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# Gender differences in self-concept consistency and career choices under stereotype threat

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GENDER DIFFERENCES IN SELF-CONCEPT CONSISTENCY AND CAREER  
CHOICES UNDER STEREOTYPE THREAT

An Abstract of a Thesis  
Submitted  
in Partial Fulfillment  
of Requirements for the Degree  
Master of Arts

Asha Ganesan  
University of Northern Iowa  
August 2014

## ABSTRACT

Associating careers with a specific gender can lead to women and men turning away from jobs atypical of their gender (e.g., math-related for women and care-related for men). The effects of stereotype threat, defined as the negative impact associated with the fear of confirming negative stereotypes about one's social group (Steele & Aronson, 1995) on women and men's working self-concept (a dynamic view of oneself) may provide some insight as to whether genderization of careers can affect women and men at the individual level. The current research examined the role played by gender-related stereotype threat cues in self-concept consistency (SCC). One hundred and forty-two college students (80 women) completed a reaction time-based career categorization task in which participants categorized math, care, and neutral jobs as either being related to "me" or "not me." Then, participants received a threatening (i.e., why men (women) are not as successful as in care (math) careers as women (men)) or a non-threatening (i.e., differences in career choices) cue and completed a questionnaire on their identification with domains related to math (e.g., algebra) and care (e.g., taking care of others). Finally, participants completed a second reaction time-based career categorization task, and the Implicit Associations Task (IAT) on their associations between words related to the categories of "self", "others", "math", and "care." Only men showed a significant reduction in the number of gender atypical (i.e., care-related) careers associated with themselves after experiencing the threatening cue, suggesting that men may disassociate themselves from care-related careers once gender-related negative stereotypes about men in those careers are activated. Women remained unaffected by the threatening cue, possibly as a result of

the negative stereotypes about women and math being more prevalent, and thus more generalized rather than cue-dependent. The extent to which men and women identified with math- and care-related careers did not significantly moderate the number of gender atypical careers selected or their reaction times in categorizing these careers. The results aid in understanding how stereotype threat affects both men and women in relation to their self-concept and future career choices, complimenting findings from test-based situations. For future research, the exploration of perception of choice in career-related gender gap may aid in understanding the interaction between gender roles and the social environment, in hopes of encouraging the general population to pursue careers based on skills and abilities rather than gender.

*Keywords: Stereotype threat, working self-concept, gender differences, career choices*

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has been approved as meeting the thesis requirement for the  
Degree of Master of Arts

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## CHAPTER 1

### INTRODUCTION

Gender-based social categorization is a process people engage in almost instantaneously (Habibi & Khurana, 2012). One of the earliest demonstrations of stereotype formation among children is gender stereotypes, as gender is seen as a simple, two-category concept (Mackie, Hamilton, Susskind, & Rosselli, 1996). Gender-based categorization of social information is likely developed during infancy and made salient throughout adulthood (Mackie et al., 1996). The “genderizing” of categories often occurs when a person is faced with information concerning sports (e.g., American football is masculine versus cheerleading is feminine), food (e.g., steak is masculine and a pink cupcake is feminine), and more importantly, jobs (e.g., engineering is for men and nursing is for women). If a particular gender group is associated with a particular job, more positive stereotypes are likely to be associated with persons from that gender engaging in the job (Sakalli-Uğurlu, 2010). The stereotypes of a particular profession help shape the intellectual identity and the subsequent performance in the job (Steele, 1997). Engineering is usually categorized as a masculine job, whereas nursing is usually categorized as a feminine job (Sakalli-Uğurlu, 2010; White & White, 2006). Conversely, both men and women in gender-atypical jobs are in the minority and may experience explicit and implicit negative attributions from their gender-appropriate colleagues (Glick & Fiske, 1999; Sakalli-Uğurlu, 2010).

### Stereotype Threat

One way that these negative attributions can affect a person in a gender atypical job is through stereotype threat. Stereotype threat puts a target person at risk of confirming to negative stereotypes about a group that he or she belongs to (Steele & Aronson, 1995). The person also has to face the subsequent negative consequences associated with the negative stereotypes about his or her group (Steele & Aronson, 1995). Past research has examined this effect primarily with ethnic minorities and women (Taylor & Walton, 2011; Walton & Spencer, 2009), but it can affect any individual who is a minority in social situations (Inzlicht & Bee-Zeev, 2003; Nguyen & Ryan, 2008).

A mere presence of situational cues is sufficient to remind a target of his or her minority status and elicit negative outcomes for the target (Inzlicht & Ben-Zeev, 2003). For example, when women report their gender, with no explicit indication of any test performance-related gender differences, stereotype threat may be activated. Because there is a negative stereotype of women underperforming in math, the activation of gender-related cues can lead to underperformance in testing situations (Schmader, Johns, & Forbes, 2008). Women who report their demographic information (i.e., gender) at the end of a math test are likely to perform better than those who report it prior to the test (Danaher & Crandall, 2008).

The degree to which stereotype threat affects a person varies by the type of cues. A meta-analysis (Nguyen & Ryan, 2008) of different types of activation cues (i.e., blatant, moderately explicit, and subtle) showed subtle-threat cues (e.g., reporting gender in demographics) as producing the largest effect, followed by blatant information (e.g.,

stating the exact negative stereotype to the target) and moderately explicit information (e.g., stating general information on differences between groups). These findings suggest that the threat does not need to be explicit and can be shown in subtle ways, such as implying that gender differences exist or reporting gender prior to taking a test.

Therefore, a woman, as a gender minority in a male-typical profession, is at higher risk of experiencing the negative effects of stereotype threat. Examples of the negative effects range from negative views of one's social identity (Steele, Spencer, & Aronson, 2002) and compromises in working memory capacity (Regner et al., 2010) to self-regulation abilities (Inzlicht, McKay, & Aronson, 2006). Whether men experience stereotype threat in a female-typical profession has received less attention. One aim of the present study is to explore this premise.

The first empirical study to test stereotype threat examined the effects of academic-related stereotype threat among African Americans students (Steele & Aronson, 1995). In this study, African American and Caucasian students took a difficult verbal test presented as either being diagnostic of intellectual ability or not, which served as the manipulation for whether or not participants experienced the risk of confirming the race-based negative stereotype pertaining to African Americans' intellectual abilities. African Americans, as compared to Caucasians, underperformed in the diagnostic condition, but not in the non-diagnostic condition (Steele & Aronson, 1995). These findings provided definitive evidence that underperformance among minority groups goes beyond pure ability-based differences, and that environmental differences, specifically stereotype threat, play a significant role.

The study discussed above set the precedence for more studies on stereotype threat specifically focusing on women in math-related situations, where Spencer, Steele, and Quinn (1999) provided the first empirical published evidence pertaining to the area. Women, usually at risk of being judged as less skilled in math than men, were expected to show detriments in a math test when under threat, similar to African Americans in intellectually diagnostic tests. When women were told that gender differences existed in a difficult math test, they underperformed in the test, compared to men (Spencer et al., 1999). Women taking the easy math test performed just as well as men.

Several studies support the findings of the two studies (Spencer et al., 1999; Steele & Aronson, 1995) discussed above (see Appel & Kronberger, 2012; Nguyen & Ryan, 2008 for reviews). A recent meta-analysis of stereotype threat studies showed women under threat underperformed when compared to women not under threat, with a *d* index of 0.24 (Picho, Rodriguez, & Finnie, 2013). Another meta-analysis (Stoet & Geary, 2012) showed that 30% of experimental studies replicated the original study by Spencer and colleagues (1999).<sup>1</sup> Taken in a wider context, 30% is a large enough percentage to illustrate the importance of more research studying stereotype threat.

