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The Relationship Between Gender Identity and the Effects of Stereotype Threat on Women's Math Performance

DISSERTATION

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Abstract

Research in the area of stereotype threat and women's math performance documents that women underperform under conditions of stereotype threat. Futher, those who identify more with the group under threat are more likely to be impacted by the negative effects of stereotype threat. Given this relationship, previous research has explored and documented the impact of gender identity on the relationship between stereotype threat and women's math performance. However, the conceptualization of gender identity in the research literature is that of a static entity. This study sought to add to the literature on stereotype threat and women's math performance by exploring the impact of gender identity on this relationship using a contextual model of gender identity. Based on the theory of "doing" gender, gender identity is seen as a dynamic interaction between person and environment, using a measure of conformity to feminine norms. This study predicted that women who are more conforming to gender norms in society would experience greater performance decrements under conditions of stereotype threat. Instead, this study found that women who are more conforming to gender norms are more likely to have lower Grade Point Averages than their non-conforming counterparts. Results and implications are further discussed.

CHAPTER 1:
INTRODUCTION

Messages about cultural expectations and acceptable behavior are powerfully conveyed throughout society. These are set as injunctions and highly impact highly on individuals and groups within that society. One expression of the impact of societal messages on individual behavior can be seen through the phenomenon of stereotype threat. First studied in the domain of academic achievement for African Americans, stereotype threat can be defined as "the immediate situational threat that derives from the broad dissemination of negative stereotypes about one's group- the threat of possibly being judged and treated stereotypically, or of possibly self-fulfilling such a stereotype" (Steele & Aronson, 1995). As such, members of the group under threat are subject to performance decrements related to the threatening situation created by the negative stereotype. Evidence for performance deficits have been documented for African Americans in the area of academic achievement and women in the domain of mathematics performance (Steele & Aronson, 1995; Spencer, Steele, & Quinn, 1999). Individuals in stereotype-threatened conditions consistently underperform compared to their non-threatened counterparts. Thus, the messages conveyed in our society about stigmatized groups are critically important in understanding the behavior of those affected by the stereotypes.

Research in the area of stereotype threat suggests that the threat experienced by members of the stereotyped group will vary based on the salience of the domain being tested (Lesko & Corpus, 2006). For example, a woman who is highly identified with the math domain will be more affected by a threat to her performance in that domain, than a woman who does not highly identify with the domain of mathematics. Similarly, those

who are highly identified with the social identity under threat are more likely to be impacted by the threatening situation than those who are not highly identified with the threatened social identity (Shih, Pittinsky, & Ambady, 1999). Women whose gender identity is particularly salient as part of their self-definition will experience the greatest level of stereotype threat and subsequent performance deficits (Schmader, 2002). Moreover, both individuals who are highly identified with the performance domain and individuals who are highly identified with the group under threat will evidence the greatest deficits in performance under stereotype threatened conditions.

Statement of the Problem

While previous research documents the salience of gender identity for women under stereotype threat, the conceptualization of gender identity has consistently been that of a static entity, one that is formed and remains constant across contexts. This formulation is consistent with previous research that considers gender as a state that is "achieved". West and Zimmerman (1991) re-define the traditional concept of gender as activities in which individuals engage in on a daily basis. This formulation of gender is one in which individuals "do" their gender, essentially shaping how their gender is acted out in various circumstances. Rather than as a stable property of the individuals, these authors view gender as an emergent feature of social situations. Gender does not exist within an individual, rather it materializes through his or her behaviors, which are elicited by social environments (West & Zimmerman, 1991).

It is within this framework that the present study seeks to explore gender identity in relation to stereotype threat. The theoretical framework provided by West and Zimmerman (1991) is consistent with the underlying premise of stereotype threat. That

is, stereotypes about gender and performance impact women's performance in the domain under threat. Thus, it is within that specifically threatening situation that women will experience performance decrements, based on messages that are conveyed in the social environment. Within the theoretical framework of "doing" gender, the present study seeks to contribute to the current literature on stereotype threat by examining the gender identity of women and its relationship to the performance detriments of stereotype threat. Although previous research underscores the salience of gender identity in relation to subsequent performance deficits under stereotype threatened conditions, no research to date explores the ways gender is acted out and how this may contribute to the effects of stereotype threat on women.

Related to West and Zimmerman's (1991) concept of gender, Mahalik and colleagues (2006) developed an inventory that addresses feminine gender role identity as conformity to specific cognitions, emotions, and behaviors with the social environment. These culturally-based components are considered "norms", and the extent to which a woman conforms to these socially-constructed norms determines her gender role identity as "feminine" within the context of society (Mahalik et al., 2006). This conceptualization is consistent with West and Zimmerman (1991) as it describes gender in relation to behaviors that are elicited by the social environment.

Purpose of the Study

The purpose of the present study is to examine the link between conformity to gender norms, and the impact of stereotype threat on women's math performance. Previous research considers the impact of gender identity in the relationship between stereotype threat and performance detriments. However, research in the area of

stereotype threat is lacking in the consideration of how one's gender identity is manifested. Understanding the concept of gender identity as something that is acted out, the current study seeks to examine a potential relationship between conformity to gender norms and performance detriments under stereotype threat conditions for women. Thus, the ways gender is acted out in relation to societal expectations (conformity to gender norms) that are associated with the group under threat, will be examined as a possible moderator to the effect of stereotype threat on women's math performance.

Stereotype threat

Stereotype threat was first examined in relation to the effects of highlighting racial identity and on subsequent academic performance (Steele & Aronson, 1995). The authors sought to examine the impact of the negative societal stereotype that African Americans do not perform as well as Caucasians on difficult standardized tests. In one of the initial studies of stereotype threat, some African Americans were asked to mark their race at the top of the test, and others were not. Those whose racial identity had been primed by indicating their race on their score form performed worse than those who did not. This early study paved the way for further research examining the effects of priming the identity under threat and subsequently examining the impact of this threat on performance. Stereotype threat research has explored not only the impacts of stereotypes on racial minorities but also the ways in which stereotypes affect stigmatized groups in other domains. In particular, research in the area of stereotype has focused on the ways in which women are negatively impacted by the stereotype that men perform better in mathematics than women (Steele & Aronson, 1995). Spencer and colleagues (1999) examined women's stereotype threat by inducing a threatening situation and comparing

the performance on a math task to individuals in a control condition. In the stereotype threat condition, individuals were told that society holds a stereotype that men are better than women in mathematics. However, they also noted that the empirical evidence in this area is mixed. Thus, the researchers highlighted the stereotype held by society but did not provide conclusive evidence supporting this claim. Despite the lack of empirical support, women in the stereotype threat condition performed worse relative to the male subjects than women in the no-threat condition.

A multitude of studies support the claim that women are impacted by stereotype threat in the domain of mathematics (Keller & Dauenheimer, 2003; Quinn & Spencer, 2001; Spencer, Steele, & Quinn, 1999; Steele, 1997; Steele & Aronson, 1995; Wheeler & Petty, 2001). While some studies have induced a threatening situation by explicitly highlighting gender differences in performance, other studies have demonstrated evidence of stereotype threat conditions in more subtle situational manipulations (Keller, 2002; Inzlicht & Ben Zeev, 2000). Inzlicht and Ben Zeev (2000) found performance detriments in women under a testing condition that included a majority of male participants in relation to women subjects. Those in a testing condition consisting mostly of female participants scored higher on the math task than the women in the stereotype condition, and equally as well as the men in the stereotype condition. These studies in combination lend support to the deleterious effects of stereotype threat across a range of potentially threatening situations.

The documented harmful effects of stereotype threat have led to research investigating the mechanisms by which stereotype threat works to impact performance of members in the threatened group (Beilock, Jellison, Rydell, McConnell, & Carr, 2006;

Wheeler & Petty, 2001). Research has demonstrated that stereotype threat may impact performance decrements by affecting working memory, level of arousal, and negative thinking (Beilock et al., 2006; Cadinu, Maass, Rosabianca, and Kiesner, 2005; Croizet et al., 2004). These mechanisms provide insight into the ways stereotype threat may operate on a cognitive level to impact the performance of members of the group under the stereotype threat.

Further research has considered the moderating variable of social identity in relation to the effects of stereotype threat (McIntyre, Paulson, a& Lord, 2003). McIntyre and colleagues (2003) found support for the hypothesis that individuals in the group under threat will experience greater performance detriments when they identify highly with the group under threat. While this research considers the salience of the social identity under threat (i.e. gender identity), it does not consider the way in which one performs their gender identity in relation to societal expectations. Moreover, the way in which individuals enact their gender, and consequently their gender identity, is an additional consideration that may further highlight the way that one's social identity serves as a moderating variable in the negative effects of stereotype threat on performance.

