subgroups based on their CTAS score being above or below the full sample median of 65.5.

Table 8

Mean scores for Instructor 1's tests by anxiety group and writing group

	High		Low	
	A	B	A	B
Instructor 1's Test	(*n* = 5)	(*n* = 1)	(*n* = 5)	(*n* = 5)
Unit Test 1	93.00 (7.87)	27.00	86.00 (19.17)	71.00 (22.27)
Unit Test 2	78.00 (8.69)	36.00	77.80 (5.93)	71.20 (14.65)
Unit Test 3	66.00 (16.72)	27.00	78.20 (13.48)	74.60 (15.96)
Unit Test 4	80.00 (8.60)	30.00	66.20 (17.80)	74.40 (15.23)
Unit Test 5	71.00 (18.88)	18.00	75.20 (23.21)	67.40 (20.89)
Unit Test 6	97.40 (2.88)	36.00	92.60 (12.76)	85.80 (15.80)
Final Exam[a]	58.50 (10.40)	45.00	65.00 (13.23)	57.50 (14.25)

Note. A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B.

[a]The Final Exam was a departmental examination common to all sections of this course.

Table 9

Mean scores for Instructor 2's tests by anxiety group and writing group

	High		Low	
	A	B	A	B
Instructor 2's Test	(*n* = 4)	(*n* = 6)	(*n* = 3)	(*n* = 6)
Unit Test 1	86.00 (15.32)	89.50 (10.73)	92.33 (12.66)	89.17 (8.42)
Unit Test 2	78.75 (10.66)	86.33 (11.50)	87.33 (4.93)	78.67 (12.97)
Unit Test 3	69.50 (30.12)	88.33 (15.15)	87.33 (10.60)	81.00 (9.78)
Unit Test 4	61.00 (27.94)	86.83 (10.85)	72.67 (15.18)	70.17 (12.86)
Unit Test 6[a]	108.13 (3.66)	99.50 (10.50)	95.33 (8.02)	93.92 (9.00)
Final Exam[b]	56.25 (12.67)	66.67 (17.51)	60.83 (12.58)	56.25 (18.08)

Note. A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B.

[a]Instructor 2's Unit Test 5 was not included in the quantitative analysis. See text for explanation.

[b]The Final Exam was a departmental examination common to all sections of this course.

Table 10

Mean scores for Instructor 3's tests by anxiety group and writing group

	High			Low	
	A	B		A	B
Instructor 3's Test	(n = 7)	(n = 9)		(n = 7)	(n = 6)
Unit Test 1	70.57 (13.23)	80.11 (16.62)		81.86 (13.99)	73.00 (23.64)
Unit Test 2	71.43 (18.06)	82.11 (11.97)		77.71 (13.15)	85.50 (9.57)
Unit Test 3	74.71 (15.14)	79.89 (20.84)		76.29 (18.66)	83.00 (13.62)
Unit Test 4[a]					
usual grouping (n_A = 7, n_B = 9)	79.00 (12.90)	75.00 (24.70)	usual grouping (n_A = 7, n_B = 6)	70.71 (18.14)	80.00 (15.44)
grouping on test (n_A = 10, n_B = 6)	73.60 (19.76)	82.00 (20.80)	grouping on test (n_A = 11, n_B = 2)	75.73 (15.32)	71.00 (32.53)
same grouping (n_A = 4, n_B = 3)	73.25 (11.84)	77.33 (29.70)	same grouping (n_A = 5, n_B = 0)	70.60 (15.13)	- -
Unit Test 5	68.14 (21.19)	65.33 (20.27)		60.71 (15.49)	79.83 (20.79)
Unit Test 6	83.43 (22.93)	87.78 (10.67)		87.14 (21.44)	96.00 (13.30)
Final Exam[b]	58.21 (15.19)	63.61 (13.81)		62.14 (9.94)	65.42 (15.61)

Note. A = the group responding to Writing Prompt A; B = the group responding to Writing Prompt B.

[a]Instructor 3 accidentally switched the writing prompts on Unit Test 4, but not all participants noticed the change in instructions. See text for explanation of subgroups.

[b]The Final Exam was a departmental examination common to all sections of this course.

With the high anxiety participants in Writing Group A collapsed among all three instructors and the high anxiety participants in Writing Group B likewise collapsed, the mean scores on the Final Exam by anxiety group and writing group were M_{HA} = 57.81,

SD_{HA} = 12.41, M_{HB} = 63.59, SD_{HB} = 15.19, p = .254. With the low anxiety participants in Writing Group A collapsed among all three instructors and the low anxiety participants in Writing Group B likewise collapsed, the mean scores on the Final Exam by anxiety group and writing group were M_{LA} = 62.83, SD_{LA} = 10.85, M_{LB} = 59.85, SD_{LB} = 15.72, p = .682. As seen in Tables 8, 9, and 10 and in the two previous statements, there were no statistically significant differences in group means. Therefore, when examining the anxiety subgroups, the null hypothesis is not rejected.

Table 11 displays the Spearman's correlations between CTA and test performance.

Table 11

Spearman's correlations between CTA and test performance

	1		2		3	
	A	B	A	B	A	B
Respective Tests	(*n*=10)	(*n*=6)	(*n*= 7)	(*n*= 12)	(*n*=14)	(*n*=15)
Unit Test 1	0.292	-0.667	-0.236	-0.124	-0.387	0.138
Unit Test 2	0.141	-0.522	-0.482	0.081	-0.110	-0.040
Unit Test 3	-0.146	-0.406	-0.309	0.359	-0.013	-0.004
Unit Test 4	0.535	-0.588	-0.252	.728**	-0.078[a]	0.619[a]
Unit Test 5	0.225	-0.551	-	-	0.264	-0.148
Unit Test 6	0.302	-0.029	0.709	0.270	-0.064	-0.574*
Final Exam[b]	-0.028	-0.441	-0.645	0.196	-0.127	0.110

Note. 1 = Instructor 1; 2 = Instructor 2; 3 = Instructor 3; A = group responding to Writing Prompt A; B = group responding to Writing Prompt B.

[a]Instructor 3 accidentally switched the writing prompts on Unit Test 4, but not all participants noticed the change in instructions. Correlations here reflect groupings on Unit Test 4.

[b]The Final Exam was a departmental examination common to all sections of this course.

*$p < .05$, two-tailed. **$p < .01$, two tailed.

With Writing Group A collapsed among all three instructors and Writing Group B likewise collapsed, the Spearman's correlations between CTA and test performance on the Final Exam were $\rho_A = -.177$, $p = .342$, $\rho_B = .044$, $p = .807$. As seen in Table 11 and in the previous statement, the only statistically significant correlations occurred with Instructor 2's Writing Group B on Unit Test 4 and Instructor 3's Writing Group B on Unit Test 6.

Qualitative

Qualitative data were collected to address the second research question (How do the students react to the writing prompts? That is, what do they do when asked to write, and what do they think about the experience?). The participants responded to their respective writing prompts immediately before taking Unit Tests 2 through 5 and the final examination. They also answered a questionnaire immediately after taking their final examination. Lastly, 18 participants – three from each of the six sections – were interviewed after answering the questionnaire. The resulting data from those three sources – the participants' responses to the interview protocol, the participants' responses to the questionnaire, and the participants' responses to the writing prompts – are reported below. When the researcher employed open coding for categories, it is noted below. Axial coding, selective coding, and triangulation will be discussed with the interpretation of the results in Chapter 5.

Interviews

The interview protocol is found in Appendix E. Transcripts of the interviews are found in Appendix F.

In regard to Question 1 (Had you responded to any kind of writing prompt in other courses prior to responding to your writing prompt in this course? If so, please give examples.), three of the nine interviewees from Writing Group A said they had responded to other writing prompts in other courses; likewise, three of the nine interviewees from Writing Group B said they had responded to other writing prompts in other courses. Of the six who had, three said they had done so in high school, the other three in college.

On Question 2 (Do you think you have high test anxiety? Why or why not? If you think you do, does it apply to all subjects, or just certain ones like mathematics?), seven of the nine from Writing Group A described themselves as having high test anxiety; three of the nine from Writing Group B described themselves as having high test anxiety. Of the ten who said they have high test anxiety, eight did have CTA measures above the sample median of 65.5, one was approximately equal to the median (at 65), and one was actually below the median (at 47). Of the eight who said they do *not* have high test anxiety, seven did have CTA measures below the sample median; the other one was slightly above the median (at 68). Of the ten who said they do have high test anxiety, seven said it was with any subject; three said it was with mathematics only.

On Question 3 (Describe in detail how you felt about taking your unit tests and final exam *before* responding to the writing prompt and why you felt that way.), the researcher employed open coding by reading the transcripts of the audio-recorded interviews and coding the responses into categories. For example, Participant 8 stated, "I just felt nervous…it always happens to me." Similarly, Participant 10 stated, "I felt really nervous. I always do." Therefore, the researcher placed both of these responses under the category: they have test anxiety. All the categories of the reasons provided by the interviewees for being anxious entering the classroom were (with frequencies in parentheses): they are not good at mathematics (2), they always felt unprepared (1), they have test anxiety (8), they were afraid they would forget everything (2), or they were worried about the consequences of a bad grade (2). The categories of the reasons provided by the interviewees for not being anxious entering the classroom were: they are good at mathematics (1), they were prepared for the test (3), they wanted to get the test

done (2), or they already knew if they were going to pass or fail and did not see a reason to be nervous (2). Some interviewees did not provide reasons; some provided multiple reasons.

On Question 4 (What did your writing prompt in this course ask you to write about? And do you feel like you followed the instructions?), everyone was able to correctly paraphrase the instructions of their usual writing prompts. But as stated earlier in this chapter, Instructor 3 accidentally switched the writing prompts before Unit Test 4. Of the six interviewees from Instructor 3, four did notice the change in instructions before Unit Test 4 and responded to the writing prompt accordingly; the other two did not. In regard to answering Question 4, the four interviewees who noticed the change in instructions before Unit Test 4 did not mention this abnormality during the interview. The two who did not notice the change in instructions before Unit Test 4 and responded as if they had received the same instructions as before claimed during the interview that they had followed instructions.

