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THE CARE FACTOR: THE IMPORTANCE OF USING DOMAIN IDENTIFICATION MEASURES TO IDENTIFY STEREOTYPE THREAT VULNERABILITY IN HIGH SCHOOL FEMALES

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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Abstract

THE CARE FACTOR: THE IMPORTANCE OF USING DOMAIN IDENTIFICATION MEASURES TO IDENTIFY STEREOTYPE THREAT VULNERABILITY IN HIGH SCHOOL FEMALES.

By Kimberly Y. Randolph, PhD

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.
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There is a gap that persists in math achievement between high school males and females. Although the NAEP 2015 longitudinal report shows a narrowing in math achievement between males and females there still remains a gap. More importantly, females are less likely to enter into math - related college programs. Those that do enter into math related college programs sometimes choose to drop out of these programs. The purpose of this study was to do an analysis of factors, along with stereotype threat (the fear of doing something that would inadvertently confirm that stereotype) that might affect math achievement in girls. The factors used were

domain identification measure, motivational orientation, self-efficacy and cognitive interference. Girls who participated in the study attended private or public schools, are in the 9th through 12 grade and have taken algebra I and geometry. Thus, for the female students in this study, domain identification level did not predict math achievement, desire to learn did not predict math achievement, mastery of goals did not predict math achievement, competitive excellence did not predict math achievement, competition seeking predicted math achievement accounting for 25% of the variance in math scores, motivation anxiety worry did not predict math achievement, and motivation anxiety emotionality did not predict math achievement, threat condition did not affect self- efficacy, threat condition did not affect cognitive interference, threat is not related to desire to learn, threat has no effect on personal mastery, threat condition had no effect on competition seeking, threat condition had no effect on emotionality, threat condition did not have an effect on mathematics achievement. . Perhaps there have been changes in female student attitude toward mathematics. With the rise of (Science Technology Engineering Mathematics) initiatives in schools across the country, females are encouraged to immerse themselves in domains that traditionally are dominated by males.

CHAPTER 1: INTRODUCTION

Background of Study

The 1954 Brown v. Board of Education (347 U.S. 483) decision overturned the Plessey v. Ferguson 1896 precedent of "separate but equal". The Brown decision showed that separate was not inherently equal (Howe, 1997; Sarat, 1997). Therefore, all people are entitled to due process and equal protection under the Fourteenth Amendment of the Constitution. Under State's rights – the 10th Amendment, education is a protected right (Howe, 1997; Sarat, 1997). Before the 1960's black students found it difficult to receive equal treatment or an equal education compared to white students (Sarat, 1997). The Supreme Court decision abolished segregation in public schools with the assurance that regardless of race, creed, ethnicity or socioeconomic status, an opportunity to receive quality education was possible (Brown v. Board, 1954). This antidiscrimination law became the foundation in enacting other antidiscrimination laws that would preclude discrimination based on race, religion, and gender, an example being, the 1964 Civil Rights Act (Sarat, 1997) . More specifically, there has been federal legislation passed that embraces diversity and provides Equality of Education Opportunity for all students. Major

federal education legislation like the Elementary and Secondary Education Act (1965) that has now become the No Child Left Behind Act (2001), Title IX of the education amendment of 1972 (now the Patsy T. Mink Equal Opportunity in Education Act) and Individuals with Disabilities Educational Improvement Act of 2004 (formerly the Individuals with Disabilities Education Act), all served to secure quality, equitable and accountable education for public school students (Howe, 1997; Sarat, 1997).

The 1983 "A Nation at Risk" report by the National Commission on Excellence in Education was critical to alerting the nation that the students of this nation were inadequately prepared academically (National Council for Excellence in Education, 1983). There was unsatisfactory achievement in many academic domains that left the nation vulnerable and ill prepared to compete globally (National Commission on Excellence in Education, 1983). President George Bush's No Child Left Behind Act (2001) became a solution to certify that students will receive a fair and equal opportunity to obtain a high quality education that will allow them to become skilled according to individual state's academic standards and assessments (NCLB, 2001; Vacca, 2005). The No Child Left Behind Act (2001) stipulates that every state and public school district be responsible for every student meeting specific math and reading standards by the year 2014 (NCLB, 2001; Vacca, 2005). NCLB was made into law to significantly reform education and to insure every child no matter the state he resides received education that was measurable and consistent with grade level. Therefore, all groups of students

were expected to meet Adequate Yearly Progress (NCLB, 2001). However, provisions in NCLB were found to impede states' progress toward educational reform. On March of 2010 the Obama Administration, presented a document to congress called "A Blueprint for Reform". This document sought to reauthorize Elementary and Secondary Education Act, also known as the No Child Left Behind (U.S. Department of Education, 2010). The Blue Print for Reform presented a reform framework that sought to correct unfavorable issues created by NCLB, while maintaining its primary goal to close the achievement gap. .Reauthorization of NCLB was not approved by congress. Nevertheless, a provision contained in the No Child Left Behind Act allowed states to adopt their own comprehensive education plans to improve educational outcomes, improve the quality of teaching and to close the achievement gap (U.S. Department of Education, 2010). Therefore, there remains a persistent performance gap between African Americans and Caucasian Americans and females and males (National Center for Education Statistics, 2005).

One phenomenon that may provide answers concerning the gender differences in academic performance for particular domains is stereotype threat (Steele & Aronson, 1995; Perry, Steele, & Hilliard, 2003). Stereotype threat is a social-psychological threat of being characterized or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, Lustina, Good & Keough, 1999; Perry, Steele, and Hilliard, 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006). When females are presented with a threat condition, females

blame their failure to accomplish the task on internal factors oppose to external factors (Koch, Mueller & Severding, 2008). This study will explore the effects of stereotype threat on high school females who may have an investment and care about their test performance in mathematics.

Brief Overview of Literature

This study's core is based on equality of education opportunity. Equality of education opportunity is a woven fabric of democracy, liberty, equality, opportunity, choice, and justice. Conceptually, when equality of education opportunity is applied properly, educational results should yield "real educational opportunities worth wanting" (Howe, 1997). In 1954, the response to a people wanting equal education opportunities was through the Brown v. Board decision. The Brown decision was a catalyst for many federal mandates that improved educational opportunities for the disadvantaged (Sarat, 1997). In 1965 the Elementary and Secondary Education Act (ESEA) was passed. ESEA's focal point was to fortify schools, reinforce accountability, and maintain current instructional and professional development necessary to support high standards and manage and direct resources necessary to advance education for all children (NCLB, 2001). Thus, the need for all Americans to have an equitable share in education persisted. In 1972, Title IX (one of the Education Amendments to the 1964 Civil Rights Act) was the primary comprehensive federal law to produce gender equitable schools and prevented sex discrimination against students and employees of educational facilities

(20 U.S.C. Sections 1681-1688). Federal legislation continued to improve education for students who were disadvantaged physically, emotionally, and mentally handicapped. The Individuals with Disabilities Educational Improvement Act (2004), formerly known as the Individuals with Disabilities Education Act (1994), sought to ensure that the rights of students with disabilities ages 3-21 (or until student graduates high school) receive a free and suitable education, which has been structured to accommodate them individually (IDEA, 2004).

In 1983, the National Committee on Excellence in Education presented a report to the federal government entitled "A Nation at Risk". The report delineated alarming statistics indicating that many of our nation's school age children fell below the achievement goal both nationally and internationally (National Commission on Excellence in Education, 1983). To add: "1) 23 million Americans were functionally illiterate in reading, writing, and comprehension; 2) Thirteen percent of all 17 year olds in the United States were functionally illiterate; 3) Minority students were functionally illiterate up to 40 percent; 4) Standard Aptitude Tests (SATs) dropped 50 percent for Verbal scores and 40 percent for Math scores, a decline from 1963 to 1980; and 5) over half of the gifted students did not match their tested ability with comparable achievement in school" (National Commission on Excellence in Education, 1983). "A Nation at Risk" put a spotlight on the nation to be accountable for the education of its children. In 2001, President Bush's bipartisan collaboration produced a comprehensive plan to restructure the approach to education and assessment for American children, entitled the No Left Behind Act. The No Child

Left Behind Act is a reauthorization of the Elementary and Secondary Education Act (1965) (NCLB, 2001). Hence, the purpose of NCLB is to certify that children will receive a fair and equal opportunity to obtain a high quality education that will allow them to become skilled in state academic standards and assessments (NCLB, 2001; Vacca, 2005). The No Child Left Behind Act's mission is to promote academic excellence. A major component of that mission is to close the achievement gap related to socioeconomic status, ethnicity and gender (NCLB, 2001; Hughes, 2007). The No Child Left Behind Act has been in force since 2001. In spite of that, the achievement gap across the demographic continuum persists (National Center Education Statistics, 2005).

The Achievement Gap

The National Assessment of Education Progress (NAEP) long-term trend data report progress in achievement in some domains. In the reading domain, students age nine reading scores were higher in 2004 than in any previous year (NCES, 2005). Students at age 13 reading scores were higher in 2004 than in 1971 (NCES, 2005). Conversely, for age 17 there was no measurable change in average reading scores in 2004 compared to 1971 (NCES, 2005). The reading score for 17 olds in 2004 was the same as 1971 (NCES, 2005). However, when the data were disaggregated according to ethnicity and gender, there remained a significant performance gap between racial subgroups (NCES, 2005). Female students' reading scores were higher on average than male reading scores (NCES, 2005). In 2012 the National Assessment of Education

Progress (NAEP) long-term trend data nine year old male students made greater progress when compared to their female counterparts in 1971 (NCES, 2016). The gender gap narrowed between males and females from 13 points to 5 points (NCES, 2016). Thirteen year old male students increased their reading scores 9 points and 13 year old female reading scores increased 6 points compared to 1971 (NCES, 2016).The reading scores for female and male students in 2012 were not significantly different from the reading scores in 1971 (NCES, 2016). Seventeen year old males made a 4 point gain in reading scores in 2012 as compared to 1971 (NCES, 2016). However, 17 year old female reading scores stayed the same in 2012 as compared to reading scores in 1971 (NCES, 2016).

The NAEP long-term trend data report a significant improvement in math achievement for ages 9 and 13 between 1973 and 2004 (NCES, 2005). Conversely, for age 17 there was no measurable change in average math score (NCES, 2005). However, gaps in the gender scores for ages 13 and 17 show a measurable difference between 1973 and 2004 (NCES, 2005). Male math scores were measurably higher than female math scores. In 2012, NAEP long-term data report for math scores showed a 26 point increase in math scores for males and a 24 point increase in math scores for females compared to math scores in 1973 (NCES, 2016). In 2012 students age 13, male students gained 21 points and females gained 17 points on math scores compared to 1973 math scores (NCES, 2016). Females age 17 made a 3pt gain in 2012 as compared to math scores in 1973 (NCES, 2016). There was no significant difference in male

math scores in 2012 compared to math scores in 1973 (NCES, 2016).

It is important to note that differences in math performance between males and females have been linked to the level of math completed. Females score above males in math from middle to high school, except on tests that contain more difficult math problems, word problems, and spatial reasoning (Willingham & Cole, 1997; McGlone & Aronson, 2006). However, psychometric studies have shown that the level of mathematic instruction received does not solely explain the difference in mathematic achievement between males and females (M. C. Linn & Hyde, 1989; Scheuneman & Grima, 1997).

Race, Gender, and Achievement

There has been some improvement in overall performance for various domains relating to achievement (NCES, 2005; NCES, 2016). Nevertheless, there remains an achievement gap between blacks and whites and females and males (NCES, 2005; NCES, 2016). There continues to be controversy surrounding the cause of the achievement gap between blacks and whites and males and females (National Commission on Excellence in Education, 1983; NCLB, 2001). The primary concern is how to close the achievement gap (National Commission on Excellence in Education, 1983; NCLB, 2001). Thus, educators and legislators have been working together for decades to produce programs to answer the pending problem (347 U.S. 483; IDEA, 2004; NCLB, 2001).

The test performance disparity seen between African Americans and Caucasian

Americans have been connected to various theories involving test bias, socioeconomic status, family background, hereditary differences, and environmental differences (Jencks & Phillips, 1998) . For example, the mathematic scores for standardized tests and math grades for African Americans are consistently lower than Caucasian Americans. Particularly in the area of word problems, African Americans score less well than Caucasian Americans (Ryan, 1991). This disparity ranges from pre-kindergarten through college (Jencks & Phillips, 1998).

Kessel & Linn (1996) report that females have higher grade point averages in math than males from elementary school through college. Even when females take the advanced Math courses, they are reported to maintain higher GPAs than males. However, on standardized tests, females perform below the math average of males. This is theorized to be because of test bias toward females (Kessel & Linn, 1996). To add, females take fewer advanced courses than males, which may assist in lowering performance test scores (McGlone & Harrison, 2006).

Stereotype Threat

There are various theories that support reasons for performance outcomes pertaining to student achievement. For example, Motivation Theory, Achievement- Goal Theory, and Stereotype Threat (Ryan & Ryan, 2005). The present study will explore stereotype threat, gender, and domain identification in mathematics.