Gender Role Identity

Previous research has conceptualized gender role identity in a way that stands in contrast to West and Zimmerman's (1991) theoretical conceptualization. According to Bem's Gender Schema Theory, gender role identity can be assessed by issuing a single score comprised of responses to stereotypical and socially desirable characteristics associated with one's stated biological sex. Mahalik and colleagues (2006) criticize this

theory by contesting that the static nature of this gender score does not sufficiently account for interactional, situational, and behavioral factors. Thus, Mahalik and colleagues (2006) proposed a measure to assess gender role identity in a way that considers critical contextual and behavioral factors, thus reflecting the dynamic nature of gender roles suggested by West and Zimmerman's (1991) theory.

Mahalik et al. (2006) contend that gender is not an isolated, stable, unchanging construct. In contrast, Mahalik and colleagues (2006) consider gender role identity to consist of interactions amongst an individual's cognitions, emotions and behaviors with the social environment. The societal impact on gender role identity is particularly salient in this conceptualization. These authors assert that the U.S. culture conveys certain expectations of what is considered "feminine." These "feminine" characteristics are expressed as expected behaviors, cognitions, and emotions dictated by society and its culture that are deemed "feminine." The authors refer to this set of expected characteristics as "norms." Mahalik and colleagues (2006) suggest that a woman's femininity is expressed by the extent to which she internalizes and conforms to these cultural norms. While many people may or may not subscribe to these norms, as well as co-cultural norms, the sample for this study fits with the dominant cultural group.

Operationalization of Variables

Stereotype Threat

Stereotype threat can be defined as "the immediate situational threat that derives from the broad dissemination of negative stereotypes about one's group- the threat of possibly being judged and treated stereotypically, or of possibly self-fulfilling such a stereotype" (Steele & Aronson, 1995) For the purpose of this study, stereotype threat

will be operationalized in this way. Previous research has made the threat salient by priming the identity under threat (Inzlicht & Ben Zeev, 2000), or explicitly stating the stereotype before administering the task measuring performance (Keller, 2002). This study will induce the stereotype threat by providing materials that highlight the negative stereotype about women's math performance in our society (Inzlicht & Ben Zeev, 2000).

Gender Role Identity

Within the framework of West and Zimmerman's (1991) theory, gender role identity will be assessed using the Conformity to Feminine Norms Inventory (CFNI; Mahalik et al., 2006). The prominent feminine norms identified by Mahalik et al. (2006) throughout an extensive research process are (a) Niceness in Relationships, (b) Care for Children, (c) Thinness, (d) Modesty, (e) Sexual Fidelity, (f) Romantic Relationships, (g) Domestic, (h) Invest in Appearance. The CFNI assesses the extent to which an individual conforms to each of these societal norms, thus measuring how each individual "does" her gender, comprising her gender role identity.

Effects of Stereotype Threat on Performance

Research consistently measures the effects of stereotype threat on women's math performance using difficult math problems to assess performance (Keller & Dauenheimer, 2003; Quinn & Spencer, 2001; Spencer, Steele, & Quinn, 1999; Steele, 1997; Steele & Aronson, 1995; Wheeler & Petty, 2001). For the purposes of this study, performance on difficult math problems taken from the Graduate Record Exam (GRE) will be used to determine the effects of stereotype threat on performance.

Significance of the study

The current study seeks to add to the literature on stereotype threat by providing further insight into possible moderators affecting the harmful consequences to individuals experiencing stereotype threat. The documented relationship between social identity and the effects of stereotype threat on performance in women leads to further speculation about the nature of the individual's social identity. In the case of stereotype threat in women, the social identity under threat is an individual's gender identity. The present study seeks to understand the way in which gender identity is expressed through conformity to gender norms, and its relationship to depressed performance under stereotype threat.

Consistent with West and Zimmerman (1991), Mahalik and colleagues' (2006) conceptualization of gender role identity places an emphasis on an individual's interaction with the social environment in determining gendered behavior. Understanding gender role identity as a reflection of the interplay between person and social environment is particularly salient in the examination of stereotype threat. Stereotype threat refers to cues in the social environment about stigmatized groups and the potential impact these stereotypes have on individual behaviors (Steele & Aronson, 1995). Thus, an examination of one's gender role identity as an individual's interaction with an environment that elicits specific culturally dictated behaviors is particularly appropriate within the context of the exploration of stereotype threat. This research aims to provide further information about the ways in which stereotype threat operates to hinder performance, and the potential costs of conformity to gender norms in relation to performance in stereotyped domains.

Research Questions and Hypotheses

*Research Question 1***.** Will women performance worse on a math task under conditions of stereotype threat?

*Hypothesis 1***.** Women will perform worse on a math task under conditions of stereotype threat.

*Research Question 2***.** Will women who conform to gender norms experience greater performance decrements under stereotype threat than their non-conforming counterparts?

Hypothesis 2. Women who conform to gender norms will experience greater performance decrements under stereotype threat conditions than their non-conforming counterparts.

Chapter 2

Review of the Literature

Introduction

This chapter will provide a background to current literature relevant to the present study. It will begin by exploring current gender theories, with a focus on the gender theory and theoretical framework of the study. This chapter will also discuss research conducted in the area of stereotype threat as well as ways the present study may contribute to the growing body of literature on stereotype threat and women's math performance.

Current Gender Theories

One of the early conceptualizations of gender includes Bem's (1981) gender schema theory. This theory outlines a predisposition to assimilate information based on a gender schema that is developed early in life. Bem (1981) suggests that as children develop and take in their surrounding environments, they begin to incorporate the dichotomous notion of sex differences that are present in society into what becomes a "gender schema". This gender schema contributes to the quickness in which information is processed, the way information is taken in and organized, and judgments that are made based on the dimensions of the gender schema (Bem, 1981). Additionally, Bem (1981) highlights the significance of gender schema for sense of self, as the self-concept becomes integrated with the gender schema. Children become aware of, and ultimately integrate into their sense of self, the behaviors and characteristics that are associated with their sex. Thus, children become acutely aware of how their behaviors and characteristics are consistent with, or deviate from the societal dimensions that represent

"appropriate" behavior for their sex (Bem, 1981). Moreover, self-esteem becomes intertwined with sex-typed behaviors, as children learn to recognize and evaluate their own gender consistency with that which is expected of them (Bem, 1981). According to gender socialization theories, gender is something that develops but is often considered fully formed and unchanging by age 5. This definition leaves little room for the consideration of further development in relation to gender identity, and the reciprocal impact of person and environment in continued gender identity development.

A second current conceptualization of gender is that of gender role theory. Gender role theory describes gender as categorized by "gender roles" (Parsons, 1951, Parsons and Bales, 1955, Thorne, 1980 Connell, 1983). Gender role theory posits that gender roles are socially constructed and performed, as well as situationally defined. West and Zimmerman (1987) suggest that this conceptualization of gender is lacking, as it does not allow for an understanding as embedded in all activities and interactions. Rather, it is a role that one can step into or out of. According to gender role theory, gender roles are identities that are adopted and shed based on situational determinants (Thorne, 1980). This definition is critiqued by West and Zimmerman (1991) for its consideration of gender roles as situational identities, that do not necessarily span the scope of all situations. West and Zimmerman (1991) contend that gender is not an entity that can be stepped into or out of, it is a component of and inherent to all interactions and activities in which one is involved.

A third framework for understanding the concept of gender is the notion of "gender display" (Goffman, 1976). Gender display views gendered behavior as "optional performances". These performances do not necessarily represent the essence of

masculinity or femininity, but are more demonstrative of what we would like to communicate about ourselves through standardized actions that are readily identified as masculine and feminine (Goffman, 1976). Further, Goffman (1976) clarifies gender as enactments of a culturally determined set of idealized notions of femininity and masculinity. Similarly, Unger's (1979) discussion of the differences between the terms "sex" and "gender" focuses on the importance of gender as a distinct notion, not defined solely by biological sex. In particular, Unger (1979) notes that gender categories are often determined separately from the biological components that may be considered their bases. Cultural responses to one's sex contributes to a conceptualization of gender, and contributes to the development of gender identity (Unger, 1979). This study draws from this understanding of gender identity as something that is developed through interaction with the environment and cultural responses to one's sex.