For Question 5 (Describe in detail how you felt about taking your unit tests and final exam *after* responding to the writing prompt.), all nine of the interviewees from Writing Group B said their anxiety levels after responding to the writing prompt were the same as before responding to the writing prompt. From Writing Group A, four interviewees said their anxiety levels remained the same, four said they decreased, and one said they increased.

On Question 6 (Why do you think you did or did not experience any changes in how you felt about taking the tests?), the four mentioned above said they felt better after responding to Writing Prompt A for the following categorical reasons: writing was a nice

outlet (1), it calmed them down (3), and it took their minds off of worrying about the tests' potential difficulty and potential consequences (1). Some interviewees did not provide reasons; some provided multiple reasons. The one interviewee who felt worse after responding to Writing Prompt A said she was thinking she had forgotten everything she had learned and was thinking about her grade.

With Question 7 (How did you feel about the actual responding to the writing prompt before starting your unit tests and final exam? That is, did you like doing it or not like doing it, and why?), five from Writing Group A said they liked responding to the writing prompts, two were neutral, and two did not like doing it. Two of the five who liked it explained that responding to the writing prompt helped clear their heads and focus better on the test. One who did not like it explained that it made her mind very scattered. From Writing Group B, two said they liked responding to the prompts, five were neutral, and two did not like doing it. The two who liked it explained that responding to the writing prompt gave them ideas of what to expect and calmed them down. The two who did not like it explained it was redundant.

In regard to Question 8 (Would you recommend that students use this writing prompt before taking tests? Why or why not? If yes, what type(s) of students would you recommend it to and why?), six from Writing Group A said they would recommend the writing prompt to other students especially with high test anxiety, one was unsure, and two said they would not recommend it to other students. As to why they would recommend it, those who provided reasons said students can write what they are feeling, the writing can clear their minds, and it can calm them down before the test. From Writing Group B, four would recommend it to other students, one was unsure, and four

said they would not recommend it. No clear reasons for recommending or not recommending were provided by Writing Prompt B participants.

Written Responses to the Questionnaire

As shown in Table 4, 108 participants were in the original sample and 19 stopped attending class. Therefore, 89 participants took the final examination. Seven of these did not respond to the questionnaire after the final examination, so the number of participants who completed the questionnaire was $N = 82$ ($n_{1A} = 13$, $n_{1B} = 6$, $n_{2A} = 10$, $n_{2B} = 14$, $n_{3A} = 22$, $n_{3B} = 17$). The questionnaire is found in Appendix D.

Question 1 of the questionnaire was similar to Question 3 of the interview protocol (Describe your level(s) of anxiety about taking your unit tests and final exam *when entering the classroom* on testing days. And why do you think you were anxious or not anxious?). The researcher employed open coding by reading the responses on the questionnaires and coding the responses into categories. Tables 12 and 13 list all the categories of the reasons provided by the participants for being anxious or not anxious, respectively, when entering the classroom on testing days.

Table 12

Reasons provided on questionnaire for being anxious entering classroom

Category	Frequency
Not good at math	1
Did not do all the homework	2
Did not study well	7
Am weak on the topics in the unit	6
Am a bad test taker	3
Have test anxiety	8
Worry about the consequences of a bad grade	9

Note. Frequencies came from full sample of 82 questionnaires. Some participants did not provide reasons; some provided multiple reasons.

Table 13

Reasons provided on questionnaire for not being anxious entering classroom

Category	Frequency
Love math	2
Did the homework	2
Studied	6
Knew the material	1
Am a good test taker	2
Test is multiple-choice	1

Note. Frequencies came from full sample of 82 questionnaires. Some participants did not provide reasons; some provided multiple reasons.

Question 2 of the questionnaire was the same as Question 4 of the interview protocol (What did your writing prompt ask you to write about?). Almost everyone who completed the questionnaire was able to correctly paraphrase the instructions of their usual writing prompts. The exceptions were one participant from Writing Group 2B who said, “Anything in mind,” and one participant from Writing Group 3B who said, “I really can’t remember.” As mentioned earlier, Instructor 3 accidentally switched the writing

prompts before Unit Test 4. Of the 43 participants that started the study with Instructor 3, 38 took Unit Test 4 and responded to the writing prompt beforehand (four were absent and did not make-up the test; one took the test but did not respond to the writing prompt). Of those 38, 24 (10 in A and 14 in B), or 63%, did notice the change in instructions and responded to the writing prompt in front of them accordingly, but the other 14 (10 in A and 4 in B), or 37%, did not notice the change in instructions and responded as they had for the previous two unit tests. Those who noticed the change in instructions for Unit Test 4 did not mention this abnormality while answering the questionnaire.

Question 3 of the questionnaire was similar to Question 5 of the interview protocol (Describe your level(s) of anxiety about taking your unit tests and final exam *after responding to the writing prompts*. Discuss any changes in level(s) between entering the classroom to completing the writing prompts.). Table 14 summarizes those results.

Table 14
How participants felt after writing, according to questionnaire (interview subgroup)

	A			B			
Instructor	Better	Same	Worse	Better	Same	Worse	Total
1	5 (1)	7 (2)	1	0	5 (3)	1	19 (6)
2	2 (1)	6 (1)	2 (1)	1	13 (3)	0	24 (6)
3	6 (2)	13 (1)	3	2	13 (3)	2	39 (6)
Total	13 (4)	26 (4)	6 (1)	3	31 (9)	3	82 (18)

Note. 1 = Instructor 1; 2 = Instructor 2; 3 = Instructor 3; A = group responding to Writing Prompt A; B = group responding to Writing Prompt B.

Question 4 of the questionnaire asked participants if they would consider using their respective writing prompts before future testing situations. Table 15 summarizes those results.

Table 15
On using their writing prompts in the future

Response	A	B	Total
Yes	9	3	12
Indifferent	3	2	5
No	26	32	58
Unclear	7	0	7
Total	45	37	82

Note. A = group responding to Writing Prompt A; B = group responding to Writing Prompt B.

Among the nine from Writing Group A who said yes, five actually mentioned that their writing prompt relieved their stress. One participant said, "It was nice to get your emotions/feelings of anxiety out of the way so you could focus more on the test instead of your nerves." Another said it helped gather his/her thoughts before the test. One said the writing prompt was "helpful," and another said it would be beneficial for the teacher to understand the students' feelings.

Among the 26 from Writing Group A who said no, seven said the writing prompt did not reduce their anxiety, six said it broke their focus, and two said it actually made them more nervous. Three said they already knew how they felt inside so they did not see a need to write it out, and two said they do not like to write. Three mentioned wanting to start the test immediately. One participant said his/her outcome on the test

would be determined by whether or not he/she reviewed and writing would not make a difference.

The three from Writing Group B who said yes said it helped them remain calm before taking the tests. Among the 32 from Writing Group B who said no, 20 said the writing prompt had no effect, seven said it was a distraction, and one said it made him/her more anxious.

Written Responses to the Writing Prompts

When responding to the writing prompts before the tests, the participants in Writing Group B provided topics from the unit that they did not think would appear on test. The participants in Writing Group A, who had been asked to write as openly as possible about their feelings and emotions about the test they were about to take, wrote down a variety of responses. Some wrote about why they were anxious, some wrote about why they were not anxious, and some wrote about other issues. Tables 16 and 17 below list all the open coding categories of the reasons provided by the participants for being anxious or not anxious, respectively. Open coding categories of other topics that participants wrote about are provided after the tables.

Table 16

Reasons provided on writing prompts for being anxious entering classroom

Category	Frequency
Do not like math	7
Missed class(es)/information	8
Did not do all the homework	4
Did not study well	16
Am weak on the topics in the unit	26
Have been spending a lot of time on other courses	3
Have a lot going on in my personal life	13
Did not get enough sleep which might affect my performance	2
Arrived late	2
Forgot my calculator	5
Am afraid my calculator batteries will die during the test	1
The time of day (evening) might affect my performance	1
Get sleepy in this temperature	2
Have irritable bowel syndrome	1
The test covers a lot of information	3
Am a bad test taker	6
Am afraid I will forget everything	8
Have not been making as high of grades as I would like	4
Worry about the consequences of a bad grade	13
The waiting makes me nervous	2

Note. Some participants may have provided multiple reasons and/or provided the same reason(s) on multiple occasions.

Table 17
Reasons provided on writing prompts for not being anxious entering classroom

Category	Frequency
Like math	1
Went to the tutoring lab	1
Did the homework	1
Worked through the review handout	4
Attended a review session	2
Prepared a note card	10
Studied a lot	51
Know the material	17
Slept well	1
Problems in the unit were done mostly on the calculator	1
Test is multiple-choice	3

Note. Some participants may have provided multiple reasons and/or provided the same reason(s) on multiple occasions.

Besides writing about why they were or were not anxious, some participants wrote about other issues. Several who were anxious listed some bodily symptoms of their anxiety: heart beating faster, hands shaking, hands being clammy, stomach being queasy, and head aching. Others mentioned having a lot of caffeine, needing to use the bathroom, and being hungry. Eight did not say that sleep deprivation would affect their performance, as some did in Table 16, but instead simply mentioned wanting to go home and sleep after the test. Nine brought up the topic of prayer (e.g. “I will pray about it” and “Pray for me!”). One participant complained about the textbook’s website, and one contemplated dropping the course.

It should also be noted that some participants did not write openly for ten minutes as instructed. The expressive Writing Prompt A told the students to “take the next 10 minutes to write as openly as possible about your thoughts and feelings” and “really let

yourself go and explore your thoughts and emotions" and "try to be as open as possible" (Appendix B). But several participants did not complete writing prompts or did not write very much (i.e. three or fewer sentences during the entire 10 minutes). During analysis, the question arose as to how many of the participants in expressive Writing Group A were not only underprepared for college-level mathematics but also underprepared for college-level writing as evidenced by their enrollment in prescribed writing courses. At the university where the study was conducted, students with an ACT English score below 18 complete a university placement test; based on the results, students enroll in "regular" Expository Writing, "prescribed" Expository Writing, or a lower prerequisite course. The researcher investigated university records and found that of the 89 participants whose written responses to the writing prompts were analyzed, 39 or 43.8% also took a prescribed writing course. Of these 39, twenty-one were in the expressive Writing Group A, making-up 42.8% of the 49 participants in expressive Writing Group A – 5 in 1A, 5 in 2A, and 11 in 3A. The researcher then went back to the written responses of these 21 participants and found that 18 or 85.7% of them wrote three or fewer sentences on half or more of their writing prompts.