Stereotype threat is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that

would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, Lustina, Good & Keough, 1999; Perry, Steele, and Hilliard, 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006; Kellow & Jones, 2007). In addition, those who experience stereotype threat when presented with a specific domain, experience "situational threat" (Steele, 1997). The "situational threat" is only applicable to that stereotype presented by that domain (Steele, 1997). Earlier studies reported historically stigmatized groups like African Americans were vulnerable to Stereotype Threat when intelligence and cognitive ability were made salient before a test (Steele & Aronson, 1995). Steele & Aronson (1995) used black and white, and female and male college students who had the same high academic ability. The students were divided into two groups. Group One and Group Two received the same questions from the verbal portion of the Graduate Record Examination. Students in Group One were presented with a stereotype condition. Students in Group One were told that intellectual ability would be tested. In Group Two, students had a non-threat condition. Students in Group Two were told that the test was non-diagnostic of ability. The results revealed that Black students who were in Group One and who had received the threat condition, scored below White students. Black students in Group Two who were in a non-threat condition scored the same as their White counterparts (Steele & Aronson, 1995).

Theoretical Foundation

The theory behind the stereotype construct involves mediating (explains causal relationships between the independent and dependent variable) and moderating (identifies

correlations between the independent and dependent variable) factors (Baron & Kenney, 1986). A proposed model of theory found in Bailey (2004) identifies proximal motivation, anxiety, and self-efficacy as the mediators of stereotype threat; and sex (gender), motivational orientation, cognitive ability and domain identification as moderators of stereotype threat (Steele, 1997; Smith & White, 2001; Bailey, 2004). The moderators and mediators are the supporting constructs to stereotype threat that help to identify individual differences that respond to negative threat situations and affect performance outcomes (Baron & Kenny, 1986).

Embedded in the supporting constructs of stereotype threat are more levels of theory that affect performance outcomes, for example, effort, self-regulation, and disidentification (Bandura, 1986, 1997; Steele, 1997; Aronson et al., 1999; Huitt, 2001). In studies done by Bandura (1986, 1997) report the importance of self-efficacy (the development of a plan to attain those goals, the commitment to implement the plan, the actual implementation of the plan, and subsequent actions of reflection and modification or redirection), and self-regulation (directs "higher order mental activities" and allocates *effort* toward task performance and goal attainment) in learning and motivation.

Stereotype Threat and Gender

Stereotype Threat conditions produced by making gender salient can alter achievement outcomes (Spencer, Steele, & Quinn, 1999; Nguyen, & Ryan, 2008). Women with high grade point averages in math, who were presented with a stereotype threat condition while taking a

difficult standardized math test, were found to score less well than males who took the same test. When the test condition was free of negative stereotypes, the women scored the same or better on the standardized math test (Spencer et al., 1999). Hence, anyone of any gender, race or culture can be vulnerable to stereotype threat (Aronson, Lustina, Good, & Keough, 1999). In order for stereotype threat to affect test performance the test taker must care about the domain being tested. The person experiencing the threat must have some personal investment in doing well in a particular domain (Smith & White, 2001).

Stereotype Threat and a Diverse Population

The majority of stereotype threat research has been administered to college students (Steele, 1995; Steele, 1997). These students have been highly identified with the domain of which they are being tested and are high performers academically (Steele, 1997; Aronson, 1999; Delgado & Prieto, 2008). However, few studies have included secondary school students. There was a 2014 mandate by the federal government of the No Child Left Behind Act for all students to be proficient. Yet, in 2016, the nation is still searching to find ways for all students worldwide to be proficient (NCES, 2016). There is a need to identify those students affected by stereotype threat. Hence, studying the effects of stereotype threat on the high school population, a more diverse population and high school aged females, may generate some valuable information concerning motivational orientation, self-efficacy, and levels of domain identification. Each of these variables can be a predictor of performance outcomes. When stereotype threat is made

salient for a particular domain, with students who have a high range for each of these variables, performance outcomes may be lower (Steele & Aronson, 1995; Steele, 1997; Aronson, 1999; Delgado & Prieto, 2008).

Rationale for the Study

It is true that some progress has been made toward improving achievement by requiring standards that will help our nation's children to compete nationally and globally. No Child Left Behind mandates require educators, parents and students to be accountable for their education. The year 2014 is has come and gone. All students attending public schools were expected to be proficient in every academic domain tested. Unfortunately, there exist students who are still lagging behind.

A population of those students is female and high school aged. There are females that have higher GPAs in math courses than males, but are under- represented in high level or advanced math classes. Females outperform males in math from pre-kindergarten through college, but do less well on the Standard Aptitude Test in excess of 100 points. It is often said that females do not do math. Statistically, females do not choose math-related degrees or careers (NCES, 2005; NCES, 2008; McGlone & Aronson, 2006). Studies report, when females with high math GPAs are presented with difficult standardized math tests that include math word problems or spatial reasoning, their scores are lower than their male math counterparts (NCES, 2005; NCES, 2008). In addition, studies show that by asking the gender of the test taker prior to

the administration of the test, enough negative threat was presented to cause test performance to lower (McGlone & Aronson, 2006). This reaction to a negative threat or fear that a stereotype about female performance on difficult math tests may be confirmed, is called stereotype threat (Thoman, White, Yamawaki, & Koishi, 2008). Thus far, these threat conditions have been investigated using college-aged participants. The scope of the present study consists of 20 high school females from private and public schools who have minimally completed Algebra I and Geometry. If the mission of No Child Left Behind is to get all students proficient in all domains including math, then educators need to be able to identify reasons for performance gaps seen between females and males in the math domain. The ability to classify those most susceptible to stereotype threat will allow educators to more accurately provide a non-threat testing environment. Reports from this study may provide a greater opportunity to improve achievement.

Purpose of the Study

Without a doubt, studies in the area of achievement and data collected through longitudinal studies have repeatedly confirmed that there remains an achievement gap between males and females. However, studies in this area have traditionally utilized college students to investigate stereotype threat. This highlights the gap in the literature. Clearly, there is a need to identify students affected by stereotype threat prior to graduation from secondary schools, explicitly to help reduce threat situation to improve opportunities to close the achievement gap. The purpose of this investigation is to use Domain Identification Measures (an assessment used

to identify a participant's value in a domain) to identify high school females who are vulnerable to stereotype threat in math domains.

Design and Method

This study is a treatment group non-treatment group design. Inferential statistics were used to identify the relationships between Domain Identification Measure (DIM), Motivational Orientation Questionnaire (MOQ), Cognitive Ability (CA), Task State Self Efficacy (TSSE), Cognitive Interference (CI), Stereotype Threat Treatment (STT); and Math SAT score, performance outcomes of participants.

Participants

Participants in this study were chosen from both private and public high schools located in Richmond City and Henrico County. Participants who are eligible to participate in the study will be female and have completed Algebra I and Geometry. There is no minimum grade point average.

Apparatus and Materials

The participants received four questionnaires the same day the sample Math SAT assessment was administered. Questionnaire 1: Domain Identification Measure (DIM), is a modified measure adopted from Smith and White (2001) and Bailey (2004). The DIM determines which participants are highly, moderately identified with the math domain and which participants have low identification with the math domain. The DIM measures the level of investment and care in

the math domain. Questionnaire 2: Motivational Trait Questionnaire (MTQ) or Self-Description from Heggestad and Kanfer (2000), is used to identify individual differences, which are personal mastery, competitive excellence, and achievement anxiety. Questionnaire 3 is the Task State Self Efficacy Questionnaire, which determines the strength of self-efficacy - the belief that a particular action can be performed or accomplished by an individual (Bandura, 1986; 1991; 1997). Questionnaire 4 is the Cognitive Interference/demographic collection. The information collected from this questionnaire will report the number of intrusive thoughts incurred during the sample Math SAT assessment. Finally, a sample Math SAT assessment will be given to all participants.

General Procedure

The participants in this investigation must be female and have completed Algebra I and Geometry to be eligible for the study. The Domain Identification Measure (DIM) and Motivational Trait Questionnaire (MTQ) will be answered before dividing the sample (participants) into the treatment group and non-treatment group. The participants will be allowed to view the Math SAT assessment which has includes the threat statement or non-threat statement. Following, the Task State Self Efficacy (TSSE) will be administered. After, the sample Math SAT assessment will be given. Finally, the Cognitive Inference (CI)/Demographic collection questionnaire will be administered. The data collection will be analyzed through descriptive and inferential statistical analyses.

Definition of Terms

Stereotype Threat (ST) is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, et al., 1999; Perry et al., 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006).

Domain Identification Measure (DIM) is an assessment given to identify a participant's value in a domain. The higher the DIM the more vulnerable a participant is to stereotype threat in a particular domain (Smith & White, 2001).

Motivational Orientation : defines the source of motivation for an individual to perform a particular action and can either originate from internal desires (e.g. interest) or external compensation (e.g. money). Motivational orientation should influence the way positive or negative feedback is processed during learning situations and this might in turn have an impact on the learning process (Atkins, 1957; Dweck, 1986; Bailey, 2004; Linke, 2010).

Task State Self Efficacy: determines the strength of self efficacy - the belief that a particular action can be performed or accomplished by an individual (Bandura, 1986; 1991; 1997).

Cognitive Ability (Cognition): of or pertaining to the mental processes of perception, memory, judgment, and reasoning as contrasted with emotional and volitional processes.

Cognitive Interference: The number of intrusive thoughts incurred during an assessment (Sarason, Keefe, Hayes & Shearin 1986).

Math Score: represents the composite score from Scholastic Aptitude Test (SAT) math questions.

CHAPTER 2: LITERARY REVIEW

Stereotype Threat

Stereotyping treat is being at risk of confirming as self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, Lustina, Good & Keough, 1999; Perry, Steele, and Hilliard, 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006). To add, "It is a social psychological threat that arises when one is in a situation or doing something for which a negative stereotype about one's group applies" (Steele, 1997).

There are several mechanisms driving stereotype threat: Anxiety, (Beilock et al. 2007), distraction and loss of motivation (Finger, 1966), physiological arousal (Blascovich et al, 2001) reduced effort (Elliot & Dweck, 2005), reduced self-control (Inzlicht et al., 2004) reduced working memory capacity (Schmader & Johns, 2003), reduced speed in performance (Bailey, 2004), and excess effort or attention (Elliot & Dweck, 2005). Thus, for stereotype threat to have an effect on the target, the target must first identify and care about the domain in which the negative group stereotypes apply (Steele, 1997). Hence, the target

is usually highly intelligent and does not have an inferior attitude toward performance in that particular domain. However, when the task is complex or difficult and stereotype threat conditions apply performance within domain usually wanes.

Although initial studies were performed with African Americans and women, stereotype threat can affect any one and is not resigned to gender and minorities (Steele, 1995, McGlone & Aronson, 2006). For, example, world renown chefs, record setting athletes, highly accurate mathematicians can be presented with a negative threat situation and their performance in the prescribed domain can decrease (Steele, 1997; Aronson et al, 1999). More importantly, stereotype threat is strictly a situational threat occurrence (Steele, 1997). The threat does not awaken or cue an existing "internalized anxiety" or "expectancy", but the targets may recognize that negative group stereotypes may apply if the situation is presented (Steele, 1997). Consequently, if people who have chronic exposure to the threat and experience stress related to the threat, they may begin to disidentify with the domain to the extent that they no longer identify with the domain (Steele, 1997; Perry et al, 2003). Observations of African Americans who have been repeatedly compared to threats of cognitive ability compared to whites, and some women who have been told that math is not feminine have been found to disidentify from domains (Steele, 1997; Perry et al, 2003).

The Stereotype Threat Construct

Many studies have repeatedly shown that stereotype threat does affect performance

outcomes over a wide range of domains (Steele, 1997, Perry et al, 2003). Domains which are academic and non- academic, non-diagnostic and diagnostic (Steele 1997).

Theoretical Underpinning of Stereotype Threat

Although the research literature is rich in connecting stereotype threat to performance in both academic and non-academic situations (Perry et al 2003), the literature has been sparse in providing, collectively, the theoretical constructs upon which stereotype threat is based. This is because the threat condition may only be raised in those who are targets for a specific negative threat (Bailey, 2004). For example, those who are a part of a particular social class, ethnicity, and gender are vulnerable to specific negative threat situations (Steele, 1995; Perry et al., 2003). Therefore, the challenge has been to identify the internal mechanisms (individual differences) affected by external negative threats which then affect performance outcomes (Bailey, 2004).

According to Bailey (2004), the stereotype threat construct is supported by mediating and moderating conceptual variables (Bailey, 2004). Identifying mediating and moderating conceptual variables are important in 'accounting for differences in peoples' behavior' (Baron & Kenny, 1986). According to Baron & Kenny (1986), the following is true about mediators and moderators:

1. Mediators explain how *external physical events* take an *internal psychological significance*.
2. Mediators speak to how and why such effects occur.

3. Mediators are used to identify *causal relationships* between the independent or predictor variable and a dependent or criterion variable.
4. Moderators specify when certain effects will hold.
5. Moderator variables are introduced when there is an unexpectedly weak or inconsistent relation between a predictor and a criterion variable (this means that the relationship will "hold" for some populations but not for others).
6. Moderator variables can be qualitative (race, sex, class) or quantitative (levels of rewards), which affect the direction and strength of the relation between an independent or predictor variable and a dependent or criterion variable.
7. Moderators are used in correlation analyses.

Sub-constructs of Stereotype Threat

The theoretical model in Bailey (2004) (Figure 1) includes the moderating and mediating conceptual variables or sub-constructs that can possibly affect the stereotype threat construct and lead to possible performance changes (Bailey, 2004).