There are currently two trends in the stereotype threat research area. One follows a macro-level approach in addressing issues such as gender discrimination within science fields (Moss-Racusin, Dovidio, Brescoll, Graham, & Handelsman, 2012), the biological differences in math and science aptitude (Halpern et al., 2007), and policy implications

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<sup>1</sup> Specifically, only 55% of experimental studies replicated the original results, but following a correction for preexisting mathematical score, only 30% replicated the original study. The percentage is also based on a total of 23 studies based on the following criteria: (1) tested both men and women, (2) used a mathematics test, (3) participants recruited regardless of their prior beliefs and gender stereotypes, (4) random assignment to conditions.

(Inzlicht, Tullett, Legault, & Kang, 2011). The second trend follows a micro-level approach by examining processes within the testing environment and factors affecting, mediating, or moderating the relationship between gender and math performance (see McGlone, 2007; Picho et al., 2013; Schmader, 2010 for reviews). The present study focused on micro-level process of how stereotype threat affects one's self-concept, specifically on whether there are gender differences in implicit and explicit career choices when negative stereotypes pertaining to gender and professions are activated.

Research suggests that stereotype threat negatively impacts cognitive, motivational, and social process. Specifically, stereotype threat affects test performance by compromising working memory performance (Schmader & Johns, 2003), increasing difficulty in learning mathematical operations (Rydell, Rydell, & Boucher, 2010), impairing the ability to formulate problem solving strategies (Quinn & Spencer, 2001), and increasing the frequency of mind wandering (Mzarek et al., 2011). Furthermore, the effects of stereotype threat can spill over to areas unrelated to the source of threat, such as eating habits and risk taking (Inzlicht & Kang, 2010) as well as consistency in one's self-concept through endorsement of math-related careers (Schmader, Croft, & Whitehead, 2013). The extension of the spillover effects to career endorsement is of particular concern in the present study.

Whereas previous literature has addressed the adverse effects of stereotype threat in relation to math performance, the effects of stereotype threat beyond performance measures has received less focus. Long-term exposure to math-related negative stereotypes can turn women off from considering math-related professions (Schmader et

al., 2013). Furthermore, the pre-requisites for competitive natural and social sciences graduate programs usually consist of math-heavy standardized tests. The interaction between the negative stereotypes and the prominence of math in most graduate programs may affect how women view these careers, regardless of whether or not they possess the skills to succeed in them.

In contrast, men with long-term exposure to care- or affect-related negative stereotypes may be less inclined to consider care-related careers such as nurse, elementary school teacher, and social worker. For example, men reminded that women were better at processing affective information made more errors in an affective lexical decision task (Leyens, Desert, Croizet, & Darcis, 2000), thus showing that men were affected by a negative stereotype in a gender atypical environment. The adverse effects of stereotype threat on how men and women view career choices warrants further research. Two models provide the foundation for studying these effects, the integrated process model of stereotype threat and the working self-concept.

#### Integrated Process Model of Stereotype Threat Effects and the Working Self-Concept Integrated Process Model of Stereotype Threat Effects

The integrated process model of stereotype threat effects posits that stereotype threat affects performance via three mechanisms - a physiological stress response (e.g., increased blood pressure, increased cortisol levels), performance regulation and negative cognition, and emotion suppression (Schmader et al., 2008). The model in Figure 1 illustrates how someone under stereotype threat experiences certain physiological responses combined with cognitive and emotional dysfunctions.

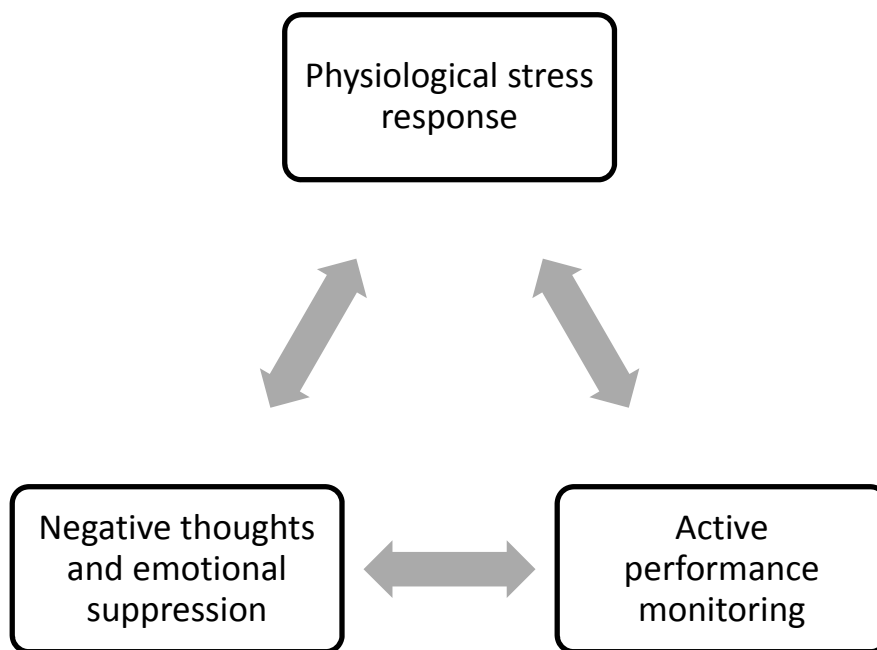


Figure 1. *Integrated Process Model Stereotype Threat Effects* (Schmader et al., 2008)

These responses elicited by stereotype threat add to the cognitive load of the target of the negative stereotype, which affects performance.<sup>2</sup> Studies applying this model show findings similar to that of Schmader and colleagues (2008). When presented negative stereotypes, the coping process requires more energy and effort (Inzlicht, Aronson, Good, & McKay, 2006) as well as more motivation to do well (Jamieson & Harkins, 2007). Subsequently, when failure is presented as an option (and there is already

---

<sup>2</sup> It is worth mentioning that some studies suggest higher cognitive load benefits person perception accuracy (Patterson & Stockbridge, 1998), efficient collaborative learning (Pass & Sweller, 2012), and judgment of others when in a sad mood (Ambady & Gray, 2002). This discussion is beyond the scope of the current research, but shows that the effects of high cognitive load are not always detrimental.

an increased motivation to do well), the targets of the negative stereotype engage in negative thought suppression (Johns, Inzlicht, & Schmader, 2008).

The combination of the responses illustrated in Figure 1, in the face of stereotype threat, can affect a person's view of self (i.e., self-concept). In gender atypical situations, a person's self-view is influenced by the association between the self-concept and the expectation of success or failure in a particular task or job (Skaalvik & Skaalvik, 2004).

The association between self-concept and performance expectations suggests that the domain of measurement (e.g., math) plays a large role in how much of an effect stereotype threat has. Women who identify strongly with the domain of math are more likely to be adversely affected by math-related stereotype threat (Spencer et al., 1999; Steinberg, Okun, & Aiken, 2012). However, the role of domain identification is not clear-cut. Those who have high math ability are more likely to identify with the domain itself (Cullen, Hardison, & Sackett, 2004), which suggests one of two possibilities - the more one likes math, the better one does in math-related outcomes or the better one does in math-related outcomes, the more one likes math.

When one's social membership is activated in a highly identified domain, the pressure to succeed in this domain could compromise the domain-relevant performance (Schmader et al., 2008). For example, a woman who is an engineering major is more likely to experience pressure to succeed in comparison to a man who is an engineering major or a woman who is a fine arts major. Thus, the extent to which social membership is relevant to self-view may affect how a person views him or herself in an environment that activates a negative stereotype about that person's social membership. The shifts or



changes in self-view can have strong effects on major life decisions such as what career one should pursue.