Chapter Summary

This chapter reported the results of the study. It first presented the quantitative results related to the participants' performance on the unit tests and the final examination. It then presented the qualitative results related to the participants' reactions to the writing prompts based on their written responses to the writing prompts, written responses to the questionnaires, and interviews. Interpretation of these results – including triangulation of

the data and, where appropriate, axial coding and selective coding – will be addressed in Chapter 5's summary and discussion.

CHAPTER V

SUMMARY & DISCUSSION

This final chapter first restates the research problem and the main components of the study's methodology. The majority of the chapter summarizes the results and discusses the implications of those results.

The research topic was test anxiety and the research problem was the effects of expressive writing immediately before tests as clarified in the two research questions:

(1) Will underprepared students who write expressively about their feelings and emotions about their impending College Algebra test outperform other underprepared students who write objectively about a topic from the unit they do not think will appear on the test?

(2) How do the students react to the writing prompts? That is, what do they do when asked to write, and what do they think about the experience?

The research perspective was primarily quantitative to address the first research question and secondarily qualitative to examine the second research question. Three prescribed College Algebra instructors each reported the test scores of participants from two sections – one section writing expressively about their feelings and emotions about their impending test (Writing Group A) and the other section writing objectively about a topic they did not think would appear on the test (Writing Group B). The researcher read the participants' responses to the writing prompts, as well as the participants' responses to a questionnaire administered immediately after the final examination. Furthermore, the researcher interviewed three participants from each of the six sections.

Summary of the Results

Quantitative

Attrition. As presented in Table 4, this study witnessed a high rate of attrition. First of all, 30 of the 138 students (21.7%) who were invited to participate in the study chose to not participate in the study. That is, they did not sign the consent form granting permission for the instructor to share the students' data with the researcher. They still completed the Cognitive Test Anxiety Scale at the beginning of the semester, the appropriate writing prompts throughout the semester, and the questionnaire at the end of the semester, but the instructor did not have permission to share the data with the researcher to analyze.

Then 19 of the 108 in the original sample (17.6%) stopped attending class at some point during the semester. Of the 89 who stayed in the class, 16 (18.0%) had at least one missing test score and another nine (10.1%), who did have all their test scores, failed to complete a writing prompt before one or more tests. The final sample of 64 was only 59.3% of the original sample of 108.

Not always following instructions. On Instructor 2's Unit Test 5, which was the take-home test, not everyone followed the instructions. On Instructor 3's Unit Test 4, which had the writing prompts swapped by accident, not everyone followed the instructions at hand. And on several of the other tests, some participants did not write openly for ten minutes as instructed. Of the 49 participants whose written responses to expressive Writing Prompt A were analyzed, over 42% took a prescribed writing course as well. Of these, over 85% generally wrote three or fewer sentences.

Test performance. This section summarizes the data presented in Tables 5 through 10. With no writing prompt at all on Unit Test 1, Instructor 2's Writing Groups A and B began the semester not significantly different from each other, and the same can be said for Instructor 3's groups. Instructor 1's groups, on the other hand, began the semester as different from each other with statistical significance.

When the writing prompts were used, starting with Unit Test 2, Instructor 1's Writing Group A continued to exhibit higher means than 1B throughout the remainder of the semester but by smaller margins compared to Unit Test 1 and with no statistical significance. Instructor 2's Writing Group A and Writing Group B remained not significantly different from each other on Unit Test 2. On Unit Test 3, Unit Test 4, and the final examination, 2A had lower means than 2B but with no statistical significance. On Unit Test 6, 2A did exhibit a higher mean than 2B but again with no statistical significance. From Unit Test 2 and onward, Instructor 3's Writing Group A consistently showed lower means than 3B, again with no statistical significance. On the final examination, when the scores of 1A, 2A, and 3A were collapsed and the scores of 1B, 2B, and 3B were collapsed, they were not statistically different from each other.

When examining the subgroups based on level of test anxiety, Instructor 1's high anxiety Group A outperformed Instructor 1's high anxiety Group B on every test but with no statistical significance; Instructor 1's high anxiety B "group" was only 1 participant. Similarly, Instructor 1's low anxiety Group A outperformed Instructor 1's low anxiety Group B, with the exception of Unit Test 4, but again with no statistical significance.

With Instructor 2's high anxiety participants, Group B outperformed Group A, with the exception of Unit Test 6, but with no statistical significance. With Instructor 2's

low anxiety participants, Group A outperformed Group B on every test but with no statistical significance.

With Instructor 3's high anxiety participants, Group B outperformed Group A, with the exception of Unit Test 5, but with no statistical significance. Similarly, with Instructor 3's low anxiety participants, Group B outperformed Group A, with the exception of Unit Test 4, but with no statistical significance.

When the scores of Instructor 1's high anxiety Group A, Instructor 2's high anxiety Group A, and Instructor 3's high anxiety Group A were collapsed and the scores of Instructor 1's high anxiety Group B, Instructor 2's high anxiety Group B, and Instructor 3's high anxiety Group B were collapsed on the final examination, they were not statistically different from each other. Neither were the collapsed groups with low anxiety.

Recall the null hypothesis was equality of means. That is, after the intervention of expressive Writing Prompt A, the test score mean for Writing Group A would be the same as the test score mean for Writing Group B. Based on the results above, after each use of the writing prompts, including comparisons of all subgroups, the null hypothesis was never rejected.

Correlations between CTA and test performance. In Table 11, the only statistically significant correlations between CTA and test performance were a strong positive one with Writing Group 2B on Unit Test 4 and a strong negative one with Writing Group 3B on Unit Test 6. Based on the negative correlations between test anxiety and test performance found in prior research (Hill & S. Sarason, 1966; Ramirez

& Beilock, 2011; I. Sarason, 1957; I. Sarason, 1963), the negative correlation mentioned above was expected, but the positive one – higher performance with higher anxiety – was not expected.

Qualitative

Interviews. Six (33%) of the eighteen interviewees had responded to other writing prompts in other courses. A higher percentage of interviewees from Writing Group A (78% of A) self-reported high test anxiety than did interviewees from Writing Group B (33% of B). The most common reason provided by interviewees for being anxious when entering the classroom was having test anxiety. The most common reason provided by interviewees for not being anxious was being prepared. Of the six interviewees from Instructor 3, the ones who did notice the different instructions on Unit Test 4 did not mention it in the interview, and the ones who did not notice the different instructions claimed they followed the instructions. Of the nine interviewees from expressive Writing Group A, four (44%) said their anxiety decreased after responding to the writing prompt, five (56%) said they liked responding to the prompt, and six (67%) said they would recommend it to other students with high test anxiety.

Written responses to the questionnaire. The most common reasons participants provided on the questionnaire for being anxious when entering the classroom were (in order of frequency): worrying about the consequences of a bad grade, having test anxiety, having not studied well, and being weak on the topics in the unit. The most common reason provided on the questionnaire for not being anxious was having studied. Of the 38 participants who took Unit Test 4 from Instructor 3, the ones who did notice the different instructions did not mention it in the questionnaire. Of the 45 participants from Writing

Group A who completed the questionnaire, 13 (29%) said their anxiety decreased after responding to the writing prompt, and nine (20%) said they would consider using the writing prompt in future testing situations.

Written responses to the writing prompts. The most common reasons participants mentioned on their writing prompts for being anxious when entering the classroom were (in order of frequency): being weak on the topics in the unit, having not studied well, worrying about the consequences of a bad grade, and having a lot going on in their personal lives. The most common reasons participants mentioned for not being anxious were (in order of frequency): having studied, knowing the material, and making a note card. The most common mentions of non-anxiety-related topics were prayer and sleep deprivation.

Discussion of the Results

Limitations

This study encountered several limitations. Most important in the attempt to answer the first research question, the final *n*s for the quantitative analyses were small. One contributing factor was the instructors using their own unit tests, not common unit tests; therefore, writing groups could not be collapsed until the departmental final examination that was common to all sections. Attrition was another major factor. Then, not all scores could be analyzed due to participants not following directions before Instructor 2's Unit Test 5, which was the take-home test. Also, scores from Instructor 3's Unit Test 4 was difficult to analyze due to both implementation error and participants not following directions. Lastly, some participants did not write openly for ten minutes as instructed. More than 42% of the participants in expressive Writing Group A are

underprepared for college-level writing because they also took a prescribed writing course. Of those, more than 85% generally wrote three or fewer sentences in their responses to the writing prompt.

Interpretations of the Findings

The first research question. (Will underprepared students who write expressively about their feelings and emotions about their impending College Algebra test outperform other underprepared students who write objectively about a topic from the unit they do not think will appear on the test?) With the small sample size, problems in implementation, and participants not following directions, it is difficult to glean the effectiveness of expressive writing on test performance from this study. There were no statistically significant differences between any groups after using the writing prompts; therefore, the null was not rejected, and this particular study cannot promote the use of expressive writing for improving test performance of students underprepared for college level mathematics.

The second research question. (How do the students react to the writing prompts? That is, what do they do when asked to write, and what do they think about the experience?) In regard to what they did when asked to write, some participants did not write before every test, and some of those who did write did not always follow the directions. Those who did write often wrote about why they were anxious or were not anxious.

As to why they were anxious when entering the classroom, the most common reasons mentioned in the written responses to the questionnaire (after worrying about the consequences of a bad grade and having test anxiety) were being weak on the topics and

not having studied well. Similarly, these were the top two reasons mentioned in the written responses to the writing prompts. After triangulating these two sources of data, it can be asserted that two common reasons why some participants were anxious when entering the classroom were being weak on the topics and not having studied well.