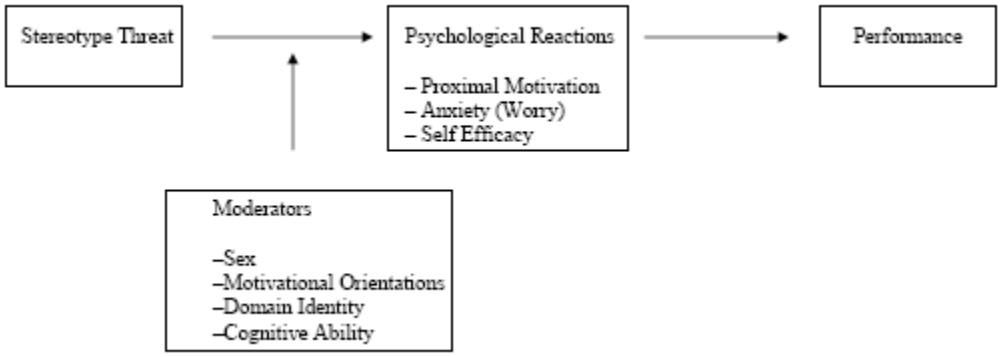

Figure 1. Mediated-Moderation Model of Stereotype Threat (Bailey, 2004)

The mediator sub-constructs (psychological reactions) are motivation, self-efficacy, and anxiety. The moderator sub-constructs are cognitive ability, domain identification, sex (gender) and motivational orientations.

Possible Mediators of Stereotype Threat

Motivation as a mediator

According to Bailey's (2004) proposed model (Mediated-Moderation Model of Stereotype Threat, Figure 1) motivation is a possible mediator of stereotype threat. Kleinginna & Kleinginna (1981) define motivation as being an internal state that activates behavior and gives it direction, desires or want that energizes and directs goal-oriented behavior, influence of needs and desires on the intensity and direction of behavior, (Franken, 1994) describes motivation as the arousal, direction and persistence of behavior (Huit, 2001). Huit (2001) describes the "source" of the "motivation to learn" as *intrinsic* (the person is motivated internally, plans and

sets goals, gets pleasure from learning, learning that is morally significant) or *extrinsic* (the person is compelled to learn, provided with valuable rewards, expectations are clear) (Huit, 2001; Ormond, 2003). Students are not always intrinsically motivated to learn (Huit, 2001; Ormond, 2003). However, a student can be extrinsically motivated to learn through *situated motivation* to perform a task (Huit, 2001; Ormond, 2003). Thus, those experiencing stereotype threat respond to situations created in the environment. For instance, Spencer, Steele, & Quinn (1999), recruited women and men who were the top 15% of University of Michigan and had high entrance SAT math scores. A situation (negative threat condition) was created in the laboratory where a condition was mimicked to "produce women's underperformance in the world". Even though the women were motivated to achieve and highly identified with the math domain, the results showed that women who experienced the negative threat situation, scored lower than males taking the same test. Thus, levels of motivation have been linked to levels of performance (Atkins, 1957; Dweck, 1983). According to Bailey (2004), low motivation has been synonymous with low performance as evidenced by Finger (1966) who saw a correlation between low performance and low motivation amongst students who did not participate in non-academic activities offered by their high school or college. Conversely, studies of people targeted by stereotype threat are highly motivated to achieve and are normally high performing students. For example, Steele & Aronson (1995) report that African Americans and women (Aronson et al, 1999) experiencing stereotype threat were highly motivated to achieve, yet still performed

poorly when presented with a negative threat situation. This is because those who are considered targets feel a need to *prove* they are capable of performing the task at hand (Bailey, 2004). Thus, targets have to first care about the domain in which the threat is presented to influence performance outcomes (Perry et al., 2003).

Approaches to Motivation as a sub-construct to Stereotype Threat

There are two approaches to motivation, distal motivation (which is the thoughtful and rational psychological process in goal selection) and proximal motivation (which is the emotive automatic psychological process in goal striving) (Kanfer, 1990; Locke & Latham, 2002). Both distal and proximal motivation "determine the distribution of *effort* (the exertion of physical or mental power to perform a task) across on- and- off task activities during performance" (Bailey, 2004). For example, in a study by Aronson & Salinas (2001), participants' wrists were connected to electrodes that measured *effort.* Although participants were told that they would have to repeat the test if enough *effort* was not exerted (stereotype threat condition), stereotype threat effects continued to emerge showing that "reduced effort is not a necessary mediator of stereotype threat effects" (Aronson & Salinas, 2001; Elliot & Dweck, 2005). Thus, it is fair to point out that the targets of stereotype threat are usually high performing academically, highly identified with the domain, and take tests that are no more than 20 minutes to 30 minutes long. Those who are highly identified with a particular domain, use the distal motivation approach, absent of stereotype threat may experience high performance in that domain and enough effort to

successfully answer questions on an assessment. However, those who use the proximal motivation approach in a threat environment, maximum effort is expended and performance may be lowered (Elliot & Dweck, 2005). However, as emphasized by Elliot & Dweck (2005), it may be that those persons who have a smaller degree of investment and take more lengthy tests, may react to stereotype threat conditions with "low effort" (Elliot & Dweck, 2005). If these conditions are presented, low effort could also be a mediator of stereotype threat. There are no studies to corroborate this postulation to date (Elliot & Dweck, 2005).

Hence, as indicated by figure 1, stereotype threat is mediated by proximal motivation. Targets that experience proximal motivation have an interest in maintaining a positive self-concept. External factors, such as the presence of others who exert social cues cause the targets to become emotionally aroused, which increases attention and direction toward task strategy in order to complete tasks (Ferris & Mitchell, 1987). To add, proximal motivation produces control task- striving behavior (Bailey, 2004). This behavior is expressed when the targets compare their goals and standards to others' goals and standards to deflect any discrepancies, which is referred to as cognitive dissonance (Festinger, 1957; Bailey, 2004). Therefore, proximal motivation affects performance outcomes (Bailey, 2004).

Self-Regulation, Cognitive Ability and Proximal Motivation

When a negative threat situation is presented, the targets' attention is aroused and the proximal motivational process is stimulated (Bailey, 2004). The targets' self-esteem is also

threatened because of the impending evaluative process brought on by the stereotype threat effect (Bailey, 2004). To add, the proximal motivation is aroused when the target identifies highly with the domain (Steele, 1997; Smith & White, 2001). Involved in this process is the target's approach to establishing goals, the development of a plan to attain those goals, the commitment to implement the plan, the actual implementation of the plan, and subsequent actions of reflection and modification or redirection, which is referred to as *self –regulation* (Bandura, 1986, 1997; Huit 2001). In a negative threat environment, the proximal motivational process directs *effort. Self-regulation* directs "higher order mental activities" and allocates *effort* toward task performance and goal attainment (Bandura, 1986, 1997; Bailey, 2004). During self-regulation, cognitive abilities may be obstructed because of the depletion of cognitive resources (intelligence and experience in the reaction to stress) (Elliot & Dweck, 2005). Thus, the more complex the task during the stereotype threat state the greater the depletion of cognitive resource and an increase in cognitive interference, which may lead to poor performance outcomes (Spencer et al., 2001; Elliot & Dweck, 2005). Elliot & Dweck (2005) report that many studies have shown targets under stereotype threat "eat up" valuable cognitive resources needed for performance. Schmader and Johns (2003) discovered that working memory decreased during stereotype threat preventing the target from processing information needed to carry out tasks. Working memory is "a short term memory system involved in the control, regulation, and active maintenance of a limited amount of information with immediate relevance to the task at hand"

(Beilock, Jellison, Rydell, McConnell, & Carr, 2007). According to Beilock et al., (2007), working memory is used to organize task- relevant information and stereotype threat appears to interfere with working memory's capacity to organize and plan, which may affect performance. Moreover, Inzicht et al., (2004) found that negative threat situations prevent the targets' self-regulation process from having self-control, memory and organizational skills. More specifically, the study reported that targets were unable to squeeze the handgrip because of cognitive load (divided attention) attributed to the stereotype threat effect (Inzicht et al., 2004).

Self-Efficacy as a mediator

Self-efficacy is the belief that a particular action can be performed or accomplished by an individual (Bandura, 1986; 1991; 1997). Self-efficacy determines the goal selection (and the effort involved in the selection) and goal selection determines performance outcomes (Gist & Mitchell, 1990; Huit, 2001). Under the threat condition, low self-efficacy may lead to the target using "less optimal" task strategies (Bailey, 2004). For example, Steele & Aronson (1995) report that blacks performed less well than whites did on the GRE verbal test when race was primed before taking the exam. Whites guessed more than blacks did on the test. Blacks also reported re-reading the questions thereby finishing fewer questions than whites (Steele & Aronson, 1995). The inability to stay on task and complete test questions during the threat situation, indicates a possible lowering of self-efficacy (Huitt, 2001). Thus, self-efficacy determines goal selection, the effort involved in the selection and goal selection determines performance outcomes (Gist &

Mitchell, 1990; Huit, 2001). Conversely, high self-efficacy may lead to maintaining self-esteem. Self-esteem is needed to plan task strategies that lead to positive performance outcomes (Bailey, 2004).

Anxiety as a mediator

According to Schwarzer (1997), anxiety is defined as "an acute emotion and as a personality construct". This construct is used to study individual differences through psychometric tools (Schwarzer, 1997). Thus, there are two types of anxiety. State anxiety occurs when there is a need for cognitive appraisal when a threat situation is presented (Lazarus, 1991). State anxiety refers to the "unpleasant emotional arousal in the face of threatening demands or dangers" (Spielberger, 1983). Trait anxiety "reflects the existence of stable individual differences in the tendency to respond with state anxiety in anticipation of threatening conditions" (Spielberger, 1983). State anxiety and trait anxiety both have levels of *worry* and *emotionalism* (Spielberger, 1980). In the stereotype threat condition, *worry* affects cognitive ability and is negatively correlated with self-efficacy (Spielberger, 1980; Schwarzer, 1996). Therefore, the target of the negative threat condition has the perception that they are not able to work against the threat. This component of state anxiety and trait anxiety is *worry* (Spielberger, 1980). However, *emotionality* is characterized by sweating, headaches and increased nervousness that occurs during arousal to the negative threat condition (Spielberger, 1980). Although *worry* and *emotionality* can happen at the same time, *worry* is directly related to performance outcomes and

*emotionality i*s not (Spielberger, 1980). According to Blascovich et al (2001), a verbal ability test was administered to a group of black and white college students. One group of college students took the test under stereotype threat conditions. The other group of college students took the test without the stereotype threat conditions. During the test, the participants' blood pressure was monitored. As a result, under the stereotype threat condition, black students performed worse than white students on the verbal ability test. To add, black students' blood pressures were significantly higher than the baseline blood pressure during the test. All other students taking the test experienced a drop in their blood pressure (Blascovich et al., (2001). Thus, Elliot & Dweck (2005) argue that anxiety boosts performance in simple tasks. Conversely, anxiety causes performance interference when the task is complex (Elliot & Dweck, 2005). When used as a mediator in stereotype threat conditions, anxiety was found to do the following in a study by O'Brien & Crandall (2003): women who took a math test under stereotype threat conditions performed better on simple math tests than women in a non-threat condition. Spencer et al, (1999) reported women taking a complex math test in a stereotype threat environment experienced performance impairment.

Possible Moderators (Individual Differences) of Stereotype Threat

Sex (Gender) as a moderator

Depending upon the domain, stereotype threat conditions can affect one gender over the other (Bailey, 2004). When testing environments favor the "female benefit" condition then high-

test performance is expected (Bailey, 2004). The "female benefit" condition is expected to produce high self-efficacy and low cognitive interference in females when the negative threat is presented, but not in males (Bailey, 2004). Quinn et al (2001) found consistent with prior research, gender differences, which benefit men on standardized math test. For example, Quinn's et al (2001) Study 1 revealed, when stereotype threat was applied, women were unable to plan strategies needed to complete word problems. However, when the word problems were converted to their numerical equivalents, the women performed equally as well as the men. In Study 2, men and women received a very difficult set of problems. There were two levels of stereotype threat administered. In the high stereotype threat environment, the women were less able to plan strategies and adequately used cognitive resources to solve the math problems. In the reduced threat situation, women were better able to plan and strategize to solve the difficult math problems Quinn et al (2001).

Motivational Orientation as a moderator

Bailey (2004) defines motivational orientation as being "a trait like difference in goal striving (proximal motivation) to either achieve success or avoid failure that is thought to impact state motivation and behavior through its impact on goal choice" (Atkins, 1957; Dweck, 1986; Bailey, 2004). Atkins (1957) separated motivational orientations into two main occurrences- achievement motivation and fear of failure. Achievement motivation is characterized by the following achievement goals:

1. Mastery Goals or learning goals (Dweck, 1986):

   The individual focuses on gaining competency and obtaining new skills and knowledge (intrinsic motivation) (Huitt, 2001). The individuals are more task-orientated (have a stronger work ethic, persistent in completing tasks, intrinsically motivated, and are learning or understanding for their own knowledge) (Nolen, 1988).

2. Performance Goals (called ego –involvement):

   The individuals' focus is on out doing others without expending much effort (Huitt, 2001).

3. Social Goals: these goals focus on relationships between people (Huitt, 2001).

The research supports findings that students with mastery goals perform better on tasks than those who are more performance goal oriented or social goal oriented (Atkinson, 1957; Dweck, 1986; Huitte, 2001). The second motivational orientation is *fear of failure* (Bailey, 2004). The people who avoid failure are displaying a factor of performance goal orientation (Huitt, 2004). Thus, Nolan (1988) investigated the relationship between individual differences in motivational orientation and goal orientation on eighth grade student's ability to use study strategies in reading expository passages. The studies revealed that task orientation as an individual difference better predicts the spontaneous use of study strategies as compared to ego orientation or work avoidance (academic alienation) (Nolen, 1988). To that end, Bailey (2004) affirms that

motivational orientation may help to predict the degree that stereotype threat affects the target. Therefore, people who have motivational orientations in mastery goals or learning goals, task orientation and are intrinsically motivated are less vulnerable to stereotype threat. Conversely, people who are performance goal orientated, ego orientated and avoid failure are more vulnerable to stereotype threat.