### Working Self-Concept

Self-concept is comprised of three primary facets: cognitive representations of oneself, general views of oneself based on prior social experiences, and multiple identities (Figure 2; Markus & Wurf, 1987). A person's self-concept is considered malleable based on salient social categories (Kawakami et al., 2012). For example, in a gender-based stereotype threat situation, a woman's "female self-concept" is more likely to be activated than her ethnic self-concept.

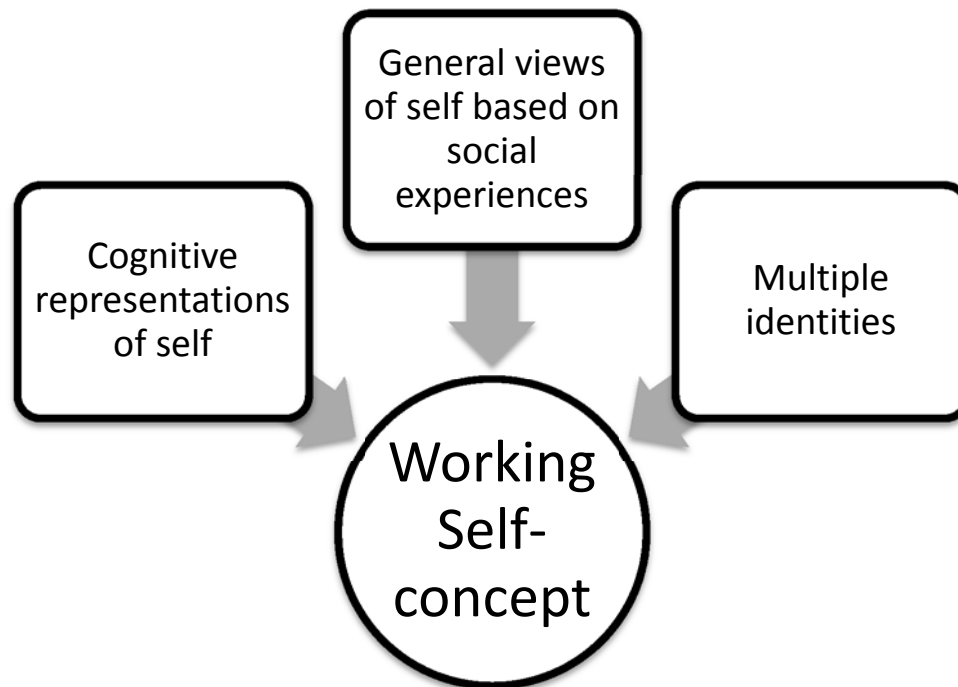


Figure 2. *Working self-concept model (Markus & Wurf, 1987)*

The working self-concept is "...best viewed as a continually active, shifting array of accessible self-knowledge" (Markus & Wurf, 1987, p. 306), as illustrated by the model in Figure 2. For example, Americans travelling overseas are likely to have their "American" identity be more salient and accessible than their "Iowan" identity. However, if they were to travel within the U.S., their "Iowan" identity is more likely to be salient than their "American" identity. These two identities can be distinct from one another. As a person's self-concept is more dynamic than static, making the use of the term "working self-concept" more appropriate than "self-concept" (Markus & Wurf, 1987). Therefore, a working self-concept shifts depending on environmental cues (Kawakami et al., 2012; Schmader et al., 2013). Both men and women have multiple working self-concepts, but which one is prominent at a particular time is dependent on environmental cues (McConnell, Shoda, & Skulborstad, 2012).

Specific working self-concepts are activated based on a person's goals within a particular environment (McConnell et al., 2012). For example, Jane, a math major who likes to exercise, will have her athletic working self-concept activated when she is exercising. However, when Jane is in a math class and her goal is to do well in the class, her math working self-concept is activated. When specific domains are activated, all self-relevant knowledge with regards to that domain is activated and easily accessible (McConnell et al., 2012). The ease of accessibility to ideas and concepts relevant to the present working self-concept is an integral part of its measurement.

The math working self-concept is usually associated with attributes such as being methodical and objective (McConnell, Rydell, & Brown, 2009). Thus, higher cognitive

accessibility to these math-related attributes (in comparison to non-math attributes) can lead to the activation of the math working self-concept (McConnell et al., 2009). Jane's environment (i.e., math class) and goals (i.e., become a statistician) increase the accessibility of a math working self-concept (McConnell et al., 2009) and attributes related to this working self-concept are also more accessible (see Figure 3; adapted from McConnell et al., 2009). Accessibility of attributes is relevant to how the working self-concept is measured.

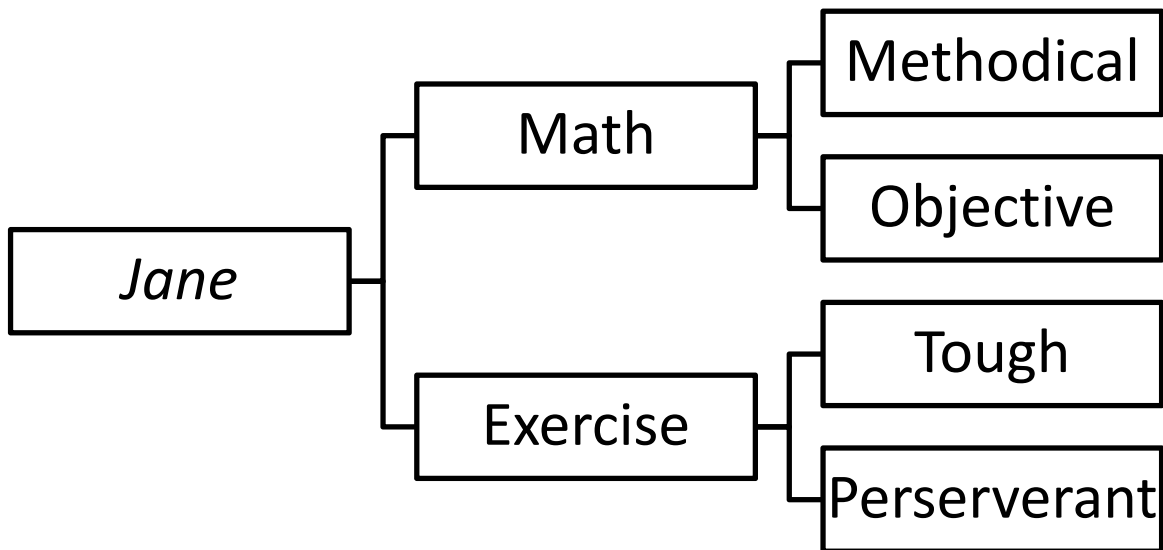


Figure 3. *Working Self-Concept Representation of "Jane"*

#### Measurement of the Working Self-Concept

Previous studies utilized both direct and indirect measurements of the working self-concept (Kawakami et al., 2012; Locke, 2006). Indirect measurements of the

working self-concept are necessary as they are better at showing the shift in the working self-concept produced by environmental cues than self-report measures (Stout, Dasgupta, Hunsinger, & McManus, 2011).

### Self-Report Measurement of Working Self-Concept

Self-report measures of the working self-concept have been primarily used in studies of psychological well-being (Locke, 2006; Sheldon, Ryan, Rawsthorne, & Ilardi, 1997) and cross-cultural studies of self-concept (English & Chen, 2011; Kraus, Chen, & Keltner, 2011). These studies utilize measures consisting of ratings of the extent to which certain attributes (e.g., anxious, dependable, conscientious) are descriptive of the participant across different situations as well as being predictive of psychological well-being. The present study used participants' explicit categorization of math, care, and neutral careers, which participants categorize as "me" or "not me" as a measure of their explicit association with these two categories of careers.