West and Zimmerman (1987) value the gender display conceptualization as effective in its understanding of gender as interactions between persons and their environments. However, West and Zimmerman (1987) critique this notion of gender as it is again considered to be on the periphery of activities. West and Zimmerman (1991) argue that while the gender displays, understood as enactments of conventionally derived definitions of masculinity and femininity, may be optionally performed, it is not sufficient to consider gender as something that is squeezed into interactions where there is room. West and Zimmerman (1991) contend that gender is embedded in all interactions, and cannot be separated out by simply fitting into the spaces of insignificant activities. It is possible that gender involves "optional" behaviors that may or may not coincide with standard conventions about masculine and feminine behavior. However, it

may not be accurate to suggest that one has a choice in being viewed as female or male, regardless of decisions about conforming or not conforming to the behaviors that are socially defined as masculine or feminine.

"Doing" gender theory

Just as the feminist ecological model posits that people impact on and are impacted by their environments and contexts, West and Zimmerman (1987) offer a view of gender that considers gender to be a continual accomplishment that is related to the context in which the accomplishment occurs. According to West and Zimmerman (1991), gender is a continual accomplishment that is embedded in all interactions. The notion that individuals perform their gender is critical to West and Zimmerman's (1991) understanding of gender. However, these authors contend that while individuals do gender, it is essential to consider the doing of gender within a context. Moreover, it is interactional and other people view as well as interpret its production. Further, gender is described as "an emergent feature of social situations; both as an outcome of and a rationale for various social arrangements and as a means of legitimating one of the most fundamentional divisions in society". (p. 126). Additionally, people behave and arrange their multiple interactions and behaviors in ways that articulate their gender, and similarly they interpret the actions of others according to an equivalent and comparable framework.

The concept of accountability is critical in the discussion of the "doing of gender". According to Heritage (1984), people are driven to behave in ways that are oriented towards the way these behaviors will be perceived by others. This definition of accountability underscores that behaviors may be undertaken with the purpose of being

recognized by others as having special or remarkable qualities. However, still other behaviors may be employed due to their inherently conventional qualities that are in line with societally determined standards for what is considered masculine or feminine. The definition of “sex category” is universal in its application, thus in any situation a woman or man may be held accountable for “gendered” behavior. The evaluation of these behaviors may be used as a means of judging the validity of other behaviors. Given the universality of placement in “sex categories”, at any given time humans can be held accountable for their gender typical, or gender atypical behaviors. Even though these gender typical constructions may vary by factors such as class, race, and ethnicity, the gender category is still relevant as it impacts the way others judge individuals. According to West and Zimmerman (1991), “doing” gender does not imply a necessary compliance with societal norms about gendered behavior. West and Zimmerman (1987) contend that “it is to engage in behavior at the risk of gender assessment” (p.136). Inherent in the gender assessment component of the definition is the interactional nature of “doing” gender. Individuals are held accountable for their behaviors by other people, and the accountability is in part determined by the setting in which the interactions are taking place. The backdrop for these interactions is a society in which standardized notions of gender set the stage for behaviors that are deemed gender-congruent, and gender-non-congruent. Individuals are inevitably placed in sex categories, and are continually held accountable for their behaviors in relation to their sex categories. Thus, the “doing” of gender cannot be escaped, and is embedded in all situations and interactions (West & Zimmerman, 1987).

West and Zimmerman (1987) suggest that “doing” gender may create and perpetuate the notion of an “essential nature” for the sexes that is not biologically rooted. Goffman (1977) describes a set of situations that draw on the supposed “essential nature” of males and females. He notes that several basic settings highlight, and may even create supposed difference between the sexes. Goffman (1977) sites public restrooms as an example of a common setting that contributes to a clear dichotomy between the sexes, and perpetuates an assumed difference between males and females. Goffman (1977) notes that the biological processes between men and women involved in using a restroom are similar if not the same. While there is some difference in the anatomy used in these processes, it is culturally determined that there should be separation due to sex in public restrooms. He highlights that often the physical nature of the restrooms themselves delineate sex differences, such as urinals in the men’s room, and extra mirrors and beauty equipment in the women’s room. This may, for example, suggest that women are more involved in taking care of appearances. Similarly, Goffman (1977) sites the arena of sports as a place where men may be lauded for such traits as competitiveness, aggression, and physical prowess. Additionally, Goffman states that these situations “do not so much allow for the expression of natural differences as for the production of that difference itself” (Goffman 1977, p.324)

Given the environmental and societal structures in place to evoke traditional gendered behavior, it is relevant to consider the consequences of “doing” gender by either conforming to the norms or non-conforming. According to West and Zimmerman (1987), “If we do gender appropriately, we simultaneously sustain, reproduce, and render legitimate the institutional arrangements that are based on sex category. If we fail to do

gender appropriately, we as invididuals- not the institutional arrangements- may be called to account (for our character, motives, and predispositions)." West and Zimmerman's (1987) theory discusses the ways societal and environmental structures impact behavior, and the consequences of comforming or not conforming to the norms dictated by society. The following discussion of stereotype threat continues to examine the ways in which messages in society impact behavior and the potentially harmful consequences of the stereotypes disseminated in society.

Stereotype Threat

Steele and Aronson (1995) first proposed the notion of stereotype threat in relation to the stereotypes present for African Americans in academic situations. They noted that there have been several explanations for the performance gaps between African Americans and other races on standardized tests, as well as academic performance. Among the proposed explanations for these differences are socioeconomic status (Ogbu, 1986), and genetic differences (Hernstein & Murray, 1994). Steele and Aronson's (1995) work suggested that these factors are neither explanatory nor sufficient to account for the academic and performance differences among the races. The authors put forth that stereotype threat may negatively impact the intellectual performance of African Americans during standardized tests (Steele & Aronson, 1995). In situations where the intellectual ability of African American students is being tested, the students may feel a threat that they will confirm the negative stereotype. As such, Steele and Aronson (1995) define stereotype threat as "a predicament that threatens one with being negatively stereotyped, with being judged or treated stereotypically, or with the prospect of conforming to the stereotype" (p.614). Steele and Aronson (1995) contend that the

threat is not derived from internalization of the negative messages that constitute the stereotype. Instead, the threat is relevant based on the level of identification with the domain under which the stereotype exists, and the resulting fear about being stereotyped in that threatened domain. Additionally, stereotype threat can be explained as "the event of a negative stereotype about a group to which one belongs becoming self-relevant, usually as a plausible interpretation for something one is doing, for an experience one is having, or for a situation one is in, that has relevance to one's self-definition" (p.616).

In particular, Steele and Aronson (1995) noted that this threat is most likely to be relevant in situations in which the students are challenged, thus highlighting the potential weakness in an area that could be associated with race. Additionally, the threat is more relevant to those who are invested in their performance in the area being tested. For those who are more invested in their performance in the domain-threatened area are more likely to experience a threat to their sense of self-worth in relation to performance on the test (Steele & Aronson, 1995). Several mediating factors were proposed to explain the effects of stereotype threat on performance, including arousal levels, self-consciousness, overcautiousness, and increasing task-irrelevant worries (Steele & Aronson, 1995).

To examine the potential effects of stereotype threat on test performance for African American students, the authors recruited a sample of African American and Caucasian students. All participants were given a 30 minute section of questions from the Graduate Record Examination (GRE) that were considered to be challenging for all students but not outside of the participants' skill range. In the stereotype threat condition, participants were told that the test was exploring "various personal factors involved in performance on problems requiring reading and verbal skills". Further, it was noted that

they would be given feedback that would provide insight into their cognitive abilities in the are of verbal problem solving. In the non-stereotype threat condition, participants were told that research was examining "psychological factors involved in solving verbal problems". The examiners attempted to convey that in the non-threat condition the test was simply given to "familiarize them with the kinds of problems that appear on tests they may encounter in the future". In the stereotype threat condition, the emphasis was placed on the diagnostic features of the test. However, the researchers attempted to de-emphasize the diagnostic quality of the research in the non-threat condition by stating that they should put forth effort despite the fact that the researchers were not going to evaluate their abilities based on the test. The dependent variable in this study was the performance on the GRE questions provided to the participants.