Meanwhile, the most common reason mentioned in both the written responses to the questionnaires and the written responses to the writing prompts for *not* being anxious was having studied. Therefore, after triangulating these two sources of data, it can be asserted that that the most common reason why some participants were not anxious when entering the classroom was having studied.

In regard to what they thought about the experience, five (56%) of the nine interviewees from expressive Writing Group A said their test anxiety did not decrease after responding to the writing prompt. The written responses to the questionnaire support this claim and extend it even further to 32 (71%) of the 45 participants from expressive Writing Group A not feeling a decrease in their test anxiety. After triangulating these two sources of data, it can be asserted that the majority of participants in expressive Writing Group A did not feel a decrease in their test anxiety.

According to the written responses to the questionnaire, only 20% of the participants from expressive Writing Group A would consider using their prompt before future testing situations. But according to the interviews, 67% of the participants from expressive Writing Group A would recommend their prompt to other students with high test anxiety.

Unanticipated Findings

Quantitative. Many of the quantitative results were unexpected. Based on prior research (Ramirez & Beilock, 2011), the researcher expected to see moderate-to-strong negative correlations between CTA and performance on Unit Test 1 with all groups and then a decrease in the strength of association with the expressive Writing Group A on later tests. The researcher also expected to see expressive Writing Group A outperform objective Writing Group B with each instructor's sample or with each instructor's high anxiety participants. Perhaps the unexpected results are attributed to the small sample size and reasons that emerge from the qualitative data.

Qualitative. While analyzing the written responses to the questionnaire and the written responses to expressive Writing Prompt A and employing the first step of the systemic approach to grounded theory – open coding for categories – the researcher was surprised to see the high frequency of the category "Did not study well" under reasons why participants were anxious entering the classroom. The category "Studied a lot" was frequent under reasons why participants were not anxious entering the classroom. It made sense to this researcher that studying a lot would put a student at ease and that not studying well would not put a student at ease. But the researcher was surprised at how often "Did not study well" was mentioned. These are college students in a college level mathematics course; why would they not study well in order to put themselves at ease going into every test?

Therefore, in the second step of the systemic approach to grounded theory – axial coding – the researcher selected the category "Did not study well" as the central phenomenon and returned to the data to find other categories that center around that

phenomenon. Other categories connected to "Did not study well" were those related to not being proactive learners or not being prepared for the test: "Missed class(es)/information," "Did not do all the homework," and "Forgot my calculator." In juxtaposition, categories connected to "Studied a lot" were those related to being proactive learners and being prepared for the test: "Went to the tutoring lab," "Did the homework," "Worked through the review handout," "Attended a review session," and "Prepared a note card."

Consequently, for the third step of the systemic approach to grounded theory – selective coding – the researcher asserts that many participants entered the classroom on testing days not fully prepared for the test. If these students were not prepared for the test, then expressive writing would have little if any effect on their test performance. This issue is summarized well by a participant who wrote on his questionnaire, "The outcome of my test is based on whether I reviewed or not, not what I wrote down beforehand." In conclusion, the quantitative and qualitative analyses show that expressive writing did not significantly impact test performance for this population of college students.

Implications

Zeidner (1998) had listed one possible reason why some students might develop test anxiety as poor study skills and had listed one possible strategy that students can try for coping with test anxiety as getting training in study skills. Colleges should evaluate how they are teaching students study skills.

In regard to the use of expressive writing before tests, perhaps this intervention should be reserved for those students who attend most if not all classes, complete most if

not all the homework, study well before the test day, and yet still get anxious. Even then, the importance of following the instructions about writing openly and freely for an extended time period should be stressed to the student. Finally, the students should be competent in their writing skills. If they are not comfortable with writing, responding to the writing prompts might make them more nervous.

Recommendations for Future Research

Any attempt to replicate this study should seek a larger sample size to increase statistical power and reduce the probability of a Type II error. This might be achieved through common unit tests among all instructors involved so that sections may be collapsed into larger groups throughout the semester, not just with the final examination. If common unit tests are not possible, then a common pre-test for all sections could provide baseline data for both comparing all sections amongst themselves and comparing to the results of the final examination. Action should also be taken to ensure proper implementation and following of directions; this researcher was not in the classroom on any testing dates, and perhaps a researcher's presence in the room would encourage more accurate implementation and better cooperation. The researcher's presence on testing dates would also allow for another source of qualitative data – field notes; if it is not feasible to observe everyone in the classroom, then a researcher could at least observe the students selected to be interviewees. It would also be interesting to examine some background data on the participants. For example, are they repeating this course? If it is their first time taking this course, what mathematics course(s) did they take before this one? How long had it been since they had taken a mathematics course? If using a population similar to this study's, then it would be important to also examine the

background data related to the participants' writing skills and then potentially accommodate for deficiencies in writing skills in the design of the study. Lastly, future studies should consider administering a scale that measures study habits to see how that might correlate with test anxiety and test performance.

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APPENDICES

Appendix A

Cognitive Test Anxiety Scale (Cassady, 2004)

Read each statement carefully, and circle the option that best describes you.

1. I lose sleep over worrying about examinations.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

2. While taking an important examination, I find myself wondering whether the other students are doing better than I am.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

3. I have *less* difficulty than the average college student in getting test instructions straight.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

4. I tend to freeze up on things like intelligence tests and final exams.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

5. I am less nervous about tests than the average college student.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

6. During tests, I find myself thinking of the consequences of failing.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

7. At the beginning of a test, I am so nervous that I often can't think straight.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

8. The prospect of taking a test in one of my courses would *not* cause me to worry.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

9. I am more calm in test situations than the average college student.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

10. I have less difficulty than the average college student in learning assigned chapters in textbooks.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

11. My mind goes blank when I am pressured for an answer on a test.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

12. During tests, the thought frequently occurs to me that I may not be too bright.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

13. I do well in speed tests in which there are time limits.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

14. During a course examination, I get so nervous that I forget facts I really know.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

15. After taking a test, I feel I could have done better than I actually did.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

16. I worry more about doing well on tests than I should.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

17. Before taking a test, I feel confident and relaxed.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

18. While taking a test, I feel confident and relaxed.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

19. During tests, I have the feeling that I am not doing well.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

20. When I take a test that is difficult, I feel defeated before I even start.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

21. Finding unexpected questions on a test causes me to feel challenged rather than panicky.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

22. I am a poor test taker in the sense that my performance on a test does not show how much I really know about a topic.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

23. I am not good at taking tests.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

24. When I first get my copy of a test, it takes me a while to calm down to the point where I can begin to think straight.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

25. I feel under a lot of pressure to get good grades on tests.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

26. I do not perform well on tests.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

27. When I take a test, my nervousness causes me to make careless errors.

A. Not at all typical of me | B. Only somewhat typical of me | C. Quite typical of me | D. Very typical of me

Appendix B

Writing Prompt A for Expressive Writing Group

Please put away all your materials (i.e. textbooks, notes, calculators) except for a pencil and do not talk during this time.

You and your classmates are about to start your unit test. However, before beginning the tests, everyone will take the next 10 minutes to complete a short writing prompt related to the test they are about to take. This writing prompt will not be graded.

Please take the next 10 minutes to write as openly as possible about your thoughts and feelings regarding the test you are about to take. In your writing, I want you to really let yourself go and explore your thoughts and emotions as you are getting ready to start the test. Please try to be as open as possible as you write about your thoughts at this time.

Once you have done this, please just sit quietly and wait for the teacher's instructions. You may end up sitting quietly for several minutes while your classmates finish. That's ok. You will be given plenty of time to complete the unit test. This task will only take 10 minutes. Please begin.

Appendix C

Writing Prompt B for Objective Writing Group

Please put away all your materials (i.e. textbooks, notes, calculators) except for a pencil and do not talk during this time.

You and your classmates are about to start your unit test. However, before beginning the tests, everyone will take the next 10 minutes to complete a short writing prompt related to the test they are about to take. This writing prompt will not be graded.

Please take the next 10 minutes to write about one topic from the unit that you feel will NOT be covered on the test you are about to take. Think about various reasons why this topic might not be covered on this test and do so objectively, that is, in a very factual manner (e.g., it is not my teacher's favorite topic, we spent a short time on it, etc.).

Once you have done this, please just sit quietly and wait for the teacher's instructions. You may end up sitting quietly for several minutes while your classmates finish. That's ok. You will be given plenty of time to complete the unit test. This task will only take 10 minutes. Please begin.

Appendix D

Questionnaire

Please answer the following questions regarding the writing prompts you responded to before your unit tests and final exam in this course.

1. Describe your level(s) of anxiety about taking your unit tests and final exam *when entering the classroom* on testing days. And why do you think you were anxious or not anxious?

2. What did your writing prompt ask you to write about?

3. Describe your level(s) of anxiety about taking your unit tests and final exam *after responding to the writing prompts*. Discuss any changes in level(s) between entering the classroom to completing the writing prompts.

4. Would you consider using your writing prompt before future testing situations? Why or why not?

Appendix E

Interview Protocol

1. Had you responded to any kind of writing prompt in other courses prior to responding to your writing prompt in this course? If so, please give examples.

2. Do you think you have high test anxiety? Why or why not? If you think you do, does it apply to all subjects, or just certain ones like mathematics?

3. Describe in detail how you felt about taking your unit tests and final exam *before* responding to the writing prompt and why you felt that way.

4. What did your writing prompt in this course ask you to write about? And do you feel like you followed the instructions?

5. Describe in detail how you felt about taking your unit tests and final exam *after* responding to the writing prompt.

6. Why do you think you did or did not experience any changes in how you felt about taking the tests?

7. How did you feel about the actual responding to the writing prompt before starting your unit tests and final exam? That is, did you like doing it or not like doing it, and why?

8. Would you recommend that students use this writing prompt before taking tests? Why or why not? If yes, what type(s) of students would you recommend it to and why?

Appendix F

Transcripts of Interviews
(The participants' responses are presented as spoken. The researcher has made no changes, e.g. incorrect grammar.)

Participant #5 (Recorded 5/9/14)

Researcher: Had you responded to any kind of writing prompt in other courses prior to responding to the writing prompt in this course? And if so, please give examples.