However, contrasting the self-report measure of the working self-concept with the implicit measures of working self-concept is necessary to obtain a comprehensive view of the working self-concept. Accessibility to one's working self-concept is a process that is unconscious, which warrants the use of a reaction time-based measure commonly used to examine automatic associations (McConnell et al., 2012).

### Indirect Measurement of Working Self-Concept

Two indirect measurements of the working self-concept, reaction time-based measurement and the Implicit Associations Test (IAT), are relevant to the present study. The first, reaction time-based measurement, serves as a measure of accessibility of

working self-concepts (Kawakami et al., 2012; Schlegel, Hicks, Arndt, & King, 2009). When environmental cues activate a particular working self-concept, an individual shows faster reaction times to concepts or attributes related to that working self-concept. In past studies, the “me/not me” task has been used to assess the reaction times in associating a specific word to “me” or “not me” (Bargh, McKenna, & Fitzsimons, 2002; Ernsner-Hershfield, Garton, Ballard, Samanez-Larkin, & Knutson, 2009; Schlegel et al., 2009). Similarly, in the present study, heightened accessibility of women’s math working self-concept and men’s care working self-concept was expected to be shown by faster reaction times (thus more automatic responses) in categorizing a particular job as being “me” or “not me.” As the activation of a particular working self-concept is based on environmental cues, the role played by negative or threatening information is relevant.

The second indirect measurement, the IAT, is a measure of automatic associations between categories of concepts (Greenwald, McGhee, & Schwartz, 1998). A faster reaction-timed association between a target category (e.g., male or female) and a specific trait or descriptor is categorized as a stereotype-consistent association (Lane, Banaji, Nosek, & Greenwald, 2007). For example, if a person holds the stereotype that men are better at math, he or she will show faster reactions times when associating the target category “man” with the descriptor “math” in comparison to the descriptor “care.”

Research suggests that the IAT is an effective measure of implicit associations concerning gender and career domain stereotypes. The gender-science stereotype version of IAT has been shown to be reliable and positively correlated with explicit measures of gender stereotypes (see Lane et al., 2007 for review). Similarly, test-retest correlations for

gender-related versions were somewhat satisfactory,  $r = .25$  for gender stereotypes (Dasgupta & Asgari, 2004) and  $r = .68$  for gender self-concept (Greenwald & Farnham, 2000). Generally, the IAT is an adequate measure of implicit attitudes and associations that are not easily measured via self-report measures (Lane et al., 2007). Findings from one IAT study showed both men and women as having stronger associations between the target category “male” with traits or descriptors such as “mathematics,” “career,” or “strong” (Nosek, Banaji, & Greenwald, 2002). Implicit measures of gender stereotypes can potentially overcome the motivational biases and social desirability that come with self-report measures (Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005). Results from past studies suggest that the IAT is a good measure of associations between concepts, but it lacks real world validity (see Blanton & Jaccard, 2006 for review). Thus, the present study included both reaction time and the IAT for a more holistic view of the working self-concept under threat.

#### Stereotype Threat and Working Self-Concept

With regards to stereotype threat, a woman who is in an environment where she is reminded consciously and unconsciously of her math knowledge is likely to have her math working self-concept activated (Markus & Wurf, 1987; McConnell et al., 2012). The role played by the working self-concept is to “reflect important goal pursuit” (McConnell et al., 2012, p.382), which implies that Jane, as a math major, is more likely to have a working self-concept for math rather than performing arts because performing arts does not help in achieving her goal of becoming a statistician. For Jane, a barrier to this goal is the negative stereotype pertaining to women and math (Schmader et al.,

2013). In an environment where this negative stereotype is active, Jane's math working self-concept could become susceptible to the inconsistencies (e.g., underperforming in a math test, or discounting the possibility of a career in math) compared to an environment where the negative stereotype is not prevalent.

As the working self-concept is described as the general state of one's self-concept (Markus & Wurf, 1987), the operational definition of this construct for the purpose of the present study is self-concept consistency (SCC) measured through reaction times to careers that participants categorize as "me" or "not me." When one's working self-concept is relatively consistent across threatening conditions, it is activated automatically (i.e., less time to access information related to the working self-concept). However, if one's working self-concept is inconsistent following activation of threat, then it is likely more time is spent accessing the relevant information, due to the additional compromises resulting from processing and evaluating the threat. Thus, whether a person's working self-concept is relatively consistent across situations can be an indicator of the effects that threatening environments have.

Some previous studies of stereotype threat created a threatening environment by informing women taking a math test that men performed better on that test (e.g., Jamieson & Harkins, 2009; Johnson, Barnard-Brak, Saxon, & Johnson, 2012), but their working self-concept shifts based on reaction time measures were not tested. In one study, women under stereotype threat showed slower reaction times in endorsing math-related careers for themselves, indicative of lower accessibility of their math working self-concept (Schmader et al., 2013). The researchers suggested that faster reaction times

in categorizing math careers as “me” is a result of more automatic working self-concept activation (Schmader et al., 2013). Furthermore, the same study found that reaction times prior to threat activation were not predictive of reaction times after activation (Schmader et al., 2013). These findings suggest that women faced with negative stereotypes pertaining to math, show a lack of self-concept consistency.

#### Gender Differences in Stereotype Threat and Working Self-Concept

Based on the mechanism of stereotype threat, when an environment such as a place of employment is described as being gender-specific, it can affect both men and women. As hypothesized by previous researchers, individuals not exposed to a negative stereotype will have their reaction times, for categorizing gender atypical careers as being related to themselves, prior to threat activation be positively predictive of the number of gender atypical careers explicitly categorized as “me” after threat activation (Schmader et al., 2013). This finding is indicative of a more automatic activation of the working self-concept, unhindered by the threatening environment. However, individuals usually affected by stereotype threat (e.g., women for math) are more likely to have a weaker relationship between their reaction times prior to and after threat activation, which is reflective of less accessibility to the relevant working self-concept, due to the hindrances created by stereotype threat.

#### Men and Stereotype Threat Effects

It is also relevant to study whether men in gender atypical situations experience the negative consequences of stereotype threat. When men are subjected to negative stereotypes about social sensitivity or nonverbal cues processing, they underperform in



tests assessing information processing (Koenig & Eagly, 2005). Whereas stereotype threat is studied more often in women, evidence suggests it affects both men and women depending on the domain of measurement and the saliency of cues. Women underperform in math-related situations, whereas Caucasian men perform worse compared to African American men in a sports-related tasks when they are told the task requires natural sports ability (Stone, Lynch, Sjomeling, & Darley, 1999).

For men, there is a dearth of research looking at the effects of negative stereotypes and performance. Men who request family leave are viewed as being more feminine and weak and less competitive (Rudman & Mescher, in press). The finding further perpetuates the idea that men need to exhibit more masculine traits to be taken seriously in their jobs. While there are studies looking at domains related to men and athletics (Steele & Aronson, 1995) as well as homosexual men in providing childcare (Bosson, Haymovitz, & Pinel, 2004), there are very few that serve as a direct comparison with the stereotype threat literature on women and career choices.

Outside of the stereotype threat literature, one review of research on gender differences in prosocial behaviour raises some important ideas. For prosocial behavior (which is usually associated with care), men and women do not generally differ in their extent of participation (Eagly, 2009). They differ on the type of prosocial behaviour engaged in, where women do more communal and relational tasks, whereas men do more physical and authority-related tasks (Eagly, 2009). Eagly (2009) posits that the differences are primarily based on the interplay between differences in physical abilities and societal differences in gender norms. A definitive empirical test of this premise is

lacking, but studying gender differences in career choices may provide some insight in whether the differences are related to gender-related preferences for certain types of tasks.