Steele and Aronson (1995) found that African American students underperformed compared to Caucasian students when the test was presented as having diagnostic value. However, in the non-stereotype threat condition in which the subjects were told that the test would not be indicative of performance in the domain, African Americans performed equally to that of Caucasian participants. The results of this study are congruent with the hypothesis proposed by Steele and Aronson (1995) that stereotype threat may, in part, account for the performance differences between African American and Caucasian students on tests diagnostic of intellectual abilities. Steele and Aronson (1995) continued their exploration of the role of stereotype threat on performance in African American students. In a follow-up to their original study, Steele and Aronson (1995) aimed to further determine the effects of stereotype threat by determining the effects of stereotype threat under conditions that do not explicitly state the diagnostic nature of the task. The

follow-up study also considered the way in which the stereotype may be primed. Steele and Aronson (1995) noted that in their original study, 75% of the African American participants in the diagnostic condition elected not to endorse their race on the demographic portion of the test. However, all other participants in all other conditions did mark their race on the demographic portion of the test. The authors reasoned that a potential factor in the avoidance of marking their race on the form could be indicative of a stereotype avoidance (Steele & Aronson, 1995). Thus, Steele and Aronson (1995) hypothesized that indicating race on the test form may induce stereotype threat. In order to test this possibility, the others constructed two test conditions. In the non-stereotype threat condition, the demographic portion of the test was removed, and the procedure for the non-diagnostic condition remained the same. In the stereotype threat condition, participants were asked to complete a "personal information" questionnaire, consisting of demographic information including race. The examiners once again found a significant underperformance of African Americans in the stereotype threat condition. The African American participants in the stereotype threat condition performed worse than all other groups in the study. However, in the non-stereotype threat condition African Americans performed equal to the Caucasian students. The results of this study demonstrate further support for the deleterious effects of stereotype threat on the performance of African American students on academic tests. Even when the test was labeled as "non-diagnostic" of intellectual abilities, priming the stereotype by asking subjects to indicate race was enough to invoke the stereotype in African American students. The authors noted that priming subjects by asking them to indicate race may have been sufficient to make the stereotype available to them, thus hindering their performance on the test.

Steele and Aronson (1995) put forth provocative findings in that stereotype threat may be a component to explain the differences in standardized test scores between African American and Caucasian students. As such, they highlight the potential need to assess ways to reduce stereotype threat in these situations due to its harmful effects on performance.

Spencer and colleagues (1997) sought to expand the research in the area of stereotype threat by considering the potential effects of stereotype threat on women in the domain of mathematics. Their work posited that women experience obstacles in their work in the math domain, and may face difficulties in math-related pursuits. Spencer and colleagues (1997) suggested that based on limitations such as cultural expectations of performance based on gender and lack of role models in the area, women would be subject to barriers that may affect performance in the math domain. For example, he suggests that women may have to contend with gender roles dictated by society, and low-expectations for performance by family, teachers, and others in the area of mathematics. These impediments could lead to a particular difficulty identifying with the field of mathematics. However, Spencer and colleagues (1997) suggests that there is a threat for those who are identified with a stereotyped domain, and participate in situations in which the threat is relevant. For example, a woman who is identified with the domain of mathematics may experience a particular threat that occurs when her performance is evaluated in the stereotyped area. Spencer and colleagues (1997) sought to examine the salience of stereotype threat for women in the domain of mathematics, and consequently its implications for performance decrements. Spencer and colleagues (1997) hypothesized that the interference of stereotype threat on performance could be

experienced in any situation related to the stereotyped domain. For example, any woman involved in a math task may feel the situational threat defined by stereotype threat. However, the authors noted that the threat was most likely to occur for women who are highly identified with the domain under threat- that is women for whom acceptance in mathematics is particularly important (Spencer et al., 1997). Additionally, Spencer et al. (1997) sited the difficulty of the task under question as highly relevant to the impact of stereotype threat. Spencer and colleagues (1997) suggest that a situation involving an easy math task may not be as conducive to inducing stereotype threat. It is possible that in these situations, women are able to experience success with the problems at hand, thus combating the potential effects of stereotype threat. However, difficulties arise when the problems are challenging, thus leaving room for possible considerations as to why one is struggling. Spencer and colleagues (1997) acknowledged the potential for men to experience a feeling of threat in a situation in which their performance is being evaluated in a domain they are highly identified with. Men who are highly identified with math could also experience a threat under circumstances in which their ability could be in question. However, Spencer and colleagues (1997) highlight the added threat that is present for women- that of potentially proving a stereotype true, as well as the threat of their performance causing them to viewed as fitting into the negative stereotype. With the consideration of this added threat embedded in women's experiences, Spencer and colleagues (1997) sought to determine the effects of stereotype threat on women's math performance.

Spencer et al. (1997) began their investigation by exploring the trend that women tend to perform worse than men on difficult math tests, but perform equally well on tests

that are easy. Participants included 28 men and women in an introductory psychology class at a large university. In order to account for inherent math abilities and experience, subjects were required to have received a letter grade of "B" or higher in Calculus, as well as a math Scholastic Aptitude Test (SAT) score above the 85th percentile. Additionally, participants were administered a measure designed to evaluate a person's self-schema related to a particular domain. Math performance was operationalized as scores on a 30 minute computerized version of Graduate Record Examination (GRE) math questions. Their findings were consistent with previous literature indicating that women perform equally to men on easy math tasks, but underperform in comparison to men on difficult math tasks.

Spencer and colleagues (1997) further examined the effects of stereotype threat on women's math performance by exploring the causes of the observed differences in women's performance on math tasks in comparison to men based on test difficulty. To test the hypothesis that stereotype threat was in fact the determining factor in the performance differences between men and women on the math test, Spencer and colleagues (1997) designed a follow-up study that removed the gender stereotype relevant for the particular test the subjects participated in. In order to accomplish this task, the examiners employed two conditions in which the test was represented differently. In the stereotype relevant condition, the test was presented as a test that had previously shown gender differences in performance. In the non-stereotype threat condition, participants were told that the test they were taking had consistently shown no difference in gender performance. The aim of presenting the test in this way was to alleviate the stereotype threat of the particular task at hand. That is, the presentation did

not refute the stereotype of gender differences on all math tasks. Rather, it removed the salience of the stereotype for the task at hand, by stating that the particular test they were taking was not subject to the gender stereotype.

Participants were drawn from an introductory psychology class at a large university. The criteria for inclusion (i.e. calculus grade of "B" or higher and SAT math score higher than the 85th percentile) remained the same. Subjects were randomly divided into two groups, and one group was primed with the gender stereotype, while the other was told that no gender differences on the task had been documented. Results of the study indicated that when the test was presented as a test that previously demonstrated gender differences, women significantly underperformed compared to their male counterparts. However, when the test was posed as having no history of gender variation in performance women performed equally as well as men. Results of this study challenge the previously accepted hypothesis that difficult math tests yield gender differences in performance due to an increased detectability of difference at higher difficulty levels. Furthermore, the finding that women's math performance improved when the test was presented as having no gender-based difference is significant. It lends support to the hypothesis that women may be negatively impacted by the gender-based stereotype around performance, rather than an inherent difference in abilities as previously suggested.

Stereotype threat and identity

Both Steele and Aronson (1995) and Spencer and colleagues (1997) documented the harmful effects of stereotype threat on performance in academic areas, further noting that the effects of stereotype threat are present when individuals are identified with the

domain in question. For example, women are subject to the threat of being stereotyped in the domain of mathematics if their performance in mathematics bears some impact on their self-regard and sense of belonging in the area (Spencer et al., 1997). Schmader (2002) sought to further the understanding of the role of identity in the relationship between stereotype threat and performance in women, by examining the role of gender identity as a moderator. In particular, Schmader (2002) explored the extent to which women were identified with the social group under threat (i.e. women), and the role of gender identification in the relationship between stereotype threat and math performance for women. Schmader (2002) suggested that the extent to which women are affected by stereotype threat may vary in relation to the degree they identify with the social identity of "woman." Schmader's (2002) study was grounded in social identity theory, which states that individuals possess both personal identities as well as social identities (Tajfel & Turner, 1986). Social identity theory posits that individuals seek to maintain not only a positive personal identity, but are also driven to maintain a positive sense of social identity (Tajfel & Turner, 1986). Further, individuals' sense of personal identity is threatened when they are viewed unfavorably against others. Social identity theory expands on this concept by outlining the potential effects of between group comparisons on individuals' sense of social identity. Individuals may experience a threat to a social identity when that group is viewed negatively in comparison to another group (Schmader, 2002). Drawing on Steele and Aronson's (1995) study in which priming the social identity under threat (i.e. race) was sufficient to induce stereotype threat, Schmader (2002) argued that social identity is a key component in the conceptualization and understanding of stereotype threat.