Cognitive ability as a moderator

Cognitive ability or intelligence is the ability to perform new or difficult tasks by dedicating the attention needed to complete tasks (Bailey, 2004). General cognitive ability or (g) is an important factor in determining performance in the area of mathematical reasoning, spatial reasoning, and vocabulary over a wide range of task driven operations (Hunter, 1986; Bailey, 2004). Research has shown the following (Bailey, 2004; Bandura 2000):

1. People with greater cognitive ability have higher task-self-efficacy.
2. Task complexity is correlated positively with high cognitive ability and performance increases.
3. High cognitive ability correlates with higher work memory capacity.
4. High cognitive ability helps to recognize and apply problem-solving rules.
5. High cognitive ability is positively correlated with finishing cognitive operations speedily. (Bandura, 2000)

Domain Identification as a moderator

Vulnerability to stereotype threat is increased when people are highly identified with a particular domain (Aronson, 1999). Domain identification refers to the degree to which a person stakes their self-image on a given ability (Brunstein. & Gollwitzer, 1996; Aronson et al, 1999). Some research findings have shown that students who have high academic ability and high domain identification have high performance outcomes. However, when they are affected by a negative stereotype their performance decreases. For example, Steele & Aronson (1997) found that African Americans and women who identified highly with advanced quantitative areas, when economic disparity or gender roles were made salient, stereotype threat depressed standardized test performance. Thus, stereotype threat may interfere with the intellectual performance of domain-identified students (Aronson et al., 1999). In other words the person experiencing the threat must care about their performance in that domain in order for stereotype threat to have an adverse effect (Smith & White, 2001). If targets of stereotype threat are put into situations that constantly put them at risk of confirming a stereotypic view about themselves or their group, then this will cause worry (anxiety) and pressure (Steele & Aronson, 1995). The anxiety and pressure may cause the target to lose self-confidence, have distracting thoughts and weaken domain performance. Chronic exposure to stereotype threat can cause disidentification with the domain. Disidentification occurs when the pressure of confirming a negative stereotype deters members from participating in that domain (Aronson et al, 1999). To that end, the lack of predictability in using college and graduate school admission tests as a valid test of cognitive

ability may be due to the relationship found between domain identification, test performance and the stereotype threat effects (Steinberger & Williams, 1997; Aronson et al, 1999). Delgado & Prieto, 2008, conducted an experiment that included males and females attending Spanish high schools. The study's focal point was on domain-specific anxiety used as a mediator to stereotype threat. The task was to complete a test which measured mathematical ability and mental rotation. Half of the participants received a threat condition which emphasized "boys have better math ability than girls" (Delgado & Prieto, 2008). The other half of the participants were not told anything about gender differences (Delgado & Prieto, 2008). The results revealed that females exposed to the threat condition with a low level to math anxiety performed better on the math test than females with high levels of math anxiety (Delgado & Prieto, 2008).

Stereotype Threat and Ethnicity

According to Steele & Aronson (1995), the researchers' argue that negative societal stereotypes about any one group can produce a social-psychological predicament called stereotype threat. Stereotype threat is experienced as a self- evaluative threat or thoughts that people will see them (a member of the group) in a negative way. This self-evaluative threat may be enough to produce "disruptive effects" on performance. The researchers hypothesized that when African Americans experienced these disruptive effects, performance on intellectual tests may be impeded. More specifically, the threat may "interfere with the intellectual functioning of these students" (Steele & Aronson, 1995). Four studies were performed to test this hypothesis.

Studies one and two reported that blacks underperformed compared to whites in ability-diagnostic conditions but not in non-diagnostic conditions. Study three confirmed that when the ability-diagnosticity cognitively was activated participants refused to be judged by the stereotype. Study four revealed that when stereotype was salient, blacks' performance was hampered even in nonability-diagnostic test. This was Claude Steele's inaugural study, which named the phenomenon- stereotype threat. In a study done by Cohen, Garcia, Apfel, & Master (2006), the researchers argue that reaffirming self-integrity through self-affirmations can lessen the stress that comes from "threatening performance situations". The researchers assert that using self–affirmations as an intervention for improving academic performance could be beneficial for all groups. To test their predictions, the researchers used two randomized double blind field experiments and close to an even number of African Americans and Caucasian Americans . The participants were seventh graders from lower to middle class families. The intervention was a 15 minutes writing assignment, which required the treatment students to write about their most important value, and the control group was asked to write about their least important value. The results showed that 70% African Americans in the treatment group improved academically. Students who were low and moderate performing students increased their performance. Those students in the highest performing group benefited less from the intervention. Overall, there was a 40% reduction in the racial achievement gap (Cohen et. al, 2006). Kellow & Jones, 2007 conducted a study which examined stereotype threat effects on White and African American 9th

grade students. African American students received the threat condition which emphasized the mathematical reasoning APR Spatial Abilty test as a predictive measure of performance on standardized tests (threat received by African American students). Other students were assured that the mathematical test was unbiased and culturally fair (non-threat condition) (Kellow & Jones, 2007). A questionnaire was given to each student to share their expectations of doing well on the math assessment (Kellow & Jones, 2007). The results showed that African Americans under threat conditions had lower expectations. The African American students performed the same in both the control and threat condition. White students' performance were described as being superb in threat conditions (Kellow & Jones, 2007). This phenomena is call stereotype lift. Stereotype lift occurs when members of the outgroup (a group not considered as a group affected by a particular stereotype) does well in the presence of a negative threat (Kellow & Jones, 2007).

Stereotype Threat and Women

According to McGlone & Aronson (2006), the researchers argue that stereotype threat (a threat that is stimulated by the salience of an ascribed identity) can be reduced by "shifting the test taker's focus to an achieved identity for which there are positive performance expectations". Participants in this investigation were undergraduates, 45 female and 45 male, in a liberal arts program from a private college. Various social identities were primed before a standardized test for spatial reasoning (Vanderberg Mental Rotation Test) was administered. Female participants who were told that students from selected private schools do better on spatial reasoning tests

performed better than students who were "primed" to identify with sex or test- irrelevant identity. Male participants who were "primed" to identify with sex or test- irrelevant identity did better on the spatial test than those who were prompted to identify with being a private college student. This research is valuable to my dissertation topic because it points out that responses by students to a posed social threat may have different performance outcomes based on gender. In addition, Spencer, Steele, & Quinn (1999), did two studies. Study 1 confirmed the pattern found in the literature that females underperformed on very difficult tests as compared to males. Study 2 demonstrated that lowering stereotype threat eliminated performance difficulties when gender differences were not made salient before taking the test. Bailey (2004) investigated 79 males and 66 females in control conditions and threat conditions by using the proposed mediated-moderation model of stereotype threat. Moderators such as, domain identification and motivational orientation of threat effect on self-efficacy and cognitive interference were tested and their effect observed on the threat- performance relationship. Additionally, a "female benefit" was included where the testing environment specifically reassured females that the test would favor females (Bailey, 2004). The results revealed significant differences in performance between male and females. Females scored below males. Domain identification and self-efficacy were found to be significant in identifying sex difference in math performance. The female participants disidentifying with the task domain – Math., supported Steele's theory of stereotype threat.

Promoting STEM (science, technology, engineering, mathematics) careers for women, both in the area of educational leadership and instructional leadership is important. Both educational leadership in the area of school policy and instructional leadership in the area of teacher training, require understanding on how to eliminate stereotype threat in a STEM classroom environment. Stout et al., 2011 used a stereotype inoculation model to improve the self-concept of women pursuing a STEM career by using more "same sex experts" (professors, professional) in STEM courses often dominated by male professors. Consequently, the women felt more connected and confident with the female experts, which resulted in the women enhancing self-efficacy, domain identification and commitment to pursuing STEM careers (Stout et al., 2011).

Stereotype Threat and Non-Stigmatized Group

Aronson, Lustina, Good, Keough, Steele, & Brown (1999) report, the researchers agree that the research shows when minority groups experience negative stereotypes and internalize them this may undermine the performance of ability-stigmatized groups, such as African American, Latinos, and women. However, the researchers argue that belonging to a stigmatized minority group is not a "sufficient factor" or reason for underperformance. They further argue that anyone can under-perform on an intellectual test if they have been exposed to stereotypes that predicted poor performance for their group. The researchers' investigation consisted of two studies. Highly intelligent white males were chosen, because they were considered least likely to

have incurred stereotypes detrimental to intellectual performance or leading to intellectual inferiority. The men had to have a SAT math score no lower than 550. Study one induced stereotype threat by presenting Asian males as the minority group who excel in math to math-proficient white males. This produced situational pressures, which resulted in white males performing less well than the Asian males. Study two replicated study one with an emphasis on domain specific – math. The white males who identified highly with the math domain performed less well than the Asian males when the threat was made salient. In sum the following was revealed: 1. for stereotype threat to be effective "the individual must care enough about performing well to be bothered by a stereotype's implication that they may lack the ability to do so"; 2. chronic feelings of stigmatization (as seen with African Americans and Latinos) was not a decisive factor in producing underperformance. However, "situational pressure" alone precipitated the underperformance. 3. The "situation list view of minority underperformance locates the problem not exclusively in the person, but within the social circumstances confronting the person". 4. Stereotyping threat is not exclusive to minorities. 5. Domain identification and responses to situational pressure may be based on self-protective processes that can be triggered, and intensified by minority status. 6. The findings may offer help in how to reduce stereotype threats that involve self-protective tactics, which may reduce motivation to perform positively on tests (Aronson et al., 1999).

Stereotype Threat and Youth

Muzzatti & Agnoli (2007) report that researchers examined both elementary and middle school children's threat susceptibility to performance in mathematics and gender identification. The researchers also investigated and identified when recognition of stereotype threat knowledge appeared and how this threat developed between elementary school and middle school. It was also important to the researchers to mention that, although, American and Italian school systems are similar, cultural aspects concerning gender may be different (Muzzatti & Agnoli, 2007).

Muzzatti & Agnoli's (2007) performance tests revealed that Italian females outperform Italian males in mathematics. Yet, Italian females are not often employed as mathematicians or obtain math related jobs (Muzzatti & Agnoli, 2007). The following explanation of the results in this investigation points to a period when the change in gender attitudes toward the math domain occurs. The researchers found that there is a line of demarcation between second and third grade children and fourth and fifth grade children in salience for gender stereotypes. The second and third grade girls believe that the ability to do math is equal for boys and girls. The second and third grade boys believe that they are better in math than girls. However, the fourth and fifth grade girls identify with gender stereotype threat and believe that boys are better than girls in mathematics. The fourth and fifth grade boys continue to believe that they will outperform the girls. Additionally, the participants were required to give their opinion on the attitude of their teachers, peers, and parents toward their math aptitude. Third, fifth and eighth grade boys and

girls participated in this second experiment. The results revealed that middle school is the time when stereotypes are initiated and cause "detrimental effects in girls"(Muzzatti & Agnoli, 2007).

Stereotype Threat Criticism and Rebuttal

Since the widely televised findings of Steele's 1995 study, criticism has arisen. For instance, Sacket, Hardison, & Cullen (2004) suggest that some claims of stereotype threat are incorrect and misleading. The concern was that the media reported stereotype threat as the only link to the achievement gap seen between minorities and majorities on standardized tests (Sacket et al, 2004). In addition, Sacket et al. (2004) did not approve of controlling for differences in standardized test performance. Thus, Steele & Aronson (1995) showed stereotype threat occurring after "statistically equating black and white scores". The mode of analysis does not account for persistent differences on Scholastic Aptitude Test (Sacket et al, 2004). Hence, statistically equating SAT scores have been used in many of Steele and Aronson's stereotype threat studies. Steele & Aronson (1995) show that stereotype threat effect signifies performance decrements greater than identifying a performance gap (Stroessner & Good, 2008).

Another criticism is that stereotype threat findings do not generalize to the real world. Cullen, Hardison, and Sackett (2004) report that performance gaps do not occur only among people that perform high academically, and Stricker and Ward (2004) report that women who gave their gender prior to taking the test did not do worse or better than those who reported the gender after the test was taken. However, the study was re-analyzed by Danaher & Crandall

(2008) and stereotype threat effects were documented. Thus, Good, Aronson & Hardee (2008) have found evidence that stereotype threat effects transfer into real world events. High performing college women, who were enrolled in an advanced math course, were found to do less well than men taking the same exam, when the women were told that the test that they were taking was diagnostic of ability. The women who were told that they were taking a non-diagnostic test and were gender bias free, performed better than the women in the threat condition (Good, Aronson, & Harder 2008). Both the men and women had the same class grades (Good et al., 2008). To that end, stereotype threat studies have been accused of having an over reliance on college student samples. The beginning stages of studies on stereotype threat effects focused on college aged students. However, stereotype threat may affect a more diverse population of student (Stroessner & Good, 2008). One such population is high school females and their performance in math domains.

A Gap Realized

More research on the high school female population may reveal specific reasons why high school females outperform high school males in school Math courses, yet consistently score lower than males on standardized test like the Math component of the Scholastic Aptitude Test (NCES, 2005; NCES 2009). Additionally, pinpointing high school females with stereotype threat vulnerability may help educators to effectively provide student protocols, teaching protocols and testing environments that help students resist stereotype threat situations. This may

help to increase opportunities for students to perform consistent with their ability.