### Gender Differences in Career Choices

A person's career choice can be viewed as a reflection of his or her self-concept, as selection of a profession requires evaluation of one's abilities and capabilities as an individual (Schmader et al., 2013). Several studies show that gender biases exist with regards to feminization or masculinization of certain professions. For example, one study using the IAT found participants' reaction times in categorizing *engineer* as a masculine profession were faster in comparison to categorizing it as a feminine profession (White & White, 2006). Faster reaction times were also shown for categorizing *elementary school teacher* as a feminine profession, than a masculine profession (White & White, 2006). This genderization of careers may begin at a young age, as one study showed elementary school students of both genders were more likely to draw a male engineer than a female one, when asked to draw an engineer (Capobianco, Diefes-dux, Mena, & Weller, 2011). For women, implicit gender stereotyping affects their desire to pursue math-related careers, where women who identify highly with their gender and hold strong gender-related stereotypes about math aptitude find math-related careers less desirable (Kiefer & Sekaquaptewa, 2006).

However, similar studies examining gender non-stereotypical careers for men are lacking. When stereotype-threatened men perform childcare-related tasks (reporting sexual orientation served as the prime), heterosexual men in the no-prime condition

appeared more anxious and relatively unskilled in childcare (based on observations of trained judges) than heterosexual men in the sexual orientation prime condition (Bosson et al., 2004). The researchers posited that the effect was attributable to men viewing childcare as a feminine job. Thus, heterosexual men in the no prime condition engaging in childcare-related jobs may have their masculinity or sexual orientation questioned, as they did not report their sexual orientation prior to engaging in the task (Bosson et al., 2004).

Furthermore, the genderizing of certain traits may affect the initial step taken towards one's career, the selection of one's college major. In one study, perspective taking and the desire to help others mediated the relationship between gender and the choice of psychology as a major (Lyons & Harton, 2003). This finding suggests that perspective taking and the desire to help may be viewed as feminine traits and could be one reason why men are less likely to choose psychology, a major usually considered as care-related and has a current trend of women dominating the field (APA Center for Workforce Studies, 2009). Taken together, the findings suggest that one's personal view of gender as well as societal gender norms can potentially impact the career choices of both men and women.

### The Present Study

The present study examined whether the working self-concepts of men and women are affected when they are in an environment where negative stereotypes pertaining to their gender are activated. Women received a math-related threat cue, whereas men received a care-related threat cue. Following either the no threat or threat

activation, participants provided reaction time-based and self-report responses relating to gender typical, atypical, and neutral careers.

The study employed a 2 (time: Time 1 and Time 2) x 3 (career domain: math, care, and neutral) x 2 (type of cues: women-math threat cue and no threat for women; men-care threat cue and no threat for men) mixed factorial design for both men and women. Time and career domain served as the repeated measures factors.

The study had three outcome measures. The first and second measures were obtained from the same task, measured at two time points. For this, participants completed a career categorization task. Their selection of math, care, and neutral careers as being “me” or “not me” was the first outcome measure and the reaction times for categorizing the same careers as “me” or “not me” was the second outcome measure. For the third outcome measure, participants completed an adapted version of the IAT (Greenwald et al., 1998), which served as a measure of implicit associations between the self and certain math- and care-related concepts (discussed further in the Procedure). Participants completed the IAT once, after the cue activation, following the second career categorization task. Additionally, participants’ identification with the domain of math and care was tested as a moderator of the interaction effects.

## Hypotheses

### Hypotheses for Women

Implicit endorsement of math careers. There will be a significant interaction between time, type of cue, and career domain such that women exposed to the women-math threat cue (i.e., “*why women are not as successful as men in math-related careers*”)

will show slower reaction times for math careers after cue activation at Time 2 (i.e., less self-concept consistency) compared to Time 1. Women in the no threat condition are expected to show comparable reaction times for neutral and care careers across Time 1 and Time 2.

Explicit endorsement of math careers. There will be a significant interaction between time, type of cue, and career domain such that women exposed to the women-math threat cue (i.e., “*why women are not as successful as men in math-related careers*”) will categorize fewer math careers as “me” after cue activation at Time 2 (i.e., less self-concept consistency) versus Time 1. Women in the no threat condition are expected to categorize a comparable number of math careers as “me” across Time 1 and Time 2.

The effects of threat on IAT scores for women. Women exposed to the women-math threat cue will make stronger “me-care,” and “other-math” associations (represented by a more positive *D* score) in comparison to women exposed to the no threat cue.

Predicting math-related SCC under threat. Women’s reaction times in categorizing math careers as “me” at Time 1 will be less predictive of the number of math careers categorized as “me” at Time 2 once the women-math threat cue has been activated (i.e., less self-concept consistency across time), but not for the no threat cue condition. The reaction times in Time 1 will be a significant predictor of explicit care and neutral career categorization in Time 2 regardless of type of cue. Math domain identification is expected to interact with type of cue in significantly predicting the number of math careers categorized as “me” at Time 2.

### Hypotheses for Men

Implicit endorsement of care careers. There will be a significant interaction between time, type of cues, and career domain such that men exposed to the men-care threat cue (i.e., “*why men are not as successful as women in care-related careers*”) will show slower reaction times for math careers after cue activation at Time 2 (i.e., less self-concept consistency) compared to Time 1. Men in the no threat condition are expected to show comparable reaction times for neutral and care careers across Time 1 and Time 2.

Explicit endorsement of care careers. There will be a significant interaction between time, type of cue, and career domain such that men exposed to the men-care threat cue (i.e., “*why men are not as successful as women in care-related careers*”) will categorize fewer care careers as “me” after cue activation in Time 2 (i.e., less self-concept consistency) versus Time 1. Men in the no threat condition are expected to categorize a comparable number of care careers as “me” across Time 1 and Time 2.

The effects of threat on IAT scores for men. Men exposed to the men-care threat cue will make stronger “me-math,” and “other-care” associations (represented by a more positive *D* score) in comparison to men exposed to the no threat cue.

Predicting care-related SCC under threat. Men’s reaction times in categorizing care careers as “me” at Time 1 will be less predictive of the number of care careers categorized as “me” in Time 2 once the men-care threat cue has been activated (i.e., less self-concept consistency across time), but not for the no-threat cue condition. The reaction times in Time 1 will be a significant predictor of explicit math and neutral career categorization in Time 2 regardless of type of cue. Care domain identification is expected

to interact with type of cue in significantly predicting the number of care careers categorized as “me” at Time 2.

## CHAPTER 2

### PILOT STUDY

Ten undergraduate and graduate students participated in the pilot study. The participants rated one of two randomized lists of 65 careers (33 on one and 32 on the other) on whether they were “math-related,” “care-related,” or “neutral.” The list of 65 careers was adapted from a long list of careers from the Current Population Survey on employment detailed by occupation and sex (Bureau of Labor Statistics, 2012). The researcher chose the careers based on the following criteria (1) percentage men and women in the career and (2) whether or not the career is likely known to undergraduate students (e.g., excluding masonry engineer). Participants also rated whether they thought there are more men or women in each of the careers. The pilot test participants also rated concepts as either being “math-related” or “care-related” for the purpose of the IAT (see Appendix B for complete list of words). Participants also provided verbal and written feedback on the appropriateness of career names as well as additional careers for inclusion. The verbal and written feedback also included some suggestions for careers to be added in the final task. The suggestions were discussed with the participants. The whole session took approximately 15 minutes.