Schmader's (2002) study was grounded in previous work on social identity that suggests a given social identity may vary based on the meaning it holds for an individual (Brewer & Silver, 2000). For example, belonging in a group may have a significant impact on one's self-concept for some and not others (Smith & Henry, 1996). In the context of women and the effects of stereotype threat, Schmader (2002) reasoned that there would be differences in the extent to which women identify with the category "women". Thus, the social identity "women" would be a core component of self-identity for some women, and not for others. Further, women who are highly identified with a group may demonstrate a greater effort to maintain a favorable social identity of "woman". This may be particularly evident when a threat is presented to the group for which the individual is highly identified. Similarly, Schmader (2002) hypothesized that individuals who are highly identified with a group would experience a more potent sense of threat when the group is evaluated negatively in comparison to another group. Moreover, women who are highly identified with the group under threat may be more effected by stereotype threat, leading to greater performance decrements in the stereotyped domain.

To test this hypothesis, Schmader's (2002) study consisted of a sample of 65 undergraduate women and men. The criterion for inclusion on the study was a Scholastic Achievement Test (SAT) quantitative score between 500 and 700. The construct of gender identity was measured using an adapted version of the Collective Self-Esteem Scale to assess how gender identity was perceived in relation to self-definition. Items on the scale included "Being a woman/man is unimportant to my sense of what kind of person I am," and "Being a woman/man is an important part of my self image".

Participants responses were averaged to determine a gender identification index. The study consisted of a “gender identity relevant” and a “gender identity not relevant” condition. In the “gender identity relevant” condition, participants were told that their test scores would be assessed as both a reflection of their math ability, as well as a measure of women’s or men’s math abilities as a group. In the “gender identity not relevant” condition, participants were not told that their scores would be used to determine the math skills of men and women as groups. Schmader’s (2002) results were consistent with the hypothesis that women’s performance under stereotype threat conditions would be moderated by the extent to which they identify with the group under threat. Results documented that women underperformed in comparison to men when their social identity was under threat. However, the degree to which their performance was hindered by the threat was moderated by their level of gender identity. Moreover, women who indicated gender identity as a central part of their self-concept were performed worse on the math test than women who did not demonstrate a high level of gender identification.

Schmader’s (2002) study represents an important contribution to the body of stereotype threat research, as it extends the literature to include not only domain-relevance as a factor to explore, but demonstrates the relevance of group identification as a salient factor in the relationship between stereotype threat and performance decrements. However, Schmader’s study conceptualizes gender identification as a construct that is defined by a narrow set of questions that aims to determine how important individuals’ gender is to their sense of self-definition. This single construct is lacking in its

explanatory value, as it does not attempt to understand how individuals conceptualize their gender identity, and how that relates to the meaning it has to their self-definition.

The role of identity in the effects of stereotype threat

While Schmader documented the importance of gender identity in the relationship between stereotype threat and women's math performance, Davies and colleagues (2005) sought to further explore the role of identity and stereotype threat in relation to women's leadership aspirations. Davies et al. (2005) noted that women are stereotyped in the domain of leadership, and may shy away from leadership situations to avoid the stereotype threat associated with leadership roles. Ragins and Sundstrom (1989) explained that women may have a more difficult time than men achieving a position of power due to the barriers created by society. Davies and colleagues (2005) sought to explore the ways in which the stereotype threat associated with women in leadership positions may be alleviated. They hypothesized that creating an "identity safe" environment that challenges the validity and relevance of the negative stereotypes associated with the stigmatized group. Davies and colleagues (2005) explored this possibility by creating "identity safe" and "identity unsafe" situations related to a leadership task. Participants in the gender stereotype condition viewed gender-stereotypic TV commercials intended to trigger the female stereotype. Those in the control condition viewed gender-neutral commercials. After viewing the commercials, participants were given instructions about participation in a leadership task. In the identity safe condition participants were told that their research showed that on this particular task there were no gender differences in leadership or problem-solving abilities. Davies et al. (2005) found that women in both identity safe conditions

(stereotype commercials and gender-neutral commercials) were as likely as men to assume the leadership roles in the task. However, those in the identity unsafe conditions were significantly less likely than men to take on leadership roles in the research task. Their research introduced two important findings to the stereotype threat literature. Firstly, stereotype threat is present for women in the area of leadership aspiration. Secondly, creating identity safe environments may eliminate stereotype threat for women even in the presence of gender stereotype activation.

Rosenthal and Crisp (2006) also explored the role of gender identity in the relationship between women and the effects of stereotype threat in a domain other than mathematics. Rosenthal and Crisp (2006) explored the effects of stereotype threat on career aspirations of women. In particular, these authors were interested in the ways stereotype threat may be eliminated or lessened by blurring intergroup boundaries. Rosenthal and Crisp (2006) stated that central to the concept of categorization is the idea that people self-categorize based on some distinguishing features that are different from another group. The emphasis on distinctions between categories then highlights differences and sets the groundwork for intergroup comparison and evaluation. Rosenthal and Crisp (2006) suggested that reducing the focus on intergroup differences and instead highlighting intergroup overlap may contribute to reduced intergroup evaluation and discrimination. Thus, Rosenthal and Crisp (2006) hypothesized that participating in a task that brings intergroup similarities to the forefront would be a way to reduce stereotype threat.

To examine the possibility that reducing the distinction between the male and female genders may lessen the relevance of gender stereotypes, in turn weakening the

effect of stereotype threat, Rosenthal and Crisp (2006) looked at the areas of career aspirations as well as math performance. In study one, the researchers asked participants to list five characteristics that men and women have in common. In the control group, no such task was included. After completing the task, participants were then given a career survey in which they indicated their career aspirations from a list of eight careers. Participants in the treatment group indicated less preference for stereotypically female careers compared to stereotypically male careers than the control group. To further expand the possible effects of the overlapping task, the authors replicated the study using a math task in place of the career inventory. Their research documented that participants in the overlapping task conditions finished more questions correctly than those in the control condition. Thus, a task that asked participants to highlight between group similarities proved influential in alleviating the effects of stereotype threat on career aspirations as well as math performance.

Based on the literature documenting the harmful effects of stereotype threat on women's math performance, as well as the role of gender identity in that relationship, it is relevant to explore the ways gender identity is constructed and how that impacts the way stereotype threat effects women. Schmader (2002) documented the role that gender identity plays in moderating the relationship between stereotype threat and women's math performance. However, his research does not explore the role that individual constructions of gender identity may factor into the relationship. The research of Rosenthal and Crisp (2006) further supports the need to explore gender identity in terms of associations with in group compared to associations with out group characteristics. Rosenthal and Crisp's (2006) study notes that focusing on group characteristics that are

distinct from another group leads to increased potential for evaluation of one group as superior to another. Thus, women who conform to feminine norms may be self-categorizing in a way that highlights the between group differences, and ultimately the negative evaluation of women associated with it. This, in turn, may lead to increased vulnerability to stereotype threat. The present study seeks to add to the literature by exploring the ways gender identity is constructed and the possible moderating role that plays in the relationship between stereotype threat and math performance for women.

CHAPTER III:
METHODOLOGY

Introduction

This chapter explains the research design and questions examined in the study. It begins with a discussion of the research sample, and continues with an explanation of the predictor and outcome variables. A description of the specific instruments used in the study as well as the rationale for using each is outlined.

Research Questions

*Research Question 1***.** Will women performance worse on a math task under conditions of stereotype threat?

*Research Question 2***.** Will women who conform to gender norms experience greater performance decrements under stereotype threat than their non-conforming counterparts?

Study Design

This study is a Control-Group Posttest-Only Design. The study is a quasi-experimental design that involves one control group (no manipulation of stereotype threat) and one treatment group (manipulation of stereotype threat). Participants were randomly assigned to conditions.

Participants

Participants in this study were 63 female undergraduate students at Northeastern University who received K-12 education in North America. Students from an undergraduate psychology class were asked to participate in the study on a voluntary basis. Participants in this study ranged in age from 18 to 25 years old with a mean age of 19.6 years. 58.7% of participants were in their first year of college, 12.7% second year, 4.8% third year, 22.2% fourth year, and 1.6% fifth year. The racial makeup of

participants was as follows: 85.7% Caucasian, 9.5% African American, 3.2% Asian American, and 1.6% Latino/a. Participants' SAT scores fell between 500 and 700, a range that was identified for use in former stereotype threat studies of women and math performance (Spencer et al., 1999). This range was identified as including a range of scores that indicate sufficient knowledge in the math domain, particularly in relation to the math questions given on the outcome measure of this study.