Primary and secondary school children are expected to be proficient by 2014. Yet, performance gaps remain between the majority and minority students, females, and males in both the math and reading areas. Therefore, the National Assessment of Education, 2005 assessment reports the following for reading performance:

1. Reading performance for 12th graders declined since 1992 in literary, informational, and functional reading contexts.
2. Scores for both black and white students were lower than in 1992.
3. There was no significant change in performance gap between black and white students.
4. Female students outscored male student by a greater margin than 1992.

The National Assessment of Education, 2005 assessment reports the following for math performance:

1. 61 percent of students in the nation performed above the basic achievement level in 2005.
2. 23 percent performed above proficient on the new 12th grade mathematics assessment.
3. Asian/ Pacific Islander outperformed all racial/ethnic groups
4. White students outperformed Black students by 31 points and 24 point higher

than Hispanic children.

5. Overall, males score on the average higher than females.

The National Center for Education Statistics (2009) report the long-term trend assessment in mathematics compared to 2004 long term assessment in mathematics are as follows:

1. Scores increased for 9 and 13 year olds for 2008. .
2. No significant change for 17 year olds for 2008.
3. Male and female 9 year olds scored higher in 2008 than in 2004.
4. The average mathematics score for males was higher in 2008. There was no significant change in the mathematics for females in 2008.
5. There was no significant difference in male and female mathematic scores for 2008 as compared to 2004 and 1973. For ages 9, 13, and 17 males continue to outperform females.

Thus, the Nations Report Card reports 2015 NAEP longitudinal scores: "The 2015 average scores were 1 and 2 points lower in grades 4 and 8, respectively, than the average scores in 2013. Scores at both grades were higher than those from the earliest mathematics assessments in 1990 by 27 points at grade 4 and 20 points at grade 8".

Therefore, the proposed study of stereotype threat effect on high school females highly identified with the math domain may yield rich findings that will help to close the achievement gap among gender. Hence, much of the literature on stereotype threat refers to

studies administered using college students (Stoessner & Good, 2008). However, conducting a stereotype threat study on a more diverse group of people like high schools

female students hopefully will provide much needed information on individual differences that may cause low performance on standardized test.

CHAPTER 3: METHODOLOGY

Introduction

Stereotype threat research has traditionally investigated threat effects on ethnic minorities, racial minorities and women matriculated to college. Very few investigations have been implemented utilizing participants enrolled in high school. The present study investigated the existence of stereotype threat in high school female with regard to math achievement. A treatment group non-treatment group design was employed. Using inferential statistics, identified relationships between domain identification measure (DIM), motivational orientation self-description motivational orientation questionnaire (MTQ), task state self efficacy (TSSE), cognitive interference (CI), stereotype threat treatment (STT); and a sample math SAT score performance outcomes of participants.

Theoretical Model

There is one independent variable, three moderators, two mediators, which help to moderate and mediate the effects of Stereotype threat on achievement. Stereotype threat is the independent variable. Domain Identification Measure, Motivational Orientation and Cognitive Ability are moderators. Moderators specify when certain effects will hold.

More specifically, the relationship between the independent variable and dependent variable will hold for some populations but not for other populations (Baron & Kenny, 1986). In this study, cognitive ability is determined by math Grade Point Average (GPA). Cognitive Interference and Task Self Efficacy are mediators. Mediators explain how and why effects occur (Baron & Kenny, 1986). In conditions of threat or conditions of non-threat, cognitive interference may be frequent or infrequent, which may help to further explain math performance outcomes (Sarason, Keefe, Hayes & Shearin 1986). Examination of task state self-efficacy after administration of threat may help to give insight to math performance outcomes (Bandura, 1986; 1991; 1997).

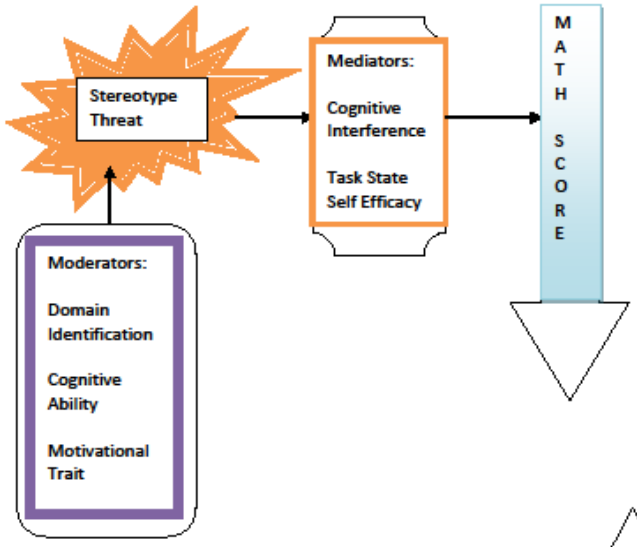

Figure 2: Stereotype Threat: math score lowered

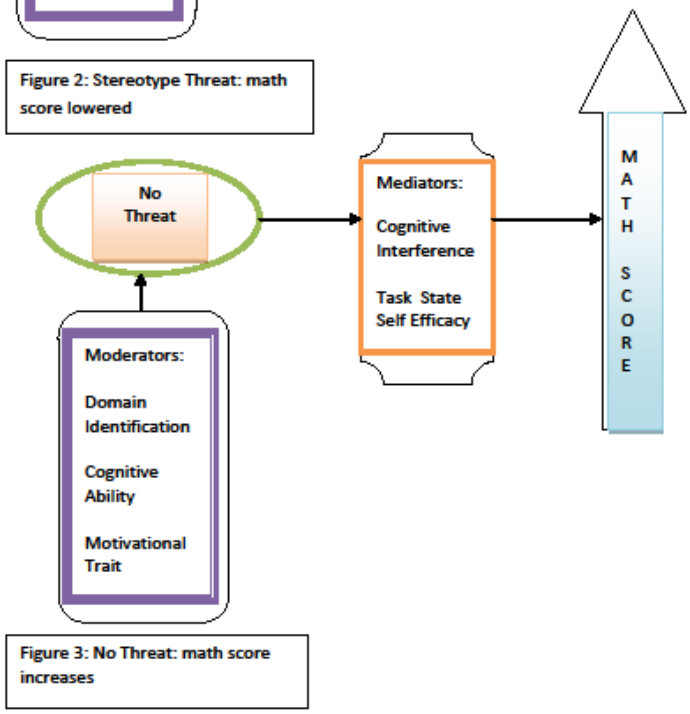

Figure 3: No Threat: math score increases

Research Questions

The purpose of this study was to examine the extent of stereotype threat for high school girls in relation to achievement? The following questions guided this study:

Question 1: Is there a relationship between math achievement and domain identification level?

***Question 2*:** Is there a relationship between math achievement and each of the 6 motivational orientations?

***Question 3*:** Are there differences in task self-efficacy by conditions of threat?

***Question 4*:** Is there a difference in cognitive interference by conditions of threat?

Question 5: Are there differences in motivation orientation by threat condition?

Question 6: Is there a difference by threat condition on mathematics achievement?

Participants

Participants in this study are high school female from public and private schools in Richmond City and Henrico County. Participants must have completed Algebra I and Geometry. There is no minimum grade point average. I have chosen these criteria based on research findings which suggest that there is more susceptibility to stereotype threat when the person cares about the math domain and achieves above average scores in math (Bailey, 2004). Because math performance was measured, it was important that all criteria be strictly followed. This helped to avoid the possibility of a participant's academic inability leading to low math performance outcomes.

Math performance was measured by a 25 item sample Math Standards of Aptitude Test (SAT). To insure that each participant had the basic skill set to attempt the sample Math Standards of Aptitude Test (SAT), these selected participants must have completed Algebra I and Geometry.

Sample Selection

School Identification

Originally, two websites, one hosted by Virginia Commonwealth University entitled, "World Religions in Richmond, Virginia" and the other hosted by the Private School Review were used to obtain a list of private religious schools for the current study. The websites provided a list of *Profiled Religious School Programs*. Included on the list were Christian, Jewish, and Islamic schools. Each school was examined for the following criteria: 1) a population of high school girls and 2) a college preparatory curriculum. Out of the many schools listed, 21 schools met the sample parameters. Coincidently, there were 20 Christian based schools (9 non-sectarian, 6 Baptist, 1 Seventh Day Adventist, 2 Episcopal, 1 Catholic, and 1 Church of Christ) and 1 Jewish school. The other schools examined were single-sex male institutions or served students in kindergarten through eighth grade. However, I did not have adequate success with obtaining participants from these institutions. Many were not interested in participating in the study. Some of the institutions agreed to participate and then pulled out at the last minute. To get participants, I relied on community leaders, retired teachers, and youth group leaders to spread the word and disseminated the invitation flyer. It is important to add, that

when females understood the intent of the study on females math, some were reluctant to participate. This led to small participant numbers.

The original decision not to use public schools was because they have rigorous protocols to follow when requesting permission to research any population under their jurisdiction. Each school district has different guidelines for gaining access. When I Approached a specialty school that educates students from various jurisdictions, after a long awaited reply, I was told that I would not be able to do my study because their students resided from various school districts. Each school has different protocols for conducting research.

Participants Selection: Protocol 1

The following outlines were followed to select participates:

Entry (Identifying Schools)

1. The 21 school principals were contacted via telephone. A brief explanation of the reason for the call was given, explaining that this is a study on girls and math. A meeting was requested to discuss the study further.

2. The principals meeting took place through technology, which included asking the principal's permission to approach high school girls to participate in the study.

3. After verbal consent was given by the principals to approach the high school girls, a letter was sent to principals via email confirming consent and plan for recruiting participants.

Student Selection

1. A list of possible participants was obtained from each of the 21 schools. To be included in the sample, the minimum requirement is the participant must be: female and have completed Algebra I and Geometry. There is no required minimum grade point average. Those students who have and Individualized Educational Plan was not excluded if it is found that she was able to complete the tasks within the allotted format. In order to obtain the list of possible participants, each principal was asked to identify all high school girls with the aforementioned criteria.
2 After the possible participants were identified, a flyer inviting the girls to participate in the study was sent to the principal. The principal of the private school that participated in the study disseminated a packet to parents which included a letter inviting their child to participate in the study, invite flyer, parent consent and student assent forms. The parents were assured that no personal information about their child will be shared. Data collected from each person participating were assigned a random number. No names of participants appear in the study. It was explained that we are conducting a study on females and math. Students received a letter of assent to participate in the study containing the same assurance. The participants who have met the criteria and have returned both consent and assent forms will be the sample for this study.

Participant Selection: Protocol 2:

A less formal approach was taking when participants from the private schools did not participate in expected numbers.

1. Community leaders, retired teachers, and youth leaders were contacted by email, to help recruit participants by disseminating the invite flyer. These surrogates then were sent an email asking them to talk to possible participants and their parents about the study. Benchmarks dates were included for recruiting participants and dates for when the study would be conducted.
2. A series of dates were set up for the participants to take the survey. Each participant was told thank you at the conclusion of the survey and asked not to talk to others about their experience until the conclusion of the study.

Measures

This survey contains four questionnaires: 1) Domain Identification and 2) Motivational Orientation Trait Self -Description (given prior to the treatment), 3) Task State Self-Efficacy (given after participants have viewed the sample Math SAT assessment) and 4) Cognitive Interference/ demographic information collection (given after the sample SAT was Administered).

Variables

Part 1 a: Domain Identification Questionnaire

This measure will identified the level of identification with the math domain. It is a 20 item, 7-point Likert scale developed for the study and modified from measures used by Bailey, 2004. The approach has been validated by Markus (1977). This is a measure

of self –schema identified within a domain (Bailey, 2004). This questionnaire will be answered before the test.

Part 1 b: Motivational Trait Questionnaire

A Motivational Trait Questionnaire from Heggestad and Kanfer (2000) was used to identify individual differences, which are personal mastery, competitive excellence, and achievement anxiety. It is a 6-point Likert scale and questions will range from "true" to "untrue" (Bailey, 2004). This questionnaire was answered before the test. Sample Math SAT Assessment: The participants will be allowed to view the test sample SAT prior to taking the Task State Self Efficacy.

Part 2: Task State Self Efficacy Questionnaire

A ten-item Likert scale questionnaire determined the strength of self-efficacy. The scale ranges from 0 – 100%. The questionnaire will be used from Bailey (2004). It will be administered prior to test. Sample Math SAT Assessment: The test was administered to the participant.

Part 3: Cognitive Interference w/ Demographic Collection Questionnaire

A self-rated 22-item questionnaire determined the number of intrusive thoughts incurred during the sample SAT Math test. This questionnaire was adopted from Sarason, Keefe, Hayes, & Shearin (1986). Demographic information was collected (ethnicity, gender, and age).

Output Measures

Treatment

Participants in the ***treatment group*** received at the top of their test the following statement: [This test is an examination of your math ability. Read the directions thoroughly. You have 25 minutes to complete the 20 item math test. Your testing facilitator will announce when to begin the test and when to end the test. Do your best.] The treatment is indicated in brackets for the reader. Participants in the ***non-treatment group***: [Thank you for participating in this exercise. Your participation will help us to create valid, reliable and fair questions for future assessments. Please follow all directions. You have 25 minutes to complete the 20 item exercise. Your facilitator will announce when to begin the exercise and when to end the exercise.] The non- treatment is indicated in brackets for the reader.