The information from the pilot study aided in creating the final list of 63 careers used in the final career categorization tasks. Some careers were excluded and replaced by other careers as suggested by pilot study participants.



## CHAPTER 3

### METHOD

#### Power Analysis

The power analysis for a factorial ANOVA used a medium effect size,  $f = .25$ , as recommended by Cohen (1988). The power analysis for a moderated regression used the lowest sensitivity estimate ( $\beta = .25$ ) from the original study by Schmader and colleagues (2013). For both the factorial ANOVA and moderated regression, power of .95 would require an estimated sample size of 120 participants.

#### Participants

One hundred and seventy-six undergraduate psychology students (79 men and 97 women) from an introductory psychology course at a Midwestern university participated in the study in exchange for research credit. From the 177, viable data from 62 men and 80 women were analyzed. Data from 17 men and 16 women were excluded as they did not complete the career categorization tasks at either Time 1 or Time 2 or both. Thus, the missing data are primarily attributable to issues with instrumentation and potentially, a lack of clarity in the instructions.<sup>3</sup> One additional female participant received the instructions relevant for men in the threatening condition, and her data were excluded.

Participants' age averaged 18.96 years ( $SD = 1.73$ ). Of the 142 participants whose data were included in the analysis, 133 identified as Caucasian, 1 as African American, 3 as Hispanic or Latino, and 2 as mixed ethnicity. Due to the lack of consistent cross-

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<sup>3</sup> Examination of these participants' open-ended responses showed the following: (1) participants had read the threat/no threat cue instructions and had recalled them accurately, (2) they had responded to the self-report measures appropriately.

cultural effects of stereotype threat (e.g., Stoet & Geary, 2012), participation was limited to those who completed their high school education in the U.S. Three participants did not report their academic background, but reported themselves as being U.S. citizens. Thus, all 142 participants fulfilled this criterion.

A chi-square goodness-of-fit test comparing gender differences by majors, where majors were categorized as STEM-related and care-related (minors were used a substitute for “undecided”), showed significant differences,  $\chi^2(1, N = 97) = 8.97, p = .003$ . Similarly, a 2 x 4 chi-square goodness-of-fit test comparing gender and four categories of college majors (STEM, care, undecided, and other) showed significant deviations between the observed and expected frequencies,  $\chi^2(3, N = 138) = 15.70, p = .0013$ . Both of these tests showed significant deviations in declaring care-related careers as majors, where more women ( $n = 31$ ) declared care-related majors than men ( $n = 7$ ). The number of STEM-related majors across men ( $n = 30$ ) and women ( $n = 29$ ) was comparable. Table 1 summarizes the descriptives for all four categories of majors.

Table 1

*Number of men and women by majors*

Gender	Majors	<i>n</i>
Male	STEM	30
	Care	7
	Undecided	13
	Other	10
Female	STEM	29
	Care	31
	Undecided	14
	Other	4

### Measures

#### Career Categorization Task

Participants categorized a list of 63 different careers (based on the pilot test) consisting of an equal number of randomly presented math-related (e.g., physicist, computer engineer, mathematician), care-related (e.g., social worker, nurse, hospice caretaker), and neutral (e.g., editor, cook, reporter) careers, as “me” or “not me” (see Appendix A for list of careers). Participants pressed one keyboard key for “me” (*q*) and one for “not me” (*p*), respectively. The program recorded their response as well as their reaction times to the careers. Participants completed this task twice, once before and after the stereotype cue activation.

## IAT

The IAT examined the strength of associations between the self and concepts related to math and care (see Appendix B for list of categories and concepts). Participants read six concepts related to math (e.g., methodical, precise) and care (e.g., nurturing, affectionate), as well as four self-related concepts (e.g., I, me, myself, and mine) and other-related concepts (e.g., they, them, their, and other). Participants categorized the concepts as belonging to one of two paired categories.

The procedures followed standard IAT protocol. Following two practice blocks, participants completed two critical blocks of 60 trials each, with the orders of the category pairs counterbalanced. For the first critical block, participants used the *q* key when categorizing self and math concepts and the *p* key when categorizing other and care concepts. In the second critical block, the program reversed keys. The version of the IAT used in the present study is a variant of the original version (see Greenwald, Nosek, & Banaji, 2003 for further discussion), in which participants must provide the correct response prior to proceeding. Participants completed the IAT once, after cue activation and the second career categorization task.

## Domain Identification Measure

To assess the importance of the domains of math and care to the participants, participants completed a self-report measure of expertise across several domains such as auto mechanics, counselling, and calculus (adapted from Graziano, Jensen-Campbell, Shebilske & Lundgren, 1993; see Appendix C). Other domains were included to avoid raising participants' suspicions about the proposed study. Participants rated how good

they considered themselves to be on each domain on a 10-point Likert scale (1 = *not at all good*, 10 = *very good*). The questionnaire consisted of a wide range of domains, including several neutral items. The two sub-scales relevant to the current study, the math and care sub-scales indicated an appropriate standardized Cronbach's alpha of .74 for the math domain and .70 for care domain identification when examined separately. Each sub-scale consisted of four items.

#### Gender and Careers Questionnaire

Participants indicated how masculine and feminine the careers of interest in the present study were (adapted from Leyens et al., 2000; see Appendix F). In this section, they answered the following question: "*How feminine or masculine would you categorize the following careers as?*" (1 = *Masculine*, 7 = *Feminine*). They also completed a questionnaire on gender-related career expertise: "*In your opinion, are men or women better at the following tasks?*" (1 = *Men are better*, 7 = *Women are better*). For this scale, the items from the domain identification questionnaire served as the expertise items.

#### Post Study Questionnaire

Participants reported their gender, ethnicity, sexual orientation, and age as well as their major and minor at the end of the study, to prevent any subtle effects of stereotype threat cues on the outcome measures (see Appendix D). This questionnaire also probed participants' suspicion on the true purpose of the study by asking participants to respond to open-ended questions on what they thought the true purpose of the study was, whether they had heard of the study before, and if they had participated in a similar study.

### Procedure

Participants signed up for the study via the SONA system. The recruitment notice stated that the study would be a 30 minute session on differences in career choices. The study utilized Qualtrics research software for implementation. For all sessions, participants attended in mixed gender groups of 12. Upon arrival, each participant was randomly assigned to a computer. Then, they provided informed consent (see Appendix E), and began the study on the computer upon the experimenter's instructions (i.e., "*The purpose of this study is to examine differences in career choices. You will begin with a career categorization task, followed by a short questionnaire of your interests*").<sup>4</sup>

First, participants completed the career categorization task for the first time (Time 1). They categorized the list of 63 careers as "me" or "not me," and had their reaction times in selecting the careers recorded. Then, participants completed the domain identification questionnaire.

Participants received instructions for one of two randomly assigned conditions (one "threat" condition and one "no threat" condition). For women, 41 experienced the no threat cue, whereas 39 experienced the women-math threat cue. For men, both cue conditions had 31 participants.

Women in the threat condition read the "woman-math threat" instructions: "*As a second part of the study, you will complete a series of questionnaires assessing different factors in future career choices, in addition to a few questions assessing your abilities in certain domains. The purpose of this section of the study is to understand why women are*

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<sup>4</sup> See Appendix H for full instructions and study protocol.