Instruments

The outcome measure in this study is math performance on a subsection of math questions drawn from the Graduate Record Examination (GRE). The math performance measure consisted of 10 multiple-choice questions derived from practice tests of the quantitative section of the GRE. The questions were chosen based on previous stereotype threat research involving word problems that required advanced algebraic calculations to determine the answer (Schmader, 2002). The reasons for selecting these questions were twofold. Firstly, this study sought to build off the previous work on gender identity as a moderating variable in the relationship between stereotype threat and math performance (Schmader, 2002). Secondly, research in the area of stereotype threat and math performance documents that gender differences in math performance are evident only on tasks that require detailed problem solving (Hyde, Fennema, & Lamon, 1990). Thus, 10 math questions from the GRE that fit these criteria were selected for use as the outcome measure of this study.

Predictor Variable

The predictor variable in this study is the stereotype threat versus non-stereotype threat condition. Based on the research of Spencer et al. (2002), subjects in the non-

stereotype threat, control condition read a statement that women and men have performed equally on previous administrations of the test. Participants in the stereotype threat condition read that the test they were taking has yielded gender differences in the past. The present study defined the predictor variable as participation in the stereotype threat or non-stereotype threat condition.

Moderating Variable

In order to examine the role of gender identity in the relationship between stereotype threat and women's math performance, the present study sought to operationalize gender identity as a set of behaviors that are influenced by context and environment. The instrument used to determine gender identity was the Conformity to Feminine Norms inventory (CFNI) (Mahalik et al., 2006). The CFNI was examined in terms of reliability and validity using a sample of 733 predominanty European American women with an average age of 18.83 years and 98 men with an average age of 18.81 years. Mahalik and colleagues (2006) developed an inventory that addresses feminine gender role identity as conformity to specific cognitions, emotions, and behaviors with the social environment. These culturally-based components are considered "norms", and the extent to which a woman conforms to these socially-constructed norms determines her gender role identity as "feminine" within the context of society (Mahalik et al., 2006).

The CFNI is an 84-item inventory with an 8-factor structure. The 8 factors of the CFNI are: Nice in relationships, Thinness, Modesty, Domestic, Care for Children, Romantic Relationship, Sexual Fidelity, and Invest in Appearance. The coefficient alpha test of internal consistency is .88 for the total CFNI score. Further, for each Femininity Norm subscale the alphas ranged from .77 for Romantic Relationship to .92 for Caring

for Children. The following are the internal consistencies of each factor: Nice in Relationships (.84), Thinness (.90), Modesty (.82), Domestic (.84), Care for Children (.92), Romantic Relationship (.77), Sexual Fidelity (.85), Invest in Appearance (.82).

The CFNI addresses the extent to which women conform to the feminine norms outlined by the inventory. The questions on the inventory reflect women's behaviors, feelings, and thoughts across each of the 8 factors of the inventory. The Nice in Relationships factor seeks to determine the extent to which women develop friendly and supportive relationships with others. Sample items include "It is important to let people know they are special" and "I will be ashamed if someone thought I will be mean." The Thinness factor addresses the extent to which women pursue a thin body ideal. Items include "I am always trying to lose weight" and "I will be happier if I will be thin." The Modesty component of the inventory looks at how much women refrain from calling attention to their talents or abilities. Sample items from this factor include "I always downplay my achievements" and "I feel uncomfortable being singled out for praise." The Domestic factor of the inventory looks at the notion of "maintaining the home." Items in this factor include "I do all of the cleaning, cooking, and decorating where I live" and I enjoy spending time making my living space look nice." The Care for Children factor addresses the norm that women should take care of and be with children. Sample items in this factor include "I will baby-sit for fun" and "Taking care of children is extremely fulfilling." The Romantic Relationship factor addresses the norm that women should invest themselves in romantic relationships. Sample items include "Whether I'm in one or not, romantic relationships are often on my mind" and "I pity people who are single." The Sexual Fidelity factor relates to the norm that women keep

sexual intimacy contained within one committed relationship. Items in this factor include "I will only have sex if I will be in a committed relationship like marriage" and "I will feel guilty if I had a one-night stand." The final factor of the inventory is Invest in Appearance that addresses the extent to which a woman commits resources to maintaining and improving physical appearance. Sample items in this factor include "I never wear make-up (reversed)" or "It is important to look physically attractive in public."

Mahalik and colleagues (2006) assert that the U.S. culture conveys certain expectations of what is considered "feminine." These "feminine" characteristics are expressed as expected behaviors, cognitions, and emotions dictated by society and its culture that are deemed "feminine." The authors refer to this set of expected characteristics as "norms." Mahalik and colleagues (2006) suggest that a woman's femininity is expressed by the extent to which she internalizes and conforms to these cultural norms. Consistent with West and Zimmerman (1991), Mahalik and colleagues' (2006) conceptualization of gender role identity places an emphasis on an individual's interaction with the social environment in determining gendered behavior. Understanding gender role identity as a reflection of the interplay between person and social environment is particularly salient in the examination of stereotype threat. Stereotype threat refers to cues in the social environment about stigmatized groups and the potential impact these stereotypes have on individual behaviors (Steele & Aronson, 1995). Thus, an examination of one's gender role identity as an individual's interaction with an environment that elicits specific culturally dictated behaviors is particularly appropriate within the context of the exploration of stereotype threat.

Procedures

The study took place in a classroom at Northeastern University. Participants were drawn from an undergraduate psychology class, and those who participated were entered into a raffle for a $50 gift certificate to iTunes. A female graduate student explained to all the subjects the purpose of the study and information regarding informed consent. Any students not participating in the study were told they could leave at that point. The experimenter randomly distributed envelopes consisting of the following materials: Informed consent form, demographic information survey, Conformity to Gender Norms Inventory and GRE math questions. Participants were asked to read the informed consent form and sign their names if they agree to participate. Participants were also told that from this point forward they would not be identified by name in the research study. Instead, the number that will be assigned to them will be the way their information will be tracked.

After reading and signing the informed consent, participants were asked to turn to the first page in their packets and read the statement. Half of the participants read a statement indicating that men had performed better than women on the test (stereotype threat condition), and half read a statement indicating that women and men had performed equally well on the test (non-stereotype threat condition). This design mirrored the manipulation used by Spencer et al. (2002) to eliminate stereotype threat. When all participants finished reading the first page, the experimenter asked the subjects to turn the page and begin the math questions. Participants had 10 minutes to complete the math questions, and were asked not to turn the page if they finished early. At the end of the 10 minutes, participants were asked to turn the page and complete the remaining

forms: the CFNI and demographic questionnaire. The experimenter then collected all papers from the participants, and debriefed the subjects on the actual purpose and research that the study will be exploring. Subjects were be informed that they can direct questions to the experimenter or reach the investigators of the study by the information provided on the informed consent form.

CHAPTER IV:
RESULTS

This chapter outlines and discusses the data analysis process and methods as well as the results of this study. The chapter begins with a discussion of the preliminary analyses including the range, mean, and standard deviation of independent and dependent variables as well as the internal consistency reliabilities for the measures used in the study. Next, the primary analyses are reviewed including a discussion of how each of the hypotheses was tested and the ensuing results. Finally, additional findings of the study are outlined.

Preliminary Analyses

Preliminary analyses were conducted to identify the range, mean, and standard deviation of independent and dependent variables. Internal consistency reliabilities were conducted for all instruments used to measure variables. Table one summarizes these statistics.

Gender Identity

The Conformity to Feminine Norms Inventory (CFNI) was used to assess gender identity. Total CFNI score was used as the measure of gender identity in this study. In this sample, scores on the CFNI ranged from 108 to 147 with a mean score of 121 and a standard deviation of 8.52. Internal consistency reliability was 0.87.

Math Performance

A ten-question sample of practice GRE questions was used to measure math performance. The questions were chosen based on previous stereotype threat research involving word problems that required advanced algebraic calculations to determine the answer (Schmader, 2002). In this sample (n=63), scores ranged from 2 to 10 with a

mean of 5.51 and a standard deviation of 1.88. The scores on this test represent a bi-modal distribution with the two modes of 4 and 6. Internal consistency reliability was 0.68.

Hypothesis 1: Stereotype Threat and Math Performance

Hypothesis one proposes that women will perform worse on a math task under conditions of stereotype threat. The independent measure used in this study was stereotype threat condition or non-stereotype condition. In the stereotype threat condition (n=35), the mean for the dependent measure, total correct on the math task, was 5.54 with a standard deviation of 1.99 as compared to a mean of 5.46 and a standard deviation of 1.77 in the non-stereotype threat condition (n=28). SAT math scores for the stereotype threat condition ranged from 500 to 750 with a mean score of 623.43 and a standard deviation of 64.71. In the non-stereotype threat condition, SAT math scores ranged from 500 to 720 with a mean score of 606.79 and a standard deviation of 65.32. In the stereotype threat condition, SAT verbal scores ranged from 500 to 700 with a mean of 612.57 and a standard deviation of 47.54. In the non-stereotype threat condition, SAT verbal scores were in the range of 490 to 770 with a mean of 618.57 and a standard deviation of 68.46. Grade point averages (GPA) ranged from 2.5 to 4.0 with a mean of 3.42 and a standard deviation of 0.39 in the stereotype threat condition while GPAs ranged from 2.5 to 4.0 with a mean of 3.30 and a standard deviation of 0.41 in the non-stereotype threat condition.