Testing Procedure

An examination location was secured. Upon arrival students were thanked for participating in the study. Participants were told that they will be completing a series of questionnaires. Each questionnaire helps with understanding the females' attitude toward math. A list was compiled of all participants. Each name corresponded to a number in numerical order from 1 to n. From that list, all participants were assigned systematically to even and odd numbers. Those who received an odd number received the threat. Those who received an even number did not receive the threat. All testing packets, which include four questionnaires and the sample Math SAT assessment, were numbered from 1 to n. The testing packet number corresponds to the participant's assigned number. All participants were tested together who received the threat or did not receive the threat. Both groups answered questionnaires 1 and 2 (Domain identification

and Motivational Trait), were allowed to look over the sample Math SAT assessment; then take questionnaire 3 (Task State Self Efficacy). The participants then took the sample Math SAT assessment. Following, questionnaire 4 (Cognitive interference/demographics) was taken. The testing facilitator asked the participants to put all packet materials together. The testing facilitator confirmed by checking contents of the packet that all packet items are present and were secured in the packet envelope. The participants were thanked for participating and released.

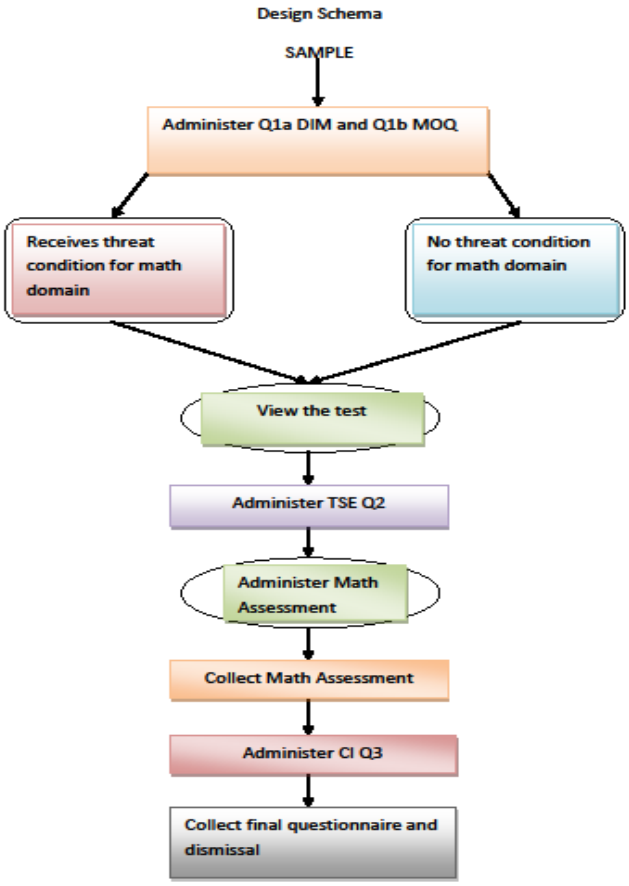

Figure 4. Design Schema

Expectations

When the threat was made salient among the treatment group with those whose domain identification levels, motivational orientation self- description, self – efficacy and cognitive interference are in the high range , math score and performance were expected to be lower than normal. Conversely, it was expected that the non-treatment group with those whose domain identification levels, motivational orientation self-description, self – efficacy are in the high range and cognitive interference in the low range, math score and performance were expected to be normal to above normal.

Priori Power Analysis and Sample Size:

The treatment / non-treatment design using values for a one tailed t-test (one directional) are as follows:

The alpha for each possibility is .05. The anticipated effect size (Cohen's d) is .80. There will be three possibilities presented with desired statistical power levels of 80, .90, and 95.

Priori Power Analysis 1:

Alpha = .05

Anticipated Effect Size (Cohen's d) = .08

Desired Statistical Power Level = .08

Sample Size = 42 (minimum total sample size) w/ 21 (minimum required per group)

Priori Power Analysis 2:

Alpha = .05

Anticipated Effect Size (Cohen's d) = .08

Desired Statistical Power Level = .90

Sample Size = 56 (minimum total sample size) w/ 28 (minimum required per group)

Priori Power Analysis 3:

Alpha = .05

Anticipated Effect Size (Cohen's d) = .08

Desired Statistical Power Level = .95

Sample Size = 70 (minimum total sample size) w/ 35 (minimum required per group)

Data Collection

All measures were collected the same day the test was administered. The data was kept in a secure site.

Data Analysis

SPSS is used to generate descriptive statistics and inferential statistics, (Aiken & West, 1991).

DIM (Domain Identification Measures) (range of DIM= 20 – 140)

MOQ (Motivational Orientation Questionnaire) (range of MOQ = [48-288)

CA (Cognitive Ability) (range= 0.00 – 4.0)

TSSE (Task State Self Efficacy) (range of TSE= 10- 50)

STC (Stereotype Threat Condition) 1= yes Stereotype threat Condition, 0= No threat

CI (Cognitive Interference) (range of CI= 22-110)

Table 1: Research Questions and Data Analysis

	Data that will be used	*Statistic that will be used to analyze data*
Question 1: *Is there a relationship between math achievement and domain identification level?*	➢ *Scholastic Aptitude Test* ➢ *Domain Identification*	*Correlation Analysis*
Question 2: *Is there a relationship between math achievement and each of the 6 motivational orientations?*	➢ *Scholastic Aptitude Test* ➢ *Motivational Trait quest*	*Correlation analysis*
Question 3: *Are there differences in task self-efficacy by conditions of threat?*	➢ *Identification of Threat* ➢ *Task Self Efficacy Questionnaire*	*Compare Means*
Question 4: *Is there a difference in cognitive interference by conditions of threat?*	➢ *Identification of Threat* ➢ *Cognitive Interference*	*Compare Means*
Question 5: *Are there differences in motivation orientation by threat condition?*	➢ *Questionnaire Motivational Orientation* ➢ *Identification of Threat*	*Compare Means*
Question 6: Is there a difference by threat condition on mathematics achievement?	➢ *Scholastic Aptitude Test* ➢ *Identification Of Threat*	*Compare Means*

VCU IRB

The procedure prescribed by the Internal Review Board was followed before any data collection ensued.

Delimitations

The study will be delimited to students from private and public high schools in Richmond, VA, and Henrico, VA.

CHAPTER 4: RESULTS

As described in Chapter 1, there is a gap that persists in math achievement between high school males and females. Although the NAEP 2015 longitudinal report shows a narrowing in math achievement between males and females there still remains a gap. More importantly, females are less likely to enter into math - related college programs. Those that do enter into math related college programs sometimes choose to drop out of these programs. Scholars continue to look for answers that will provide reasons for the attrition and change in direction toward math related careers.

Many investigations have revealed when stereotype threat conditions become salient, females who identify with the math domain are less likely to perform well on math assessments Quinn et al (2001). Stereotype threat is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, et al., 1999; Perry et al., 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006).

Other constructs have been found to moderate a negative threat response, such as motivational orientation and domain identification. Moderators explain when certain effects will hold for certain populations (Baron & Kenny, 1986). Motivational orientation defines the source of motivation for an individual to perform a particular action and can either originate from internal desires (e.g. interest) or external compensation (e.g. money) (Linke, et.al, 2010). Domain identification is an assessment given to identify a participant's value in a domain. The higher the DIM the more vulnerable a participant is to stereotype threat in a particular domain (Smith & White, 2001). In addition there are constructs that mediate stereotype threat. They are task self efficacy and Cognitive Interference. Mediators explain how or why certain effects will 57 hold for a population (Baron & Kenny, 1986). Self efficacy is the belief that a particular action or goal can be performed or accomplished by an individual (Bandura, 1986; 1991; 1997). Cognitive interference are the number of intrusive thoughts incurred during an assessment (Sarason, Keefe, Hayes & Shearin 1986).

The purpose of this study was to identify high school females who had the "care factor." If a female has the "care factor" for the math domain, it means that she cares about her success and performance in that domain. Females who identified positively with the math domain and were, thus, vulnerable to stereotype threat, when presented with a threat condition referring to their gender and math performance, their performance was low (Smith & White, 2001). Thus,

there is a need to identify female students who have threat vulnerability before they enter college. I used four measures (domain identification, motivational trait self-description, task self-efficacy, and cognitive interference), threat condition or non-threat condition statements, and a math achievement assessment to identify those females who may be susceptible to stereotype threat vulnerability. "Stereotype threat is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype" (Steele & Aronson, 1995; Aronson, et al., 1999; Perry et al., 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006).

Description of Sample and Respondents

The sample consisted of 20 girls from public and private high schools located in Henrico county, Virginia and Richmond, Virginia (see Table 5) . The females describe themselves as Native American, African American or Non-Hispanic White (see Table 2). The sample of respondents ranged from ages 13 through 17 (see Table 3). The level of high school was first year high school, sophomore, junior and senior (see Table 4). As shown in Table 7, 10 respondents received the threat assessment and 10 did not receive the threat assessment. The non-threat group was considered the control group. The threat and non-threat group were evenly distributed. Both threat and non-threat groups were tested together in the same room with the exception of two respondents who did the study alone. Table 6 shows mean, median and mode for each of the classifications. The statistical norm of the sample was African American, 15 years

old, sophomore and attends public school. A unique discovery was made during this study, the sample contained athletes in the following sports, track, volley ball and dancing.

Table 2

SPSS Value Labels for One option that best describes you (Race)

Label	Value
American Indian or Alaskan Nature	1.00
Hawaiian or Other Pacific Islander	2.00
Asian or Asian American	3.00
Black or African American	4.00
Hispanic Latina/o	5.00
Non-Hispanic White	6.00

Table 3

SPSS Value Labels for student's age

Label	Value
Age 13	1.00
Age 14	2.00
Age 15	3.00
Age 16	4.00
Age 17	5.00

Table 4

SPSS Value Labels for year in school

Label	Value
First year in high school	1.00
Sophomore	2.00
Junior	3.00
Senior	4.00

Table 5

SPSS Value Labels for school type

Label	Value
Private school student/attends private school	1.00
Public school student/attends public school	2.00

Table 6

Statistics: Mean, Median, Mode, and Standard Deviation

		Race	Student age	Year in school	School type
N	Valid	20	20	20	20
	Missing	0	0	0	0
Mean		4.0500	3.4500	2.3000	1.7500
Median		4.0000	3.0000	2.0000	2.0000
Mode		4.00	3.00	2.00	2.00
Std.		.94451	.94451	1.03110	.44426

Table 2, Table 3, Table 4 and Table 5 show the SPSS value labels. The values are used to calculate mean, median and mode in Table 5. As shown in Table 6 the mean, median and mode describes the statistical norm for this sample as African American, 15 years old, sophomore and attends public school.

Table 7

Frequency Table Received Threat

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	10	50.0	50.0	50.0
No	10	50.0	50.0	100.0
Total	20	100.0	100.0	

Note: N=20, 10 respondents received threat assessment and 10 respondents did not receive the threat assessment/control.

Summary of Findings

Q-1: Is there a relationship between math achievement and domain identification level?

The domain identification measure (DIM) is an assessment given to the participant to identify if she values the math domain. The higher the score for domain identification measure, the more she values the math domain and is vulnerable in stereotype threat conditions. When the girl is vulnerable to threat conditions, math achievement is low. The domain identification measure is a Likert-like scale consisting of 20 questions, ranging from 1 (strongly disagree) to 7 (strongly agree). The DIM score range is 20 – 140. Participants were given a sample SAT math assessment which contained 20 questions. The time allotted for the assessment was 25 minutes. The sample math assessment was difficult. However, high school females taking this assessment had to have algebra I and geometry to insure that the assessment was fair.

A Pearson's product-moment correlation coefficient was computed to assess the relationship between math achievement and domain identification level. There was no statistically significant relationship between the two variables, $r = .131$, n = 20, $p = .581$. Thus, for the female students in this study, domain identification level did not predict math achievement. Thus, for the female students in this study, domain identification level did not predict math achievement.

Q-2 Is there a relationship between math achievement and motivational orientation?

When presented with a difficult task, such as a math achievement, it is important to understand motivational orientation. Motivational orientation defines the source of

motivation for an individual to perform a particular action and can either originate from internal desires (e.g. interest) or external compensation (e.g. money). Motivational orientation should influence the way positive or negative feedback is processed during learning situations and this might in turn have an impact on the learning process (Atkins, 1957; Dweck, 1986; Bailey, 2004; Link et al, 2010).

Motivational orientation consists of three motivational trait factors: (1) personal mastery, (2) competitive excellence, and (3) motivation related to anxiety. Each motivational trait factor has two scales, for a total of 6 motivation scales (Kanfer & Ackerman, 2000). The motivational orientation construct lays upon a foundation of goal orientations. Goal orientations are divided into two categories 1) approach related tendencies or avoidance related tendencies. Those who display approach related tendencies are expected to have high scores on performance related tasks. Those who display avoidance related tendencies are expected to have low scores on performance related tasks (Kanfer & Ackerman, 2000). Desire to learn, mastery goals, competition seeking have approach related tendencies. Worry and emotionality are avoidance related tendencies. Depending on the item, other reference goals can be approach related or avoidance related tendencies (Kanfer & Ackerman, 20000).

Personal Mastery

Personal mastery consists of two scales: desire to learn and mastery goals. Both of these

scales assess approach oriented motivational traits (Kanfer & Ackerman, 2000).