*not as successful as men in math-related careers.*” Men in the threat condition read the “men-care threat” instructions: *“As a second part of the study, you will complete a series of questionnaires assessing different factors in future career choices, in addition to a few questions assessing your abilities in certain domains. The purpose of this section of the study is to understand why men are not as successful as women in care-related careers.”*

Both women and men in the no threat condition read the following instructions: *“As a second part of the study, you will complete a series of questionnaires assessing different factors in future career choices, in addition to a few questions assessing your abilities in certain domains.”*

Then, participants completed the second career categorization task and responded to an open-ended question asking them to recall the instructions (i.e., the threat or no threat cue) they had been provided with earlier. Next, they completed the IAT. Following this, participants rated each of the careers in the careers categorization task on whether a man or woman would be better suited for the career. This served as general measure of whether participants viewed certain careers as being gender-specific. Finally, they completed the gender and careers questionnaire and the post study questionnaire, after which the computer presented them with the debriefing of the true purpose of the study (see Appendix G). A protocol of the study is provided in Appendix H.

## CHAPTER 4

### RESULTS

#### Data Management

##### Manipulation Checks

Type of cue. A manipulation check for the type of cue manipulation showed that the manipulation was effective. First, a 2 x 2 independent ANOVA of the time spent reading the instructions showed no significant main or interaction effects across gender and type of cues,  $F(1, 138) = 389.72, p = .085, \eta_G^2 = .005$ . Thus, this reduces the possibility that any significant effect may have been a result of structural differences of the cue (e.g., the length of cue).

Second, a content analysis of open-ended responses to an instruction recall question showed that in the threat cue condition, 70% of men and 72% of women recalled gender-related terms in relation to careers in the threat cue condition (e.g., “men,” “women”). For men, 10% in the threat cue condition responded using self-related terms (e.g., “to see what I am good at”), indicating that these participants viewed the threat cue as being a comparative to another group. Women did not show a similar trend by responding in self-related terms in the threat cue condition. Also, 14% of women in the threat cue condition did not mention any gender-related terms in their responses. In the no threat cue condition, 95% of men and 84% of women said that the purpose of the study was examining “differences in career choices” or “comparisons of career choices.”<sup>5</sup>

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<sup>5</sup> The remaining percentages were for no responses as well as for no recollection of instructions for the threat cue (Men = 20%, Women = 28%) and for the no threat cue (Men = 5%, Women = 16%) conditions.



Type of careers. An additional manipulation check examined whether participants saw math and care-related careers as masculine or feminine through a one sample *t*-test.<sup>6</sup> Participants viewed math careers ( $M = 43.47$ ,  $SD = 10.30$ ) as being more masculine than neutral,  $t(127) = -22.545$ ,  $p < .001$ . Participants also viewed care careers being more feminine ( $M = 65.71$ ,  $SD = 7.42$ ) than neutral,  $t(132) = 21.322$ ,  $p < .001$ .

### Reaction Time

The reaction times from the career categorization task served as the implicit measure of self-concept consistency. Reaction times shorter than 300 milliseconds (msec) or longer than three standard deviations above the mean were removed for the final analysis (Bargh & Chartrand, 2000). Following this, the distribution of the deleted reaction times across conditions was determined. This particular procedure examined whether a disproportionate number of the deleted times fell in one particular condition, which would be indicative of systematic errors within that condition (Bargh & Chartrand, 2000), and no such indication was found.

A second issue pertaining to reaction time data management is the high possibility of a positive skew in the distribution of the data (Bargh & Chartrand, 2000). To counteract this, the data were transformed using the natural logarithm to normalize the distribution (Bargh & Chartrand, 2000).

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<sup>6</sup> For math careers, participants rated a total of 16 careers on a 7-point scale. The mid-point of the scale was used as neutral, thus the mean was compared against the mean score that participants would obtain if they saw math careers as being neutral ( $M = 64$ ). Similarly, for the 13 care careers were rated on a 7-point scale and the mean for comparison was 52.

## IAT

The computation of the IAT scores followed the procedures recommended by Greenwald, Nosek, and Banaji (2003). The computation sequence follows: (1) deletion of trials greater than 10,000 msec, (2) deletion of data from participants who had more than 10% of trials with latency less than 300 msec, and (3) calculation of *D* score. The *D* score is the equal-weight average of ratios resulting from two mean differences calculated for the critical blocks, which are all the trials in Stages 3, 4, 6, and 7 (Lane et al., 2007).<sup>7</sup>

The present study showed an overall high rate of missing data of approximately 9%. Due to the lack of validity studies in IAT administration via Qualtrics, it is difficult to determine whether the data were missing at random. The pilot study showed no indication of a large amount of missing data, thus pointing to a possible technical issue with the implementation of the study to a larger group of participants. For women, 69 of the 80 participants had sufficient data to compute the *D* score. For men, 54 of the 62 participants had sufficient IAT data for *D* score computation.

### Special Case of Missing Data

A large percentage of women and men had not categorized any math and care careers respectively, as being “me.” Thirty-nine (49%) women at Time 1 and 4 (5%) women at Time 2 did not categorize any math careers as being “me.” For care (Time 1:

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<sup>7</sup> The following is the step-by-step procedure for *D* score calculation as recommended by Lane and colleagues (2007): (1) Computation of inclusive standard deviation for all trials in Stage 3 and 6 as well as for trials in Stages 4 and 7; (2) Computation of mean latency for correct responses for Stages 3, 4, 6, and 7; (3) The incorrect response are replaced with the stage mean as well as a penalty, either as “Stage mean + 600msec” (the computation used in the present study) or “Stage mean + twice the *SD* of correct responses for that stage; (4) Computation of two mean differences between Stages 6 and 3 and Stages 7 and 4; (5) Each of the mean differences is divided by the relevant inclusive standard deviation, which resulted in the *D* score.

6%; Time 2: 10%) and neutral careers (Time 1: 0%; Time 2: 5%) among women, the loss of data was not as severe. For care career reaction times, 27 (44%) men at Time 1 and 32 (52%) men at Time 2 did not categorize any care careers as being “me.” This loss of data was not as severe for the math (Time 1: 15%; Time 2: 5%) and neutral (Time 1: 0%; Time 2: 10%) careers for men.

The implications of this data loss are twofold. First, the degrees of freedom (both for men and women) are low in comparison to the total sample size for the mixed ANOVA analysis for implicit endorsement of careers as the no selection of math careers by women and care careers by men is treated as missing data. Similarly, the degrees of freedom for the moderated regression analyses will be lower than expected, in comparison to degrees of freedom in previous research. Upon examination of the degrees of freedom of the Schmader and colleagues (2013) study (specifically Study 2), their degrees of freedom appeared to be lower as well, from a total of 49 participants to degrees of freedom of 31 and 38 for the two-way interactions’ in the mixed ANOVA analyses. The researchers explicitly mention the exclusion of six participants from their final analyses, but there was no mention of the loss to degrees of freedom in the research article.

Second, the interpretation of the majority of the present study’s findings invariably excludes participants who may have been affected by the type of cue, but they simply did not see themselves in any math or care careers begin with. This is possibly due to disengagement or disinterest, based on prior experiences, the implications of

which will be addressed in the discussion section of this paper. However, when interpreting the results, the loss of these participants should be considered.

### Statistical Analyses

#### Descriptive Analyses and Assumptions Testing

First, data analysis consisted of testing the assumptions for conducting a mixed factorial ANOVA and multiple regression. For the mixed factorial ANOVA, the examination involved appropriate normality, homogeneity of variances, sphericity for repeated measures factor and assumption of equality of covariance matrices (using Box's  $M$  statistic). For the moderated regression, assumptions testing consisted of tests of normality, multicollinearity, homoscedasticity and uncorrelated errors.

Assumptions for mixed factorial ANOVA. The log transformed and the standardized residuals for the log transformed reaction times showed acceptable levels of normality graphically. However, there was a negatively skewed distribution for the number of math, care, and neutral careers, which is expected as the explicit categorization of careers as “me” falls in a restricted range (i.e., participants can only categorize up to 21 careers for each career domain). The Levene's test of homogeneity of variances was satisfied for both men and women, across all outcome measures ( $p$ s ranging from .214 to .932).