An independent-samples *t* test was calculated comparing the mean score on the ten question math task of participants in the stereotype threat condition to the mean score of participants in the non-stereotype threat condition. No significant difference was

found ($t(61) = -0.163$, $p>.05$). The mean of participants in the stereotype threat condition ($m = 5.54$, $sd = 1.99$) was not significantly different from the mean of participants in the non-stereotype threat condition ($m = 5.46$, $sd = 1.78$).

Table 1.
Mean Scores and Standard Deviations for Study Variables

	n	*m*	*sd*
Total Correct			
Stereotype Threat	35	5.54	1.99
Non-Stereotype Threat	28	5.46	1.77
GPA			
Stereotype Threat	35	3.42	0.39
Non-Stereotype Threat	28	3.30	0.41
SAT Math			
Stereotype Threat	35	623.43	64.71
Non-Stereotype Threat	28	606.79	65.32
SAT Verbal			
Stereotype Threat	35	612.57	47.54
Non-Stereotype Threat	28	618.57	68.46
Total CFNI			
Stereotype Threat	35	120.17	8.33
Non-Stereotype Threat	28	121.75	8.83

Hypothesis 2: Conformity to Gender Norms as a Moderator in the Relationship Between Stereotype Threat and Math Performance

Hypothesis two posits that women who are higher conforming to gender norms will experience greater performance decrements under stereotype threat than their non-conforming counterparts. To examine this hypothesis, a test for moderation was conducted. A moderator is a variable that affects the direction and/or strength of the relationship between an independent and dependent variable (Baron & Kenny, 1986). When creating the interaction term, the variables were centered in order to reduce the likelihood of collinearity problems, and the centered variables were used in the interaction term. Next, the dependent variable (math performance) was regressed on the independent variable (stereotype threat condition), the moderator (CFNI score), and the interaction of the moderator and the independent variable (stereotype threat condition X CFNI score). The test for moderation was not significant, as both the predictor variables accounted for 2.0% of the variance in math performance (R^2=.02) and the interaction term accounted for only an additional 0.07% (ΔR^2=.007) which is not a significant difference.

Additional Findings

A Spearman rho correlation coefficient was calculated for: (a) the relationship between subjects' SAT math score and the total number correct on the math task, (b) CFNI score and GPA, SAT math score and GPA, and SAT Verbal score and GPA. Table two displays these findings. A strong positive correlation was found for the relationship between subjects' SAT math score and the total number correct on the math task (*rho*(61)= .543, p <.01), indicating a significant relationship between the two variables.

Subjects with higher SAT math scores tended to answer more questions correctly on the math task. A correlation analysis for the relationship between CFNI score and GPA indicated a negative correlation (*rho* (61) = -.251, $p<.05$) between the two variables. Subjects with higher CFNI scores tended to have lower GPAs. A test for correlation between SAT scores and GPA showed that there is a positive correlation between SAT math score and GPA (*rho* (61) = 0.269, $p<.05$), revealing that subjects with higher SAT scores also have higher GPAs. However, a correlation analysis for the relationship between SAT verbal score and GPA indicated no significant correlation between the two variables (*rho* (61) = 0.032, $p>.05$).

Table 2.
Correlations Among Study Variables

	Total Correct	GPA	CFNI Score	Math SAT	Verbal SAT
Total Correct	____				
GPA	.245	____			
CFNI Score	.136	-.251*	____		
Math SAT	.543**	.269*	.134	____	
Verbal SAT	.141	.032	.025	.126	____

* $p<.05$. ** $p<.01$

CHAPTER V:
DISCUSSION

This study examined the relationship between stereotype threat and women's math performance. Additionally, the study proposed that under conditions of stereotype threat, those who demonstrated a higher level of conformity to gender norms as assessed by the CFNI would be more negatively impact by the effect of the stereotype threat. It was predicted that women with higher CFNI scores would score lower on the math task than their non-conforming counterparts.

The results of this study stand in contrast to previous stereotype threat literature and did not confirm the hypothesis that women under conditions of stereotype threat would underperform on a math task compared to those who were in a non-stereotype threat condition. Instead, this study finds that mathematic ability as measured by SAT-Math is a strong predictor of GRE score and GPA. It is possible that the group of subjects in this study was not highly identified with the domain of mathematics. The relevance of math performance to the subjects' identity may be a key reason that no effect for stereotype threat was found. While most previous research in the area of stereotype threat and women's math performance has involved subjects drawn from undergraduate psychology courses (Steele & Aronson, 1995; Spencer et al., 1997; Schmader, 2002), the issue of the relevance of math performance on sense of identity is called into question. Spencer and colleagues (1997) documented that women are more likely to be affected by stereotype threat based on their identification with the field under threat. Their research found that women who were highly identified with mathematics and therefore felt that acceptance in the field was important to them, were more impacted

by stereotype threat than their non-highly identified counterparts. Spencer and colleagues (1997) acknowledged that any women may experience stereotype threat in the area of mathematics regardless of how identified they are with the field. However, the effects appear to be stronger for those who are highly identified with mathematics.

These findings raise the question of how likely the participants in the present study were to be affected by stereotype threat. While the threat was induced in one condition and removed in another, it is likely that the effects of the threat were impacted by the participants' investment in their performance in mathematics. Given that this study was conducted in a class of psychology students, it is possible that the sample as a whole was not highly-identified with the field of mathematics. If this was the case, it would be a contributing factor to the finding that there was no significant difference in the math performance of stereotype threat group and the non-stereotype threat group in this study.

Further, there may be factors involved in the dependent measure itself that contributed to the finding that there was no significant difference between the stereotype threat and non-stereotype threat group on the math task. In keeping with previous research (Schmader, 2002; Steele and Aronson, 1995; Spencer et al., 1997), this study utilized GRE math questions as the outcome measure of math performance. However, this study consisted of ten math questions that were given in a ten minute period. It may be that the number of items given was too small to be able to provide a reliable and valid assessment of the effects of stereotype threat on math performance. Further, the way the threat was induced in this study may contribute to the lack of significant differences in math performance between the stereotype threat group and the non-stereotype threat

group. This study induced the stereotype threat by having participants read a passage stating either that men had performed better than women on the math task they were taking, or that men and women had performed equally well on the math task they were about to take. This method of stereotype threat manipulation has been utilized in previous research (Spencer et al., 1997). However, other researchers have tested stereotype threat by presenting the purpose of the test in different ways, having subjects indicate their race or gender prior to completing the task, and informing subjects that their test results would be used as representative of all women (Schmader, 2002). It is possible that the way the threat was introduced in this study was not effective based on the group of subjects. Therefore, the threat may not have impacted the subjects in such a way that their test scores would accurately represent the way in which stereotype threat could impact their performance.

Gender Identity as a Moderator in the Relationship Between Stereotype Threat and Women's Math performance

The current study sought to expand the research in the area of stereotype threat by examining the role of gender identity as a moderator in the relationship between stereotype threat and women's math performance. Previous research has documented such a relationship (Schmader 2002), and measured gender identity using an adapted version of the Collective Self-Esteem Scale to assess how gender identity was perceived in relation to self-definition. Items on this scale included "Being a woman/man is unimportant to my sense of what kind of person I am," and "Being a woman/man is an important part of my self image." The present study conceptualized gender identity in accordance with the theory of "doing" gender (West & Zimmerman, 1991). That is, gender does not exist within an individual, rather it occurs through his or her actions

which are elicited by social environments. Based on this conceptualization, the Conformity to Feminine Norms Inventory (CFNI) was utilized a measure of gender identity. The CFNI is a measure that examines the extent to which individuals conform to a set of socially-constructed norms that are elicited by the social environment. The present study found that gender identity, as assessed by the CFNI, did not moderate the relationship between stereotype threat and math performance in women. The findings of the present study (that gender identity does not moderate the relationship between stereotype threat and women's math performance,) stand in contrast with the existing research in this area (Schmader, 2002). Schmader's (2002) study found that women who are more identified with the group "women" were more impacted by stereotype threat than those who were not as identified with the group "women."