Desire to Learn: This scale is composed of 8 items that focus on a need to achieve in the context of learning new skills or acquiring knowledge (Kanfer & Ackerman, 2000). The scale range is (8 to 48). Example item: "When I become interested in something. I try to learn as much about it as I can" (Kanfer & Ackerman, 2000). The higher the score, the more likely the student is to learn.

A Pearson's product-moment correlation coefficient was computed to assess the relationship between math achievement and personal mastery desire to learn. There was no statistically significant relationship between the two variables, r =.141, n = 20, p =.553. Thus, for these female students a high score on desire to learn did not predict math achievement.

Mastery Goals: This scale is composed of 8 items that focus on personal goal setting and other aspects of the achievement context that represent an orientation toward continued task improvement or mastery, even when it is not required (Kanfer & Ackerman). The scale range is 8 to 48. Example item: "It really upsets me when someone does something better than I do" (Kanfer & Ackerman, 2000). The higher the score, the higher the orientation toward improving or mastering a goal.

A Pearson's product-moment correlation coefficient was computed to assess the relationship between math achievement and mastery goals. There was no statistically significant relationship between the two variables, r = .365, n =20, p =.125. Thus, for the female

participants in this study, mastery of goals did not predict math achievement.

Competitive Excellence

Competitive excellence consist of two scales: other reference goals and competition seeking. Both of these scales assess approach-oriented motivational tasks (Kanfer & Ackerman, 2000).

Other Reference Goals: Seven items on this scale involve comparisons to other performers (coworkers and peers) for the purpose of establishing a social reference context for the individual's performance (Kanfer & Ackerman, 2000). The scale range is 7 to 42. Example Item 1: "It really upsets me when someone does something better than I do" (avoidance related tendencies) (Kanfer & Ackerman, 2000). Example Item 2: "I am motivated to do things better than others" (Kanfer & Ackerman). The higher the score, the greater the participants need to compete with others.

A Pearson's product-moment correlation coefficient was computed to assess the relationship between math achievement and competitive excellence other referenced goals. There was no statistically significant relationship between the two variables, r =.378, n =20, p =.101. Thus, for participants in this study, competitive excellence did not predict math achievement.

Competition Seeking: The six items on this scale involve the comparisons of personal performance with others with the main focus on competition and performing better than coworkers or peers (Kanfer & Ackerman, 2000). The scale range is 6 to 36.

Example Item: “I like to turn things into a competition” (Kanfer & Ackerman, 2000).). The higher the score, the more likely the student is to do well on math achievement.

A Pearson’s product-moment correlation coefficient was computed to assess the relationship between math achievement and competitive excellence competition Seeking. There was a statistically significant relationship between math achievement and competitive excellence competition seeking, r = .523, r^2 = .27 n = 20, p = .018. The higher the motivation for competitive excellence competition seeking, the higher the number of math questions correct. On this variable, competitive excellence competition seeking accounting for 25% of the variance in math scores.

Motivation Related to Anxiety

Motivation related to anxiety consists of 2 scales: worry and emotionality. Both of these scales represent avoidance related tendencies (Kanfer & Ackerman, 2000).

Worry: This is a 10 item scale that focuses on worry and other aspects of evaluation apprehension in performance contexts (Kanfer & Ackerman, 2000). The scale range is 10 to 60. Example Item: “I get tense when other people assess my progress” (Kanfer & Ackerman, 2000). The higher the score, the more likely the student worries about her performance.

A Pearson’s product-moment correlation coefficient was computed to assess the relationship between math achievement and motivation anxiety worry. There was no statistically significant relationship between the two variables, r = -.146, n =20, p =.539. Thus, for these

participants, motivation anxiety worry did not predict math achievement.

Emotionality: This is a nine item scale that focuses on emotions associated with performance in evaluation contexts (Kanfer & Ackerman, 2000). The scale range is 9 to 54. Example Item: "I lose sleep because I am troubled by thoughts of failure" (Kanfer & Ackerman, 2000).). The higher the score, the more likely the student is to focus on her emotions.

A Pearson's product-moment correlation coefficient was computed to assess the relationship between math achievement and motivation anxiety emotionality. There was no statistically significant relationship between the two variables, r = .112, n =20, p = .639. Thus, for these participants, there was no relationship between emotionality and math achievement. Motivation anxiety emotionality did not predict math achievement.

Motivational Trait Self- Description Total

Examining all of the 48 items which comprise the six subscales together the total scale range is 48 to 288. The higher the score, the more likely the student is to show a composite motivation trait score of both avoidance and approach traits.

A Pearson's product-moment correlation coefficient was computed to assess the relationship between math achievement and motivational trait self -description total. There was no statistically significant relationship between the two variables, r = .294, n = 20, p = .208. Thus, for these students, motivation did not predict math achievement.

Of the six scales, only one competitive excellence competition seeking had a positive correlation with math achievement. Therefore, despite earlier research on the relationship of motivation to math achievement for girls, in this study there was no relationship.

Q-3 Are there differences in task self- efficacy by conditions of threat?

Task self- efficacy is the belief that a particular action can be performed or accomplished by an individual (Bandura, 1986; 1991; 1997) Stereotype threat is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, et al., 1999; Perry et al., 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006). In this study, the task is math achievement. When task self efficacy scores are high math performance is expected to be high. In the presence of a threat condition, task self- efficacy scores are expected to be low and math scores low.

In this study the girls were allowed to look over the sample math assessment first and then fill out the task self efficacy measure. Attached to the front of the sample math assessment was either a threat condition statement or a non-threat statement. The threat condition statement said, "This test is an examination of your math ability. Read the directions thoroughly. You have 25 minutes to complete the 20 item math test. Your testing facilitator will announce when to begin the test and when to end the test. Do your best". The non-threat condition statement said,

"Thank you for participating in this exercise. Your participation will help us to create valid, reliable and fair questions for future assessments. Please follow all directions. You have 25 minutes to complete the 20 item exercise. Your facilitator will announce when to begin the exercise and when to end the exercise".

The task self efficacy measure is a 10 item measure with a scale range of 10 to 50 (Bailey, 2004). The higher the score, the more likely the student believes he can complete the math assessment in the allotted time frame.

A one way between subjects ANOVA was conducted to compare the effect of threat condition on self efficacy. There was no statistically significant difference by threat condition at $p<.05$ level on self efficacy [F (1, 18) = 1.590, $p= .223$]. Thus, a threat condition did not affect self efficacy, the belief that she could complete the test in the allotted time frame.

Q-4: Is there a difference in cognitive interference by conditions of threat?

Cognitive Interference is the number of intrusive thoughts incurred during an assessment (Sarason, Keefe, Hayes & Shearin 1986). Stereotype threat is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, et al., 1999; Perry et al., 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006). When cognitive inference scores are high then

math scores are expected to be low. Girls taking the math assessment who were presented with the threat condition are expected to have low math scores . Girls taking the math assessment who were presented with the non-threat condition were expected to have higher scores than girls who were presented with the threat condition. Cognitive interferences is a 22 item questionnaire with a scale range 22 – 110. The higher the score, the more likely the student is to have intrusive thoughts during math assessment.

A one way between subjects ANOVA was conducted to compare the effect of threat condition on cognitive interference. There was no statistically significant difference by threat condition at $p<.05$ level on cognitive interference [F (1.18) =.729, $p=.405$]. Thus, a threat condition did not affect cognitive interference.

Q-5 Are there differences in motivation orientation by conditions of threat?

As discussed earlier in this chapter, motivational orientation defines the source of motivation for an individual to perform a particular action and can either originate from internal desires (e.g. interest) or external compensation (e.g. money). Motivational orientation should influence the way positive or negative feedback is processed during learning situations and this might in turn have an impact on the learning process (Atkins, 1957; Dweck, 1986; Bailey, 2004; Linke, 2010). Stereotype threat is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that

stereotype (Steele & Aronson, 1995; Aronson, et al., 1999; Perry et al., 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006).

Motivational orientation consists of three motivational trait factors: (1) personal mastery, (2) competitive excellence, and (3) motivation related to anxiety. Each motivational trait factor has two scales, for a total of 6 motivation scales (Kanfer & Ackerman, 2000). Details for each of these scales were explained earlier in the chapter.

Personal Mastery

Desire to Learn:

A one way between subjects ANOVA was conducted to compare the effect of threat condition on personal mastery desire to learn. There was no statistically significant effect of threat condition at $p<05$ level on self efficacy [F (1, 18) =.148, $p=.705$]. Thus, threat is not related to desire to learn.

Mastery Goals:

A one way between subjects ANOVA was conducted to compare the effect of threat condition on personal mastery goals. There was no statistically significant effect of threat condition at p<05 level on personal mastery goals [F (1, 18) =.837, $p= .372$]. Thus, threat has no effect on personal mastery.

Competitive Excellence

Competitive excellence consist of two scales: other reference goals and competition

seeking. Both of these scales assess approach-oriented motivational tasks (Kanfer & Ackerman, 2000).

Other Referenced Goals:

A one way between subjects ANOVA was conducted to compare the effect of threat condition on competitive excellence other reference goals. There was no statistically significant effect of threat condition at p<05 level on competitive excellence other reference goals [F (1, 18) =.184, *p= .673.*]. Thus, threat had no effect on competitive excellence other reference goals.

Competition Seeking:

A one way between subjects ANOVA was conducted to compare the effect of threat condition on competitive excellence competition seeking. There was no statistically significant effect of threat condition at *p*<05 level on competitive excellence competition seeking [F (1, 18) =1.540, *p*=*.231*]. Thus, threat had no effect on competition seeking.

Motivation Related to Anxiety

Motivation related to anxiety consist of 2 scales: worry and emotionality. Both of these scales represent avoidance related tendencies (Kanfer & Ackerman, 2000).

Worry:

A one way between subjects ANOVA was conducted to compare the effect of threat condition on motivation anxiety worry. There was no statistically significant effect of threat condition at p<05 level on Motivation Anxiety Worry [F (1, 18) =.276, *p*=*.606*]. Thus,

threat had no effect on worry.

Emotionality: This is a nine item scale that focuses on emotions associated with performance in evaluation contexts (Kanfer & Ackerman, 2000).

A one way between subjects ANOVA was conducted to compare the effect of threat condition on motivation anxiety emotionality. There was no statistically significant effect of threat condition at $p<05$ level on motivation anxiety emotionality [F (1, 18) =.115, $p=.738$]. Thus, the threat condition had no effect on emotionality.

Motivational Trait Self- Description Total

A one way between subjects ANOVA was conducted to compare the effect of threat condition on motivational trait self-description total score. There was no statistically significant effect of threat condition at $p<05$ level on motivational trait self-description total score [F (1, 18) =.016, $p=.899$].

Q-6 Is there a difference by threat condition on mathematics achievement?

Stereotype threat is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, et al., 1999; Perry et al., 2003; Ryan & Ryan, 2005; McGlone & Aronson, 2006). Studies have shown when a threat condition has been introduced to females about gender and ability, females who are invested in doing well on math performances have tendency to

perform poorly on the math assessment (Smith & White,2001).

A one way between subjects ANOVA was conducted to compare the effect of threat condition on mathematics achievement. There was no statistically significant effect of threat condition at p<05 level on mathematics achievement score [F (1, 18) =.004, *p=.899*]. The threat achievement did not have an effect on mathematics achievement.

Summary of findings Extended

There was only one scale that was related to math achievement and none that were affected by threat assessment. However, it is important to note that many of the correlations (*r*) are going in the direction predicted. A discussion of why this might be the case is presented in Chapter 5.

CHAPTER 5: DISCUSSION

Originally my purpose was to look at all of the conditions, along with stereotype threat that might affect math achievement. I decided to do an analysis of factors, along with stereotype threat that might affect math achievement in girls.

Factors, Stereotype Threat and Math Achievement

The factors or constructs that might affect math achievement in girls along with stereotype threat are domain identification measure, motivation orientation, self-efficacy and cognitive interference. I used domain identification measure to identify girls vulnerable to stereotype threat. Domain identification is an assessment used to identify a participant's value in a domain (Smith & White, 2001). Stereotype threat is being at risk of confirming as a self-characteristic, a negative stereotype or viewed through the lens of a negative stereotype, or fear of doing something that would inadvertently confirm that stereotype (Steele & Aronson, 1995; Aronson, et al., 1999; Perry et al., 2003; Ryan & Ryan, 2005; Aronson & McGlone, 2006). In this study, domain identification measure was used to identify high school aged girls who value or care about doing well in the math domain. Girls who identify with the math domain have an

investment in their math achievement (Ryan & Ryan, 2005). When presented with a threat condition, and a difficult math assessment, girls with this math domain identity produce lower math scores (Ryan & Ryan, 2005; Spencer, Steele, Quinn, 1999).

Motivational orientation was identified by using the motivational orientation (trait) self-description questionnaire. Bailey (2004) defines motivational orientation as being "a trait like difference in goal striving (proximal motivation) to either achieve success or avoid failure that is thought to impact state motivation and behavior through its impact on goal choice" (Atkins, 1957; Dweck, 1986; Bailey, 2004). In addition, motivational orientation "defines the source of motivation for an individual to perform a particular action and can either originate from internal desires (e.g. interest) or external compensation (e.g. money). Motivational orientation should influence the way positive or negative feedback is processed during learning situations and this might in turn have an impact on the learning process" (Linke, pg. 1).

As mentioned prior, self-efficacy is the belief that a particular action can be performed or accomplished by an individual (Bandura, 1986; 1991; 1997). Self-efficacy determines the goal selection (and the effort involved in the selection) and goal selection determines performance outcomes (Gist & Mitchell, 1990; Huit, 2001). Under the threat condition, low self-efficacy may lead to the target using "less optimal" task strategies (Bailey,2004).