Participant: You mean, like, in college? 'Cause, I mean, I did plenty of prompts in high school.

R: High school's fine. Can you just think of one that you might have done in high school?

P: Every day in my, um, well, in the after school, they called it, um, Seminar in my school in Detroit. In Seminar classes, we had to do a writing prompt, like, every day when we were a junior; don't know why.

R: Do you remember what one might have been?

P: Just stupid stuff. It was, like, one, it was, um, should professional athletes have to go on, like, I mean, not professional, but, like, high school athletes go onto any type of restricted guidelines as normal students? Actually, like, should they get, like, extensions on tests and stuff 'cause they go out of town and all this late games and stuff.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?

P: No, I don't have high, I don't have any test anxiety at all actually. I mean, I don't know why, I just, either I feel like, before I get to the test, either I know I'm gonna fail or I know I'm gonna pass. So there's no reason for me to sweat or get scared.

R: So describe how you felt about taking your tests *before* the writing, or before responding to the writing prompt, and why you felt that way. You kind of addressed it already, but go ahead and repeat.

P: Oh, I really, it really didn't make a difference.

R: What did your writing prompt in this course ask you to write about?

P: It always told me to write freely about how I feel. And am I nervous or blah blah blah. And I'm never nervous, and I'm, I was like, let's get this over with and go home. That's all that mine said.

R: Describe how you felt *after* responding to the writing prompt. And I think you had already said no change.

P: Yeah, it's just, the same.

R: Why do you think that you did not experience any changes in how you felt before and after?
P: I don't think I experienced any changes because I've always just never had test, I, don't know. I remember, like, growing up all my friends were like, "Oh, we gotta take this big final. I'm fittin', I'm fittin' to crap myself." I'm like, "All you gotta do is study." I said, "Either you study, or you don't study. If you study, then there's no reason for you to be nervous." They're like, "But you don't understand. This test makes or breaks your grade." I'm like, "Well, if you really want a good grade, you'll study. If you don't care, then you won't. So there's no reason for you to be scared." Like today, I have a B in this class, I want a A, I just don't know if it's possible to get an A if I do good on this final. I didn't study. So if I know I get a C on this final, I'm like, I expect a C. I expect, okay, I expect myself to not fail; I'm not failing the final. But I know I'm not gonna get a A on it. So there's no use for me to be shaky or sweating.

R: How did you feel about the actual responding to the writing prompt? That is, did you like doing it or not like doing it, and why?
P: Um, I mean I really don't have a feeling towards it. Like,
R: Just sort of neutral?
P: It's just neutral. It's like, since it doesn't affect my thinking or affect anything, it doesn't, it doesn't matter. Like, I can do it, or I can not do it.

R: Would you recommend that students use this before taking tests? Why or why not? And if yes, what type of students would you recommend it to?
P: Yeah, I'm gonna recommend it to students that have bad test anxiety. Like my best friend, she has the worst test anxiety ever. And me and her will study for hours, and she'll still be like, "Oo, I got this test." She'll be like literally shaking. I'm like, "What's wrong with you, I don't understand, when you know the information?" Like, this was in high school, like me and her would study, okay, before every test in every class, we'll just like go back and forth, like (snaps fingers). Boom. What's the answer to this? Blah blah blah. Boom. What's the answer to this problem? Blah blah blah. And I know another friend that go here, um, me and her took a class last semester, and she had really bad test anxiety. And me and her used to study like two or three days, you know, before the test and everything, and I'm like, "Why are you still nervous if you know the information?" She's like, "I don't know, I just always get very nervous I'm still gonna fail." I'm like, I don't know. Those students really should just, like, clear their mind.

<u>Participant #8 (Recorded 5/9/14)</u>
R: Had you responded to any kind of writing prompt in other courses prior to responding to the writing prompt in this course? And if so, please give examples.
P: I have not.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: Uh, I do have high test anxiety. And it pretty much applies to every subject. But, uh, I don't really know why. I just always get nervous, especially with math though.
R: But you would say, with most subjects?
P: Yeah.

R: Describe how you felt about your tests *before* responding to the writing prompt and why you felt that way.
P: Um, okay repeat the question?
R: Before responding to the writing prompt, like when you first came into the classroom, can you describe how you felt about the tests?
P: Oh, um, I just felt nervous and like I was gonna forget everything that I had like that I had studied for the night before. And like it always happens to me, I just, um, that's just always been a trouble for me.

R: What did your writing prompt ask you to write about? And do you feel like you followed the instructions?
P: My prompt asked me to write about how, explore my feelings, so how I uh was feeling before taking the test and if like how anxious I was and all that and um, what was the last part of the question?
R: Do you feel like you followed those instructions?
P: Oh, I do.

R: Describe how you felt about taking your tests *after* responding to the writing prompt.
P: Um, it didn't really feel that different for me. I was, I always felt, I mean, I still kinda felt anxious about it, but I don't know, as I was taking it, I kind of, I mean, as I take it I don't really think about being anxious, I'm just always thinking about, uh, how to solve the problems and other questions and stuff like that.
R: And are you talking about the test? When you're taking the actual test?
P: Yeah.
R: You're not thinking about the anxiety?
P: Yeah. I guess mostly the buildup to the test I get nervous about mostly.

R: Why do you think you did or did not, I guess maybe *didn't* in your case, experience any changes in how you felt between starting the writing prompt and finishing the writing prompt?
P: Um, I'm not really sure. I just always, I mean, I just knew I was feeling anxious, and I um…
R: You were just still anxious afterward as well?
P: Mm hmm.

R: How did you feel about the actual writing? That is, did you like doing it or not like doing it, and why?
P: Uh, I enjoyed it. It was pretty, uh, it was a good way to help me assess how I was feeling about the test and uh to see how prepared I felt about it. I don't know, stuff like that.

R: Would you recommend that students use this prompt before taking their tests? Why or why not? If yes, what type(s) of students would you recommend it to?
P: Um, I'd recommend it to students who have uh a lot of test anxiety. I do think it, I do think it could help people who, uh, have, who, uh, experience anxiety before tests and stuff like that.

<u>Participant #10 (Recorded 5/9/14)</u>
R: Had you responded to any kind of writing prompt in other courses prior to responding to your writing prompt in this course? If so, please give examples.
P: Do mean like before tests?
R: Just any kind of writing prompt
P: Oh, we had to in high school, but not in college. So that was the first time in college.
R: Alright. The ones in high school, can you think of one example of what you were asked to write about?
P: Uh, they were world views and those type of things, like do you think cell phones should be allowed in school or something like that.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: It does apply to math; I'm not very good at it. But I do because I over think everything. I think, "Am I gonna fail this test or not?" So it does give me a little bit of anxiety.

R: Describe in detail how you felt about taking your tests *before* responding to the writing prompt and why you felt that way.
P: I felt really nervous. I always do.

R: What did your writing prompt ask you to write about? And do you feel like you followed those instructions?
P: Um, just, it told me to say how I was feeling.

R: Describe in detail how you felt about your tests *after* finishing the writing prompt.

P: Well it took my mind off of the fact that this test can really drop my grade a little bit, so I felt pretty good afterwards.
R: Why do you think you experienced that change in how you felt?
P: Um, just because I wasn't really thinking about it, and writing is just a nice outlet.

R: How did you feel about the actual writing of the prompt? That is, did you like doing it or not like doing it, and why?
P: Well I was fine with it, but other people were complaining.

R: Would you recommend that students use this writing prompt before taking tests? Why or why not? And if yes, what type of student would you recommend it to?
P: I think it would be helpful for people with high anxiety like before tests, they could just write as kind of a stress reliever and let go and really say what they're feeling so that it can kind of like be a sigh of relief before the test.

Participant #20 (Recorded 5/7/14)
R: Had you responded to any kind of writing prompt in other courses prior to responding to the prompts in this course? And if so, please give examples.
P: Ah, not that I can ever remember. So you're just talking about preliminary just like before I take the test kinda like we were doing in here?
R: Just any prompt really, where an instructor said, "Write about this for this long."
P: Oh, I, um, one time it was for the Tennessee Board of Regents, we had to fill-out a questionnaire, kind of like a list of essays for my Intro to Philosophy class about a year ago. So if you count that, then yeah.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: I don't think that I have high test anxiety, like I don't know, I just finished um writing on the last questionnaire that you had, I rated probably typically 4 out of 10. I try not to get too anxious just because I figure that either way I'm gonna do just as good or bad. So as long as I feel I've prepared to maybe not my fullest extent but know that I've prepared, then I figure, well, why get anxious about it, you know what I mean? I don't think I have too, I think I have just enough anxiety to do well sometimes.

R: Describe in detail how you felt about taking your tests *before* starting the writing prompt and why you felt that way.
P: Before the writing prompt?
R: Mm hmm

P: I, just because it was the final it's worth like I think 33% of our grade potentially, um, I was a little nervous. It only lasts usually only until I get the test, and then once I get the test, for me almost essentially all anxiety calms down. It's like once I see it, it's no longer a problem for me. Even if I'm worried what's on it, once I see it, well, I'm here now, I have to deal with the situation. Let's go for it. So, that's how it was before the test. And obviously after.

R: What did your writing prompt ask you to write about? And do you feel like you followed those instructions?
P: Yeah, it asked me like what section of the material, are you talking about the ones we've been taking all semester? Or the last…
R: Yeah
P: It was um, what section of each chapter do I think will not be covered on the test and why? Like, pick one section out of each chapter.

R: You might have already addressed this earlier, but describe how you felt about taking your tests *after* finishing the writing prompt.
P: Okay, it's weird, I put this on the last questionnaire you just gave us too, once I got the writing prompts, sometimes my anxiety would increase a little bit. I don't know if it's because I was waiting, like I knew the test was about to come, not I wanna say like had to get over or that this was something I had to do to get the test, but then once I, once I started writing it would subside then, so it was like a little bit of a peak, and then it would go back down, you know what I mean? And like, I took notice of it too because I knew what the study was about. So it was kind of like, okay, you know I'll pay attention to this as I'm going throughout the semester. So yeah, it's just like a small peak. I don't know maybe like, again, I always do a scale 1-10 and stuff like that, so maybe a 1 and then it would go back down as I was kind of completed or was about to finish writing.