One possible explanation that this was not proven in the present study is that the women in the study may not have been highly invested in their math performance. As documented by Spencer and colleagues (1997), women are more likely to be impacted by stereotype threat if they are invested in their performance in the domain of mathematics. Similarly, it is plausible that those who were highly conforming to gender norms may in fact be even less invested in their math performance than those who are less conforming to gender norms. This may be particularly true if high conforming women place a high emphasis on meeting the gender expectations of society that are based around appearance, modesty, and relationships and do not include a focus on academic achievement.

Another possible explanation could be that the induced gender threat was not very effective for this sample.

Conformity to gender norms and GPA

The present study found that CFNI score was not correlated to math performance as measured by the ten GRE mathematic questions. However, further analysis documented a significant relationship between CFNI score and GPA. That is, those who scored higher on the CFNI, indicating higher levels of conformity, had lower GPAs than those who were less conforming to feminine norms. This is a significant finding, as the GPA is a measure that reflects more global academic achievement than the small math test that was given in this study. Thus, although conformity to gender norms was not linked with the specific area of math performance, it is associated with lower overall academic achievement. There are several possible ways to understand this finding. One possibility is that those who demonstrate higher conformity to feminine norms dictated by society may have a lower sense of self-efficacy in academics than those who do not conform to gender norms. This may be related to broader, societal issue of expectations and cultural norms for women that hinder their ability to view themselves as equally capable and efficacious in areas such as academic and career achievement.

In a broader sense, those who demonstrate a higher level of conformity to feminine norms may place less value on and have lower expectations for their academic performance than those are less conforming. An examination of the Conformity to Feminine Norms Inventory, with subscales representing the widely held norms about feminine behaviors and attitudes in our society, reveals a set of expectations in which items regarding academic achievement are conspicuously missing. Instead, the subscales of this measure include: investment in appearance, drive for thinness, caring for children,

niceness in relationships, sexual fidelity, modesty, and romantic relationships. These subscales indicate that women are expected to be focused on appearance, and invested in finding romantic relationships and caring for children. The norms suggest that "femininity" in our society is associated with all of those qualities, perhaps in place of characteristics such as academic achievement and focus on career aspirations. Thus, it is possible that women who are higher conforming to these norms may possess less motivation to achieve in school and less perceived efficacy in the academic domain. It is also worth considering that women who are higher conforming to feminine norms may have adopted different values than those who are less conforming. For example, women who are highly conforming may place more emphasis on the importance of areas represented in the conformity to feminine norms inventory than areas such as academic achievement. While it is impossible to draw conclusions about the factors contributing to the relationship between conformity to feminine norms and grade point average based on the results of this study, further research may explore this relationship further with a focus on possible mediating and moderating variables in this relationship.

Directions for Further Research

One limitation of this study is that it is lacking information about the level of identification with the subject of math for the subjects in the study. This information would be useful in understanding the lack of significant difference in math performance between the stereotype threat and non-stereotype threat group. Future studies may further explore the role of math identification in the effects of stereotype threat on math performance in women. The present study did not find that conformity to gender norms moderated the relationship between stereotype threat and women's math performance.

However, there was a significant negative correlation between conformity to feminine norms and GPA. It is important to note that future research could be directed at further testing this relationship to determine if the results would be replicated under different test conditions. If the finding holds true in future research, it could be valuable to continue exploring this relationship, with a possible focus on mediating and moderating variables that might impact the relationship. For example, an exploration into the values, perceived efficacy, and investment in academic achievement for high conforming women may provide further insight into possible factors impacting the relationship between conformity to gender norms and GPA.

A second limitation of the study is that data was not collected that investigated the participants' individual constructions of gender. From an ecological perspective, it is salient to consider the issue of history in relation to individual constructions of gender identity, as well as the CFNI measure itself. Constructions of gender are not stable across time, and vary based on changes in society and the current gender which are continuously evolving. Similarly, individual constructions of gender vary based on individuals' place in history, their experience of self, and the coordinates affecting them at any given time. Thus, a limitation of this study is that it lacks qualitative data regarding the composition of the sample in relation to the point of view of the respondents and how they interpreted the questions from their own individual standpoints. Additionally, while the CFNI is both a valid and reliable measure, the sample on which it was normed represents the constructs of gender identity as they applied at the time of the measure's construction. Thus, it is relevant to consider the possibility that the feminine norms present in society

have changed over time. Further research may seek to examine and compare the norms that are present in society today to the norms presented in the CFNI.

The historical context of this study is relevant not only in terms of gender norms, but also in relation to the concept of stereotype threat as well as the population involved in the study. The concept of stereotype threat emerged in the 1990s and was influenced by the historical context of that time. It is important to note that stereotype threat is a dynamic concept, and this study looked at the impact of stereotype threat on a population of female college students in 2008. Future research may focus on the conceptualization of stereotype threat as it pertains to the current historical context. An exploration of the way stereotype threat may be redefined within the current historical context may provide insight into new conceptualizations that could be useful for future research.

Drawing on previous stereotype threat research and the present finding that conformity to gender norms is negatively correlated with GPA, it may be relevant to examine the relationship between stereotype threat, conformity to gender norms, and career aspirations. Stereotype threat provides a powerful message in society that men are expected to perform better than women in mathematics. With such a pervasive threat looming in society, it is reasonable to consider the effects this may have on academic and career choices of women. Further, women who are higher conforming to gender norms demonstrate lower GPAs relative to their non-conforming counterparts. Further research may explore this link further and examine the link between conformity to gender norms and career interests and aspirations. If it is indeed true that women who are higher conforming to gender norms hold different values or perceptions of self-efficacy in the area of academic achievement, then it is plausible that career interests and aspirations

may vary from those who are less conforming. The purpose of these future directions of study would be to gain further insight into the ways in which societal expectations of behavior are linked to perceived self-efficacy, values, and career aspirations. This may provide further data about the costs and benefits of conformity to gender norms.

Conclusions

The present study sought to expand the research in the area of stereotype threat by exploring the role of gender identity in the relationship between stereotype threat and math performance. This study operationalized gender identity as a dynamic construct that involves interactions between individuals and their environments. It was hypothesized that women who were higher conforming to the gender norms in society would be more affected by stereotype threat than those who were less conforming to gender norms. The results of this study did not find that math performance varied as a function of conformity to gender norms. However, an important finding emerged, indicating that those who are higher conforming to gender norms have lower GPAs than their less-conforming counterparts. Moreover, on a broad scale assessment of academic achievement, i.e. GPA, higher conformity to gender norms was significantly related to lower GPAs. This finding warrants further exploration in future studies to determine if there is a relationship between conformity to gender norms and academic achievement. Further, if the relationship is indeed supported in future studies, an exploration into the mediating and moderating factors in the relationship would be warranted.

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APPENDIX A

The math questions you are about to complete have previously been given to both men and women as sample questions in preparation for the Graduate Record Examination standardized test. The results from these tests indicate that men perform better than women on the following set of math questions. Please work as quickly and accurately as possible, completing as many questions correctly as you can in the time given.

APPENDIX B

The math questions you are about to complete have previously been given to both men and women as sample questions in preparation for the Graduate Record Examination standardized test. The results from these tests indicate that men and women perform equally well on the following set of math questions. Please work as quickly and accurately as possible, completing as many questions correctly as you can in the time given.

APPENDIX D

BACKGROUND QUESTIONNAIRE

Please answer the following questions to assist in interpreting of the data.
You will not be identified by your responses.

1. Age _____

2. Gender _____

3. Ethnicity
   - O African American
   - O Asian
   - O Hispanic
   - O White-Non Hispanic
   - O Native American
   - O Other_____

4. College Major_____

5. Year in College _____

6. How many undergraduate courses have you had in mathematics?_____
7. What is your GPA? _____
8. What is the highest level math course you have taken at Northeastern University? _____
9. What was your score on the Quantitative (Mathematics) section of the SAT? ____

10. Is English your first language?
    - O Yes
    - O No
11. Did you receive K-12 education in the United States?
    - O Yes
    - O No

APPENDIX E

DEBRIEFING

This study looks at the way messages in society impact performance. In particular, we were examining the phenomenon known as stereotype threat- which says that men perform better in mathematics than women, and how this stereotype impacts performance. Some of you were told that men perform better than women on the math questions you took today. That was not true, in fact these questions have not been tested on any previous subjects. Research actually shows that women perform just as well as men in mathematics. Our research is trying to understand the ways that the stereotype about men being better than women in mathematics impacts women's performance, and how to help to dispel this myth in our society.