Cognitive interference is the number of intrusive thoughts incurred during an assessment (Sarason, Keefe, Hayes & Shearin 1986).When threat condition becomes salient those who take

an assessment, report having thoughts that interrupt their concentration while taking the assessment. The intrusive thoughts may result in not completing an assessment or doing poorly in performance (Schwarzer, R. (1996) Sarason, Sarason, Keefe, Hayes, & Shearin, (1986).

The following research questions guided my investigation:

***Question 1*:** Is there a relationship between math achievement and domain identification level?

***Question 2*:** Is there a relationship between math achievement and each of the 6 motivational orientations?

***Question 3*:** Are there differences in task self-efficacy by conditions of threat?

***Question 4*:** Is there a difference in cognitive interference by conditions of threat?

Question 5: Are there differences in motivation orientation by threat condition?

Question 6: Is there a difference by threat condition on mathematics achievement?

Design

This study is a treatment group non-treatment group design. Inferential statistics were used to identify the relationships between domain identification measure, motivational orientation questionnaire), task state self-efficacy(TSS), cognitive interference (CI), stereotype threat Treatment (STT); sample math SAT score, and performance outcomes of participants.

The girls in the study were scheduled to fill out questionnaires and a sample math assessment at a secure facility on 7 different days in order to accommodate their school

schedules. One meeting took place in the conference room of one of the private schools with the first 4 girls that participated in the study. The other scheduled appointments took place at the home of the principal investigator. A room in the principal investigator's home was set up with seating around the perimeter of the room. There were clipboards given to each girl as they came into the area where the questionnaires were filled out. Upon arrival the participants were greeted and made comfortable; all consent and assent documents were confirmed and participants were instructed when to open their packets to fill out their questionnaires.

When they opened their packets, they were told not to look through the questionnaires until instructed. They were asked to fill out the first two questionnaires, domain identification and motivation orientation self-description questionnaire. After the first two questionnaires were completed, the girls were asked to read silently the statement on the top page of the sample SAT math assessment (they received a threat statement or non-threat statement). They were asked to look over the sample SAT math assessment and to fill out the third questionnaire self-efficacy. The participants were told that they would have 25 minutes to complete the sample SAT math assessment. After the sample SAT math assessment was completed the fourth questionnaire, cognitive interference was filled out. All of the documents were returned into the randomly numbered envelopes. The cognitive interference questionnaire contained a section for demographic information. Participating In this study were 20 girls who attended private or public school, on the secondary school level

or high school level a freshman, sophomore, junior or senior, and were ages 14 through 17. At the end of each scheduled meeting the girls were asked not to discuss the contents of the questionnaires until they were notified the full study was concluded. They all agreed not to disclose the content of the questionnaires or to discuss their experience until further notice.

Statistical Analysis and Findings

As mentioned prior in Chapter 4, many of the variables did not show statistical significance, with the exception of one, *competition seeking*, a sub construct of motivation orientation was able to predict math achievement outcomes. Because of the competitive attributes of the competition seeking variable, it is interesting to note that many of my participants were athletes. This sample consisted of track, volley ball and trained dancers. This may account for the high numbers in the sub construct *competition seeking*. However, the following variables could not predict math achievement for the female students participating in this study: domain identification level, desire to learn, mastery goals , other reference goals, competition seeking (only for question 5), worry, and emotionality. Threat condition did not affect self efficacy, the belief that she could complete the test in the allotted time frame. Threat condition did not affect cognitive interference, the number of times intrusive thoughts occurred while taking the test. Overall, the threat condition did not have an effect on math achievement.

The research literature would predict that I would find a relationship among the

variables I studied and mathematics achievement. The research also indicates that I should have found differences in these variables by threat condition. However, as mentioned at the conclusion of chapter 4, many of the correlations are in the right direction even though there is a small sample. I strongly believe if the sample size were at least 42 as suggested by the priori analysis performed in Chapter 3, more statistical significance would have been revealed. .

Why didn't my analysis support existing research?

Choices in methods and response rate might explain some of the differences in findings. The sample for this survey was small, which makes it difficult to achieve statistical significance. In many of the correlations, the *r* was robust, but was not statistically significant because of my small sample size. The higher the power of a study the probability that the findings about a particular population can be generalized. The larger the sample, the more robust the statistical power. Therefore, it is important to do sample size calculations when designing a study. I did a sample size calculation which required 42 participants in order to detect statistical significance at the $p = .05$ level was done for the study.

However, there were obstacles to increasing the sample size of my study. Two protocols used to invite high school girls to participate in this study about girls in math. Originally, I attempted to build a sample of girls attending private religious schools by contacting the principals of these schools. The principals were contacted by phone or

email about the study, the purpose of the study, and about my intent to do the study. One private school granted me permission to invite female students to participate. The first four girls agreed to the study.

Out of the original 21 private religious schools, after contacting them, several churches for one reason or another no longer had high schools. The number of prospective participating schools decreased approximately to 12 religious schools. Of those 12 schools, I ended up with many principals who either did not return my calls or emails, or who said they did not want to participate at this time. I had principals who agreed to disperse my invite flyers that asked the high school girls to participate in the study. Some principals wanted to disperse the flyers themselves. The prospective schools decreased to 3, of the three schools, two schools granted me a meeting to discuss the details of the study further. There were two administrators that agreed to participate in the study. One administrator opted to use the recruiting flyer to talk to both female students and their parents about participating in the study. Four students from this school participated in the study. The other administrator met with me officially and set up a window of recruiting time. The administrator promised to call me with a specific date to come to recruit. This was my largest school. It could have possibly given me the remainder of my participants. Two weeks went by and I did not receive a call from the administrator. When I called to inquire about the recruiting date, I was told that they had decided not to participate in the study.

Unfortunately, the promise to participate in the recruitment of girls by principals or administrators were not always carried out. Their reasons varied from "I don't want to do the study", "Sorry I won't be able to help you, to "You must have miss understood me ". After my longtime study of stereotype threat, I believe that the implications of finding students who identified with the math domain and who may have stereotype threat vulnerability, prevented many principals and administrators from supporting the study.

After three cycles of trying to carry out protocol 1, I was forced to establish protocol 2 in order to obtain my sample. I asked retired teachers, community leaders, and youth leaders to act as my surrogates. They help pass out my invite flyers and ask students they knew if they would consider doing the survey. Sixteen more students participated in the study, bringing the sample number to 20 participants. It is interesting to note that there were females students who declined the opportunity to be included because the study was about girls and math. The latter 16 who agreed to participate in the study 15 came from public schools and 1 came from a private school.

More importantly underpowered studies, with a small sample size, may not reveal statistically significant findings.

> According to Nyak (2010), "the underpowered studies should be interpreted cautiously and the 'absence of evidence' in these studies should not be taken as 'evidence of absence" (pg.1).

The above quote helps support many of my findings. Although the sample size was small, the Pearson Coiefficients in the statistical analyses performed, showed the correlations often pointing to the direction of the predicted outcomes. Therefore, a larger sample may have produced more statistical significance between the variables when correlations were performed.

An additional explanation to low statistical significance focuses on the way the self-efficacy measure is administered. In this study, the self- efficacy measure was completed after the participants had an opportunity to view the math assessment with the threat or non- threat statement attached to the front of the sample SAT exam Self-efficacy in an individual becomes resilient and evolves as the person becomes more experienced in performing in that domain (Bandura, 1986,1997).

However, Ryan & Ryan, 2005 states the following:

> Stereotype threat may not immediately impact self-efficacy for the exam but rather sets up an "interpretive framework" that when difficulty is experienced, self-efficacy falters (and stereotype threat paradigms are structured to ensure students experience difficulty). However, work to date has not examined changes in self-efficacy during the course of the exam. (pg. 59)

The latter statement 'changes in self-efficacy during the course of the exam' points out that during the difficult sample SAT exam, the females' thoughts toward the ability to complete the test (self-efficacy) in the allotted time(25 minutes) may have changed with subsequent

questions. In retrospect, monitoring self efficacy throughout the exam may have produced a different statistical outcome than I reported. It may also be that the findings are accurate.

Perhaps there have been changes in female student attitude toward mathematics. With the rise of STEM (Science Technology Engineering Mathematics) initiatives in schools across the country, females are encouraged to immerse themselves in domains that traditionally are dominated by males. There are partnership programs dedicated to supporting females in STEM domains, such as, the National Girls Collaborative Project (NGCP). NGCP is a partnership of organizations across the United States who are committed to informing and encouraging girls to pursue careers in science technology engineering and mathematics. This initiative provides a mini grant to help support females serving the STEM focused programs and to help address gaps and overlaps in STEM related areas. There are also programs in public schools, such as the Richmond Technical Center STEM academy of which my sister teaches sports medicine and athletic training. As mentioned in Chapter 2, both in the area of educational leadership and instructional leadership reducing stereotype threat is important. Both educational leadership in the area of school policy and instructional leadership in the area of teacher training, require understanding on how to eliminate stereotype threat in a STEM classroom environment.

Testing environment is important and may have accounted for the threat condition not

producing a statistically significant effect on math achievement in the study. The environment in which the girls filled out the questionnaires and took the sample math SAT exam may have lessened the threat condition for those girls that received the threat. The first 4 girls filled out the questionnaires and sample math SAT exam in their school conference room, which had comfortable padded office chairs. The other 16 participants were in a comfortable home with a choice of comfortable chairs to sit. In both testing cite, the girls were administered questionnaires by females. Those females were African American, the principle researcher and an Internal Review Board (IRB) approved study personnel. When participants can identify with those instructing them in domains they identify, through gender, the potential for a threat condition to be created is decreased (Stout et al, 2011). The fact that the girls may have identified with the gender of the testing facilitators may also have reduced the stereotype threat. There was no manipulation check included to see if the participants noticed the difference in the treatment.

Stereotype threat inoculation models have been used to help provide visual support to those who are prone to threat conditions in STEM related fields.by enlisting same-sex-experts (Stout et al, 2011). Same sex experts are professionals who help to improve the self-concept of women pursuing a STEM career by using more "same sex experts" (professors, professional) in STEM courses often dominated by male professors (Stout et al, 2011).

Future Studies

There are still too few studies done in stereotype threat on children and adolescents. More studies should be done to understand how both male and female children and adolescents perform in the presence of a threat condition as it relates to particular domains. If threat vulnerability is identified before minors embark on obtaining a college or career technical education, perhaps the acquisition of jobs will be more evenly distributed among gender.

In this study, *competition seeking*, a sub construct of motivation orientation revealed a statistically significant relationship with math achievement in females. Thus, this sample was unique in that over 50% of my participants were athletes, representing track, volley ball and dance. It would be interesting to do a study on high school female athletes and high school non-female athletes where the threat condition has been made salient, using math achievement, motivational orientation, cognitive interference and self-efficacy. In addition, the self efficacy measure would be tested intermittently during the course of the sample math SAT assessment to identify if self –efficacy wanes as the participant moves through the difficult questions included in the assessment.

Conclusion

In 1983 a report released by the National Commission on Excellence in Education titled, "A Nation at Risk", revealed that many school aged students in the United States were performing under grade level in many academic domains (National Commission on Excellence

in Education, 1983). In comparison to other countries our children were vulnerable and ill prepared to compete globally (National Commission on Excellence in Education, 1983). In addition, across the country there are achievement gaps between ethnicity and gender. I thought why did the achievement gaps exist? I began to read about the many theories of why achievement gaps remained a concern in our elementary and secondary schools and sought to research the matter. Among the many theories, one intrigued me the most, stereotype threat. Stereotype threat is a theory developed by Dr. Claude Steele in the 1990s. How was stereotype threat identified from other social psychological constructs? As I continued to research other studies, domain identification measure, developed by Smith & White (2001) presented a true measure that could identify stereotype threat vulnerability. More specifically, I found a dissertation done by Alice Anne Hardee-Bailey in 2004, which used this measure to identify stereotype threat in a mixed gendered study. Reading this dissertation inspired me to do a study on high school females vulnerable to stereotype threat in the math domain.

As discussed earlier in Chapter 4 and Chapter 5, domain identification measure did not detect stereotype threat vulnerability or show a relationship with math achievement in my unique sample of participants. However, a sub construct of self- description motivational trait called *desire to learn* revealed a motivation orientation that revealed approach related tendencies to achieving goals. To that end, more studies need to explore stereotype threat vulnerability, domain identification measure, motivation orientation, self-efficacy and cognitive interference as

they relate to math achievement in females. The goal is to increase the number of females with science, technical, engineering and math (STEM) degrees. Also, to find ways to remove obstacles that prevent females from entering into math related fields.

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Appendices

Appendix A

This page contained Appendix A, “Domain Identification Measure”; Bailey, 2004; Content of these pages is copyrighted. Permission to use this measure must be requested from the author.

Appendix B

This page contained Appendix B, “Motivational Trait Questionnaire” Short Form; Heggestad and Kanfer, 2000; Content of these pages is copyrighted. Permission to use this measure must be requested from the author.

Appendix C

This page contained Appendix C, “Self-Efficacy Measure”; Bailey, 2004; Content of these pages is copyrighted. Permission to use this measure must be requested from the author.

Appendix D

This page contained Appendix D, "Cognitive Interference Questionnaire." Sarason, I. G., Sarason, B. R., Keefe, D. E., Hayes, B. E., & Shearin, E. N. (1986). Content of these pages is copyrighted. Permission to use this measure must be requested from the author.

Vita

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