R: Again, you might have already addressed this, but why do you think that you did or did not experience any changes in how you felt through the process of writing?
P: Yeah, I may have already addressed it. Like I said, I don't know, I think it's just, it's always for me about seeing a test, getting the test. So once I get the writing prompt, it's, again, I don't wanna say like it's an obstacle or something like a nuisance, but maybe it was just like subconsciously I'm like, "This is something I have to do before I can get the test. I want the test, you know what I mean? I wanna kinda get into it. But again, it wasn't like, "Oh, the writing prompt is here, the whole time throughout it I'm anxious and then when it's done it's over. It's like, "Oh, I'm kinda anxious a little bit more, and then it would just go back down. I don't know what any other reason would be, other than I just wanted to, like, see the test each time. Yeah, I'm impatient.

R: How did you feel about actually doing the writing prompt? That is, did you like doing it or not like doing it, and why?

P: It, like it wasn't like I didn't like doing it, and it wasn't like I *like* doing it. I wanna say maybe indifferent, neutral would probably be a good word. Like I, 'cause I like, you know, I like doing it because it was helping me study, so it was fine with me, but at the same time, it wasn't like I thought, "Oh great, the writing prompt."

R: Would you recommend that students use this writing prompt before taking their tests? Why or why not? And if yes, what type(s) of students would you recommend it to?
P: See, if, I would recommend it if they thought that it helped them. The only reason I could see that it may help them is if like say for myself when I get it, it would like, I would get anxious but then that would subside. I don't know if somebody walked into it, 'cause I know people who get very anxious before tests, if they walked into it very anxious, if somehow just some type of release helps them, like their anxiety, subside, then I would recommend it for them. That would be the type, but I would probably say it's more like an individual like case by case basis. It may help you, or it may not. But if, you know, if you're really anxious, I'd say it can't hurt you if you're anxious before a test, you know what I mean?

Participant #28 (Recorded 5/7/14)
R: Had you responded to any kind of writing prompt in other courses prior to responding to writing prompts in this course? And if so, please give examples.
P: No, I have not.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: Um, I wouldn't say high; I would say kinda mid-range. 'Cause it's like math, it's kinda, I'm not gonna say difficult, but certain things, certain, you know, particular parts of it just gets me. I don't know.

R: Describe in detail how you felt about taking your tests *before* writing the prompt and why you felt that way.
P: Can you say it again?
R: Describe how you felt about taking your test before you started writing the prompt and why you felt that way.
P: Well we got the prompt first, and then we started the test. So, yeah.
R: But when entering the classroom, how did you feel about the upcoming test?
P: When I entered, I wasn't nervous or anything like that, but it's like when I got my writing prompt, it calmed me a little bit before I actually received the test, because when I received it, I got a little nervous. When I first came in, there was no emotion at all.

R: What did your writing prompt ask you to write about? And do you feel like you followed those instructions?
P: I feel like I followed because it said, it was the one where, which particular questions or problems that we feel would not be covered on the test. And I think I answered it.

R: You kind of addressed this already, but describe how you felt about taking your tests *after* you had finished writing the prompt.
P: Calm

R: Why do you think you did or did not experience any changes in how you felt?
P: It took my mind off of it.

R: How did you feel about the actual writing? That is, did you like doing it or not like doing it, and why?
P: It was fine. I didn't see any harm in it. Making my writing skills a little better.

R: Would you recommend this to students before taking tests? Why or why not? And if yes, what type of student would you recommend it to?
P: I mean, me, I wouldn't do it again. But anybody else who's like a real nervous person, I would recommend 'cause it'll help them in the long run.

Participant #29 (Recorded 5/7/14)
R: Had you responded to any kind of writing prompt in other courses prior to responding to writing prompts in this class? And if so, please give examples.
P: No

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: Um, not really

R: Describe in detail how you felt about taking your tests *before* starting the writing prompt and why you felt that way.
P: About the same

R: What did your writing prompt in this course ask you to write about? And do you feel like you followed those instructions?
P: It asked to write about whether or not the material was gonna, what we thought wasn't gonna be on the test.

R: Describe in how you felt about taking your tests *after* finishing writing the prompt.

P: About the same

R: Why do you think you, in this case, did not experience any changes in how you felt? Why do you think there wasn't any change after writing?
P: I felt like it didn't have any effect on whether I did well or not.

R: How did you feel about the actual writing before starting your unit tests and final exam? That is, did you like doing it or not like doing it, and why?
P: It really didn't matter. It just didn't, just 'cause.
R: Okay, so kinda neutral?
P: Yeah

R: Would you recommend that students use this writing prompt before taking their tests? Why or why not? And if yes, what type(s) of students would you recommend it to?
P: Oh I don't know how to answer that. 'Cause I wouldn't use it for math. Probably use it for like, English or anything that has to do with writing. But I wouldn't use it for math.

Participant #33 (Recorded 5/9/14)
R: Had you responded to any kind of writing prompt in other courses prior to responding to the writing prompt in this course? And if so, please give an example.
P: Not in college.
R: Anything in high school?
P: In high school, they did kinda the same thing, but I don't think it was for psychology or anything, I think it was just the teacher being curious.
R: Can you think of maybe one topic that you might have written about?
P: Yeah, it was about Beowulf. I did it senior year in high school.
R: Okay, so for English?
P: Yeah, it was like, she just wanted to see what we didn't think we would know. And like she was one of those teachers where she liked to screw us over. So, yeah.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: I don't think I have test anxiety, but I do have OCPD, so time limits kinda freak me out sometimes. And I hate it when the teachers just go on and on and on about the rules. I'm like, "Enough of the preview. Let's get to the feature." I've taken a test before; I don't need to know how to bubble things in.

R: Describe how you felt about taking your tests *before* starting the writing prompt and why you felt that way.

P: Well I always got to her classes early, so she insists that I take them early, and it only took me a couple of minutes to write something out. Then she insisted everybody like get there, and we take the test as a group, and I have OCPD, so I'm like enough with the preview, get to the feature.
R: But in regard to how you felt about the tests, you were just anxious to get it started basically before doing the writing prompt?
P: Yeah.

R: What did your writing prompt ask you to write about? And do you feel like you followed the instructions?
P: What I didn't think would be on the test.

R: And then *after* doing that, how did you feel about the tests? So once you were finished with the writing prompt, was there any change in how you felt from coming in to when you finished?
P: No, I didn't feel that different.

R: Why do you think you did not experience any change in how you felt?
P: I felt like I was really ready for it, then when I actually took it, I wasn't.

R: How did you feel about the actual writing? That is, did you like doing it or not like doing it, and why?
P: I guess I would say no honestly 'cause I felt like I was kinda writing the same thing every time.

R: Would you recommend that students use this writing prompt before taking tests? Why or why not? And if yes, what type(s) of students would you recommend it to and why?
P: I'd probably say no because I didn't feel like there was a difference in my grades if I did or didn't take it.

Participant #36 (Recorded 5/6/14)
R: Had you responded to any kind of writing prompt in other courses before responding to your writing prompt in this course? If so, please give examples.
P: This has been the only class.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: Um, I think I do have like high test anxiety, but I think that it's just towards math.

R: Describe how you felt about taking your tests *before* startig the writing prompt and why you felt that way.

P: Um, usually before any math test, I'm just really nervous and just kinda scared.
R: What did your writing prompt in this course ask you to write about? And do you feel like you followed the instructions?
P: Mine was asking if um everything we learned in that chapter like the unit was going to be on the test that the teacher gave us.

R: Describe how you felt about the tests *after* you had finished writing.
P: Um, I guess it made me realize what exactly was going to be on the test and what actually wasn't on the test.

R: Why do you think you did or did not experience any changes in how you felt about the tests?
P: Well, um, doing the writing prompt it kind of felt like made me forget that I had a test, and then when I started the test, like, I kinda like try to remember stuff right before I take the test and then I always end up forgetting it while I'm writing.

R: How did you feel about actually doing the writing? That is, did you like doing it or not like doing it, and why?
P: I actually really like doing it because it gave me a chance to calm down. I just kinda wish it was like, I don't know if it would help if it would like be a completely different subject or something else, but I actually liked it.

R: Would you recommend that students use this prompt before tests? Why or why not? If yes, what type of student do you think should use it?
P: Um, not necessarily for math, well, yeah I guess it could if um your teacher was really picky about what she did or didn't put on the test, but also for like sciences, I think it's really important to know what's gonna be on the test and what's not. I think if it's just a student like me, who's very nervous about taking a test or very scared about it.

<u>Participant #43 (Recorded 5/9/14)</u>
R: Had you responded to any kind of writing prompt in other courses before doing this one?
P: No

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: Uh, not really

R: Describe how you felt about taking your tests *before* starting the writing prompt and why you felt that way.
P: About how I felt before coming in?
R: Yeah, before you came into the room

P: Before the test?
R: On test days, how did you feel about the test?
P: I didn't really feel nothing because I'm always ready for it.

R: What did your writing prompt ask you to write about?
P: About what's coming in the test. What's coming and what's not coming.

R: How did you feel about your tests *after* the writing prompt?
P: I feel good.
R: So no change?
P: No

R: Why do you think that you did not experience a change in how you felt about taking the tests?
P: Why I feel no change?
R: Right. So you came into the room, feeling alright about the test, then you did the writing prompt, and afterward you still felt fine about the test, so there wasn't any change in how you felt. And you wrote about what was not going to be on the test, so any thoughts about why you didn't feel any change from the writing prompt?
P: Because sometimes when I write stuff, it might come on the test, it might not, you see what I'm saying? Then when I get the test, I'm done. I just feel okay.

R: How did you feel about the actual writing? Did you like doing it or not like doing it, and why?
P: I mean, I like doing it because it did kind of give you like ideas, like what to expect.

R: Would you recommend that students use this writing prompt before taking their tests? Why or why not? And if yes, what type(s) of student would you recommend it to?
P I recommended students taking math: because you know a lot of, it seems like a lot of people have a problem in math.

<u>Participant #48 (Emailed to Researcher)</u>
1. Had you responded to any kind of writing prompt in other courses prior to responding to your writing prompt in this course? If so, please give examples.
Yes,English 1010 ,but all she did was review each paper we typed.

2. Do you think you have high test anxiety? Why or why not? If you think you do, does it apply to all subjects, or just certain ones like mathematics?
Yes ,I have Extremely high test anxiety,and it is with every subject .

3. Describe in detail how you felt about taking your unit tests and final exam *before* responding to the writing prompt and why you felt that way.
I was not as nervous ,because I was not really thinking about the exam .
4. What did your writing prompt in this course ask you to write about? And do you feel like you followed the instructions?
How I felt about the exam .

5. Describe in detail how you felt about taking your unit tests and final exam *after* responding to the writing prompt.
I was in a sick state ! Very nervous .

6. Why do you think you did or did not experience any changes in how you felt about taking the tests?
Because I was thinking about my grade,and how I had forgetten everything I had learned .

7. How did you feel about the actual responding to the writing prompt before starting your unit tests and final exam? That is, did you like doing it or not like doing it, and why?
I hated it because it made me very mind scattered ,and more nervous .

8. Would you recommend that students use this writing prompt before taking tests? Why or why not? If yes, what type(s) of students would you recommend it to and why?
NO

Participant #50 (Emailed to Researcher)
1. Had you responded to any kind of writing prompt in other courses prior to responding to your writing prompt in this course? If so, please give examples.
I have never had a wirting prompt in another class and was wondering why I would have one in this course.

2. Do you think you have high test anxiety? Why or why not? If you think you do, does it apply to all subjects, or just certain ones like mathematics?
I am sure I do have high anxiety. It applies when it comes to test in general. I find myself struggling when it comes to test because I always feel unprepared.

3. Describe in detail how you felt about taking your unit tests and final exam *before* responding to the writing prompt and why you felt that way.
I would always take the writing prompt before taking the test. I would always feel like I am getting stuck with the writing and my feelings it would claim me down but take my mind off the material I studied.

4. What did your writing prompt in this course ask you to write about? And do you feel like you followed the instructions?
The writing prompt would always ask about my emotional state of mind. I feel the instructor ask us to do our best but asking someone to do extra work is not so easy.

5. Describe in detail how you felt about taking your unit tests and final exam *after* responding to the writing prompt.
I feel like I missed out of some of the material I studied.

6. Why do you think you did or did not experience any changes in how you felt about taking the tests?
I felt regardless of testing or not I feel that I am always going to fail a test.

7. How did you feel about the actual responding to the writing prompt before starting your unit tests and final exam? That is, did you like doing it or not like doing it, and why?
I felt the students in the class could have cared less. I felt the results would help with preparing for the test by talking about my feelings.

8. Would you recommend that students use this writing prompt before taking tests? Why or why not? If yes, what type(s) of students would you recommend it to and why?
I would require for an extra point on the test.

Participant #62 (Emailed to Researcher)
1. Had you responded to any kind of writing prompt in other courses prior to responding to your writing prompt in this course? If so, please give examples.
No

2. Do you think you have high test anxiety? Why or why not? If you think you do, does it apply to all subjects, or just certain ones like mathematics?
Yes, and in all subjects.

3. Describe in detail how you felt about taking your unit tests and final exam *before* responding to the writing prompt and why you felt that way.
Nervous because math is not my strongest subject

4. What did your writing prompt in this course ask you to write about? And do you feel like you followed the instructions.
How we felt about the test we were about to take, yes.

5. Describe in detail how you felt about taking your unit tests and final exam *after* responding to the writing prompt.

I felt the same.

6. Why do you think you did or did not experience any changes in how you felt about taking the tests?
Because writing about how I felt about the test didn't change my nervousness.

7. How did you feel about the actual responding to the writing prompt before starting your unit tests and final exam? That is, did you like doing it or not like doing it, and why?
I didn't like doing it. I just wanted to take the test and get it over with.

8. Would you recommend that students use this writing prompt before taking tests? Why or why not? If yes, what type(s) of students would you recommend it to and why?
I think it just takes up time so I wouldn't recommend it.

Participant #67 (Recorded 5/3/14)
R: Had you responded to any kind of writing prompt in other courses prior to responding to the writing prompt in this course?
P: No, I have not.

R: Do you think that you have high test anxiety? Why or why not?
P: No, I think, I believe that if you're gonna pass or fail the test kinda determines your anxiety levels.

R: Describe how you felt about taking your tests in this course *before* responding to your writing prompt.
P: Um, it kinda helped me write down, like when I was writing with a prompt, I felt like if I wrote down what I needed to, like, it kinda calmed me down, and I could take the test.

R: What did your writing prompt ask you to write about?
P: Today?
R: Yes
P: Uh, anxiety levels.
R: And when you were responding to the prompts, did you feel like you were following the instructions?
P: For the most part

R: You might have already addressed this, but how did you feel about taking your tests *after* you had finished writing the prompt?
P: Pretty good

R: If you experienced any changes in how you were feeling about the test, from the point of coming into the classroom to the point of finishing up the

prompt, did you feel a change in between coming into the room and then finishing writing the prompt? Or did you feel the same way?
P: Well kinda the same

R: How did you feel about the actual responding to the prompt before taking your tests? That is, did you like doing it or not like doing it?
P: I did like doing it.
R: Why?
P: Like I said, it calmed me down kinda before taking the test. You know, it cleared my head. Before taking the test, I kinda did feel nervous, and then when I write down it kinda calmed me down so I could focus on taking the test.

R: Would you recommend that students use this writing prompt before taking tests? Why or why not? And if yes, what type(s) of students would you recommend it to?
P: Um, uh, I would probably recommend doing the writing prompt but I'd ask the students first to see if they wanted to do it. But I feel like it did work.

Participant #78 (Recorded 5/3/14)
R: Had you responded to any kind of writing prompt in other courses prior to responding to the writing prompt in this course?
P: No, I have not.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: I do, and it's all subjects during any test. I've been to the counselor already and I got some pills, but I haven't got them yet 'cause on campus doesn't take my insurance, so I have to go off-campus, and I don't have a car.

R: How have you felt about taking your tests *before* responding to the writing prompt.
P: Nervous
R: And why did you feel that way?
P: Uh, I always feel nervous during tests and before tests.

R: What did your writing prompt ask you to write about?
P: Uh, what I was feeling before the test
R: And did you feel like you followed those instructions when you were writing?
P: Um, the last one, not really because I had to use the bathroom really bad. The other ones, I probably did more stuff on there.

R: How did you feel about taking your tests *after* you had finished writing?
P: I felt it was pretty easy. I didn't think it was that hard. I felt great.

R: If you did feel changes between when you started and after you finished, why do you think you felt those changes?
P: I felt that I was just thinking about it too much, thinking that it was harder than it was.

R: How did you feel about actually doing the writing? Did you like doing it or not like doing it, and why?
P: Um, certain times I like doing it because it helps me. There's other times like where I'm too focused about the test, I'm hardly thinking about what I'm writing on the prompt.

R: Would you recommend that students use this prompt before taking their tests? Why or why not? And if yes, what type of student would you recommend it to?
P: Um, I don't know. Probably yes because the way it helped me to focus more on the test, not really much on myself or thinking about it too much. Um, I'd probably give it to anyone who has anxiety about their tests. To know what they need to calm down or what they need to do so they won't be nervous during tests.

Participant #85 (Recorded 5/3/14)
R: Had you responded to any kind of writing prompt in other courses prior to responding to the writing prompt in this course?
P: No, I have not.

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: I do, and it's all subjects during any test. I've been to the counselor already and I got some pills, but I haven't got them yet 'cause on campus doesn't take my insurance, so I have to go off-campus, and I don't have a car.

R: How have you felt about taking your tests *before* responding to the writing prompt.
P: Nervous
R: And why did you feel that way?
P: Uh, I always feel nervous during tests and before tests.

R: What did your writing prompt ask you to write about?
P: Uh, what I was feeling before the test
R: And did you feel like you followed those instructions when you were writing?
P: Um, the last one, not really because I had to use the bathroom really bad. The other ones, I probably did more stuff on there.

R: How did you feel about taking your tests *after* you had finished writing?
P: I felt it was pretty easy. I didn't think it was that hard. I felt great.

R: If you did feel changes between when you started and after you finished, why do you think you felt those changes?
P: I felt that I was just thinking about it too much, thinking that it was harder than it was.

R: How did you feel about actually doing the writing? Did you like doing it or not like doing it, and why?
P: Um, certain times I like doing it because it helps me. There's other times like where I'm too focused about the test, I'm hardly thinking about what I'm writing on the prompt.

R: Would you recommend that students use this prompt before taking their tests? Why or why not? And if yes, what type of student would you recommend it to?
P: Um, I don't know. Probably yes because the way it helped me to focus more on the test, not really much on myself or thinking about it too much. Um, I'd probably give it to anyone who has anxiety about their tests. To know what they need to calm down or what they need to do so they won't be nervous during tests.

<u>Participant #94 (Recorded 5/6/14)</u>
R: Have you responded to any kind of writing prompt in other courses prior to responding to the writing prompt in this course? And if so, please give examples.
P: Uh, as in, like, a writing prompt before a test?
R: Any kind of writing prompt for any reason
P: Oh, definitely. I had expository writing this semester, so we had a bunch of writing prompts in there. So it was what about, um, whether or not we feel like it's unethical to be a photographer taking pictures of a very devastating scene, and the fact that they were there, could they have done something about it? That's one of the prompts.
R: Interesting
P: Yeah, we had a couple political-themed ones, and just really like, our professor in that class was really trying to get into our heads.
R: Very interesting

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: I do have high test anxiety; it's really only towards math though. Every other subject that I've ever taken, I've never had a problem with until math.

R: Describe how you felt about taking your tests *before* starting the writing prompt and why you felt that way.
P: Um, uh, I was always just really high high high anxiety, really nervous. I mean, I have an anxiety disorder, um, but you know, I sit down and get all nervous and shaky, and like, no matter how much I try to focus, it's like, it's not there. Like the recall just isn't happening.

R: What did your writing prompt in this course ask you to write about? And do you feel like you followed the instructions?
P: Um, our writing prompt was if we felt like our professor had left anything out of the unit tests. I'm pretty sure all my responses said, "No, I don't think she left anything out of the unit test." They're actually kind of snide responses, so please don't take it personally.
R: No offense taken
R: I was like, "No, I don't think she would've left anything out." You know, like, it gave me a few minutes before the test, but it really didn't do anything for my anxiety issues with the test.
R: That kind of leads us to the next one.

R: How did you feel about the tests *after* you had finished the writing prompt.
P: Same as I always did. I'm just like, "Oh my god, they're back again!"

R: Why do you think you did or didn't in this case experience any change?
P: Um, I'm already, like I consider myself a pretty talented writer. Um, I've been told that I'm a great writer by almost every writing professor that I've ever had, so when it comes to writing and writing prompts and sitting for a few minutes and focusing on writing, that is not a problem for me. So it really didn't make a difference either way. But I just thought I'd help you out.

R: You sort of addressed this, but I'll just say it again, how did you feel about the actual writing? That is, did you like doing it or not like doing it, and why?
P: As a prompt, uh, the prompt itself, like the subject matter was, you know, I think somewhat relevant, but the fact that we were sitting down and writing before the test, I feel like that for some people it would help, but for me personally it didn't do much.

R: Would you recommend that students use this prompt before taking tests? Why or why not? And if yes, what type of student would you recommend it to?
P: Honestly, I would recommend, the prompt that our class got, do you feel like your teacher left anything out, I feel like that needs to be a prompt that would be used in like a University 1010. 'Cause that's the class I took before this. This is

1710, and I had to take 1010 twice. And I feel like if maybe we had that kind of a prompt in 1010 that that might have helped. Um, I don't know. I think so. That's my inclination.

Participant #95 (Recorded 5/6/14)

R: Had you responded to any kind of writing prompt in other courses prior to responding to your writing prompt in this course? And if so, please give examples.
P: No

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: Yes, and it applies to everything, not just math.

R: Describe how you felt about taking your tests and exam *before* starting the prompt and why you felt that way.
P: Anxious and nervous, kind of afraid I'm gonna fail.

R: What did your writing prompt ask you to write about? And do you feel like you followed the instructions?
P: To discuss what material might not be covered on the test and why.

R: Describe how you felt about taking the tests *after* you had finished writing.
P: Still very anxious

R: Why do you think you did or did not experience any change about how you felt? I guess you didn't feel a change.
P: Right
R: Why do you think maybe you didn't feel a change?
P: 'Cause it didn't, it was the same writing prompt and [indistinguishable]

R: How did you feel about the actual writing? That is, did you like doing it or not like doing it, and why?
P: I didn't like it.
R: Because…
P: Because it seemed redundant; it was the same one over and over.

R: Would you recommend that students use this before taking tests? Why or why not?
P: If it was a different writing prompt, might relax if it's different one.

Participant #105 (Recorded 5/6/14)

R: Had you responded to any kind of writing prompt in other courses prior to responding to the writing prompt in this course? And if so, please give examples.
P: No

R: Do you think that you have high test anxiety? Why or why not? And if you think you do, does it apply to all subjects, or just certain ones like mathematics?
P: I feel like I'm usually well-prepared, so no.

R: Describe how you felt about taking your tests *before* starting the writing prompt and why you felt that way.
P: Uh, I was excited to get it over with, the tests.

R: What did your writing prompt in this course ask you to write about? And do you feel like you followed the instructions?
P: Uh, it always asked if we thought if what we covered in class would be covered on the test.

R: Describe how you felt about taking your tests *after* you had finished writing the prompt. Any change?
P: Uh, it didn't affect me.

R: Why do you think that you didn't experience any change?
P: It just had no effect.

R: How did you feel about the actual writing? That is, did you like doing it or not like doing it, and why?
P: It didn't seem like it really accomplished anything for me.

R: Would you recommend that students use this writing prompt before taking tests? Why or why not? If yes, what type of student would you recommend it to?
P: It might be able to help a few. It really just depends on the individual.

January 22, 2013

Rachel Sefton, Dr. L. Diane Miller
Department of Mathematical Sciences
reb2c@mtmail.mtsu.edu, diane.miller@mtsu.edu

Protocol Title: "Effects of Writing before Tests in College Algebra"
Protocol Number: 13-181

Dear Investigator(s),

The exemption is pursuant to 45 CFR 46.101(b) (2). This is because the research being conducted involves the use of educational tests, survey procedures, interview procedures or observation of public behavior.

You will need to submit an end-of-project report to the Compliance Office upon completion of your research. Complete research means that you have finished collecting data and you are ready to submit your thesis and/or publish your findings. Should you not finish your research within the three (3) year period, you must submit a Progress Report and request a continuation prior to the expiration date. Please allow time for review and requested revisions. Your study expires on **January 22, 2016.**

Any change to the protocol must be submitted to the IRB before implementing this change.

According to MTSU Policy, a researcher is defined as anyone who works with data or has contact with participants. Anyone meeting this definition needs to be listed on the protocol and needs to provide a certificate of training to the Office of Compliance.

If you add researchers to an approved project, please forward an updated list of researchers and their certificates of training to the Office of Compliance before they begin to work on the project.

Once your research is completed, please send us a copy of the final report questionnaire to the Office of Compliance. This form can be located at www.mtsu.edu/irb on the forms page.

Also, all research materials must be retained by the PI or **faculty advisor (if the PI is a student)** for at least three (3) years after study completion. Should you have any questions or need additional information, please do not hesitate to contact me.

Sincerely,
Andrew W. Jones
Compliance Office
615-494-8918
Compliance@mtsu.edu

Re: your Cognitive Test Anxiety scale
Cassady, Jerrell [JCCASSADY@bsu.edu]
Sent: Thursday, November 15, 2012 10:14 AM
To: Rachel E Sefton

Absolutely – please feel free to use it. I will alert you that we have found some measurement issues with the scale (very minor technical things that don't really change the operation of the overall outcomes), and those are under review in measurement journals right now. This has led to the creation of a revised version – which has yet to be published. In the end, the outcomes are identical…but just a warning that you may see some changes in the scale used over the next couple of years.

When you have results you are willing to share – I hope you will let me know. I try to promote other researchers' work through my own referencing as well as posting information on the AARC website (see below).

Good luck, and let me know if there is anything I can do to support your progress.

Best,
Jerrell

_____

Jerrell C. Cassady, Ph.D.
Professor of Psychology
Director, Academic Anxiety Resource Center
Director of MA and PhD programs in Educational Psychology
Dept. of Educational Psychology
Ball State University
765-285-8522
www.academicanxiety.org

From: Rachel E Sefton <reb2c@mtmail.mtsu.edu>
Date: Wednesday, November 14, 2012 11:55 AM
To: Jerrell Cassady <jccassady@bsu.edu>
Subject: your Cognitive Test Anxiety scale

Dr. Cassady,

I am a doctoral candidate at Middle Tennessee State University, and in my research on test anxiety, I have come across the following publications of yours:

Cassady, J. C. (2001). The stability of undergraduate students' cognitive test anxiety levels. *Practical Assessment, Research & Evaluation, 7*(20). Retrieved from http://PAREonline .net/getvn.asp?v=7&n=20

Cassady, J. C. (2004). The influence of cognitive test anxiety across the learning-testing cycle. *Learning and Instruction, 14,* 569-592.

Cassady, J. C., & Johnson, R. E. (2002). Cognitive test anxiety and academic performance. *Contemporary Educational Psychology, 27,* 270-295.

In the 2004 article, I see you provided the CTA scale in its entirety in the Appendix, and I am interested in administering it as part of my research. Do I have your permission to do so, and if so, is there a fee?

Thank you for your time,
Rachel Sefton

Re: the use of your writing prompts to relieve test anxiety
sianbeilock@gmail.com on behalf of Sian Beilock [beilock@uchicago.edu]
Sent: Wednesday, November 14, 2012 2:24 PM
To: Rachel E Sefton
Cc: Gerardo Ramirez [ramirezg@uchicago.edu]

Hi Rachel,

Thanks for the email. You are free to use the prompts. Great to hear about your results. I am copying this to Gerardo (who is my star student and can help you further if needed).
Also, if you haven't already done so, you should check out my book "Choke" - sianbeilock.com

Best, Sian

On Wed, Nov 14, 2012 at 11:38 AM, Rachel E Sefton <reb2c@mtmail.mtsu.edu> wrote:
> Dr. Beilock,
>
> I am a doctoral candidate at Middle Tennessee State University, and in my
> literature review on test anxiety, I came across your article:
> Ramirez, G., & Beilock, S. L. (2011). Writing about testing worries boosts
> exam performance in the classroom. Science, 331, 211-213.
>
> In the supplemental online material, I found the writing prompts that you
> used, and I used them this semester with two College Algebra classes on
> their second unit test. Before their first unit test, neither class did a
> writing prompt, and the class averages were the same (79.94 and 80.00). But
> before their second unit test, one class responded to the prompt about their
> thoughts and feelings, and the other class responded to the prompt about a
> topic they didn't think would be on the test. Unfortunately, I don't have
> enough subjects for enough statistical power to show a statistically
> significant difference, but the first class did outperform the second class
> by 7 points (74.88 and 67.60). I plan on using the prompts again for their
> third unit test in December to see if there is a similar effect or perhaps a
> larger or smaller one.
>
> Now in the coming spring semester, I will collect data for my dissertation,
> where I hope to use these prompts again on a much larger sample and analyze
> some qualitative data too to see how the students react to doing the prompts
> (through their written responses to the prompts, a questionnaire, and some
> interviews). Because there is the possibility that portions of the
> dissertation could get published, I would like to make sure I have your
> permission to use your prompts for the dissertation, and if so, is there a
> fee?
>
> Thank you so much for your time,
> Rachel Sefton

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