Mauchly's test of sphericity was satisfied for men,  $\chi^2(2) = 3.60, p = .165$ , but not for women  $\chi^2(2) = 35.96, p = .000$ , for the implicit career categorization measure. For women, the examination of the Greenhouse-Geisser epsilon,  $\epsilon = .605$ , showed that the sphericity violation was not severe. Thus, for women, the Greenhouse-Geisser correction

served as the basis for the inferential statistics for the implicit career categorization outcome. The test of sphericity for the explicit career categorization measure was satisfied for both men  $\chi^2(2) = 1.575, p = .455$ , and women,  $\chi^2(2) = 3.893, p = .143$ . Next, the assumption of equality of covariance matrices was satisfied for both men [Box's  $M(21, 1356) = 34.27, F = 1.08, p = .36$ ] and women [Box's  $M(21, 4242) = 55.85, F = 2.16, p = .002$ ] for the implicit career categorization measure. The same assumption was satisfied for both men [Box's  $M(21, 6367) = 43.01, F = 1.73, p = .02$ ]<sup>8</sup> and women [Box's  $M(21, 14942) = 28.91, F = 1.24, p = .21$ ], with the explicit career categorization measure.

Assumptions for moderated regression. The outcomes measures showed acceptable levels of normality (as discussed above). The variance inflation factor (VIF) served as the test for multicollinearity. For both men and women, VIF was below 5, which satisfied the assumption. For the test of homoscedasticity of the data, the Breusch-Pagan test indicated that the null hypothesis of homoscedasticity was not rejected for both men ( $p = .48$ ) and women ( $p = .35$ ).<sup>9</sup>

### Plan of Analysis

The analysis examined two main models. The first model utilized a mixed factorial ANOVA, which examined the interaction effects of the independent variables on

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<sup>8</sup> As Box's  $M$  is a highly sensitive test, the recommended significance level is .001 or less (Hair, Anderson, Tatham, & Black, 1998).

<sup>9</sup> The following is the step-by-step procedure for computing the Breusch-Pagan test (Breusch & Pagan, 1979) for homoscedasticity: (1) Unstandardized residuals of the moderated regression model is squared [a]; (2) The sum of squared residuals is computed [b]; (3) The square residual is divided by the sum of the squared residuals, which is divided by the number of observations [a/(b/N)]; (4) The result of (3) is regressed against the predicted values; (5) The resulting sum of squares of this regression (SS\_Regress) is used to calculate the Breusch-Pagan test score,  $B = \frac{1}{2} (SS\_Regress)$ ; (6) The  $p$ -value is associated with a chi-square distribution ( $df=1$ ) is computed.

the dependent variables, to illustrate the effects of stereotype threat cue, career choices, and time on reaction times and explicit career categorization. The analysis necessitated two separate mixed factorial ANOVA models for men and women as a mixed factorial ANOVA model larger than three independent variables poses some difficulty in interpreting the interactions (Box, Hunter, & Hunter, 2005). An independent *t*-test examined the effects of type of cues on the score obtained from the IAT (measured only once). For computation of the effect size statistic for mixed designs, the generalized eta squared ( $\eta_G^2$ ) was utilized. Several researchers recommend  $\eta_G^2$  as it is a more conservative and comparable estimate of effect size than the eta squared ( $\eta^2$ ) and the partial eta squared ( $\eta_p^2$ ), especially in mixed designs (Bakeman, 2005; Lakens, 2013; Olejnik & Algina, 2003).

The second model utilized multiple regression analyses for men and women separately, to examine self-concept consistency across Time 1 and 2 through the predictive value of the reaction times. The regression model also examined whether the type of cue, explicit career endorsement, and domain identification predicted implicit career endorsement for both men and women. Prior to these analyses, all continuous variables were centered.

#### Analyses for Women

Implicit endorsement of math careers. First, a three-way interaction between the independent variables of time, career domain, and type of cues was expected to affect the reaction time of categorizing math careers as “me” in Time 1 versus Time 2. The mixed

model was not statistically significant,  $F(1.210, 42.355) = .043, p = .879, \eta_G^2 < .001$ , as there was no three-way interaction between the factors (see Figure 4).

There was a significant two-way interaction between time and career domain,  $F(1.210, 42.355) = 4.045, p = .043, \eta_G^2 = .041$ . The first contrast analysis, comparing across Time 1 and Time 2 (weighted against reaction times for neutral careers), showed that there were no significant differences in math career reaction times ( $p = .194$ ). The second contrast analysis, comparing across Time 1 and Time 2 (weighted against reaction times for neutral careers), showed significant differences in care career reaction times ( $p = .016$ ). Table 2 provides the descriptives for this analysis.

Table 2

*Descriptives for reaction times (log transformed) across career domains and time for women*

Time	Career Domain	Mean [95% CI]	Std. Error
1	Math	3.10 [3.06, 3.16]	.02
	Care	3.05 [3.02, 3.08]	.02
	Neutral	2.32 [2.28, 2.36]	.02
2	Math	2.98 [2.94, 3.02]	.02
	Care	2.99 [2.96, 3.03]	.01
	Neutral	2.09 [1.93, 2.24]	.08

The other two-way interactions were not statistically significant. The type of cue and time did not significantly interact to affect implicit endorsement of careers,  $F(1, 35) = .280, p = .600, \eta_G^2 = .001$ . Similarly, the type of cue and career domains did not significantly interact to affect implicit endorsement of careers,  $F(1.24, 43.44) = .121, p = .783, \eta_G^2 = .592$ . The main effect of time, as expected, showed statistical significance,  $F(1, 35) = 35.722, p < .001, \eta_G^2 = .128$ . Overall, women showed faster reaction times in Time 2 ( $M = 2.69$ ) versus Time 1 ( $M = 2.83$ ). The main effect of career domains did attain statistical significance,  $F(1.24, 46.44) = 403.65, p < .001, \eta_G^2 = .823$ . Women showed faster reaction times for neutral careers ( $M = 2.20$ ) than math ( $M = 3.04$ ) and care ( $M = 3.02$ ) careers. The main effect of type of cue [ $F(1, 35) = .276, p = .603, \eta_G^2 < .001$ ] did not attain statistical significance. Table 3 and 4 summarize these findings, while Figure 4 graphically represents the three-way interaction.<sup>10</sup>

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<sup>10</sup> Weighted contrast analysis using Bonferroni's adjustment on career domains for Time 1 showed significant reaction time differences between math and neutral careers ( $p = .026$ ), care and neutral careers ( $p < .001$ ), and math and care careers ( $p < .001$ ). Similar significant differences were found for career domains in Time 2, between math and neutral ( $p = .001$ ), care and neutral ( $p < .001$ ), and math and care ( $p < .001$ ). This contrast does not include participants who chose none of the individual careers as being "me."



Table 3

*Mixed ANOVA for implicit endorsement of careers for women*

Effects	<i>MS</i>	<i>df</i>	<i>F</i>	<i>p</i>	$\eta_G^2$
Time	1.066	1	35.722	<.001	.128
Time * Cue	.008	1	.280	.600	.001
Domain	27.204	1.241	403.648	<.001	.823
Domain * Cue	.008	1.241	.121	.783	.592
Time * Domain	.258	1.210	4.045	.043	.041
Time * Domain * Cue	.003	1.210	.043	.879	<.001
Error	.064	42.355			

Note: All statistics are from the Greenhouse-Geisser correction.

Table 4

*Between subjects main effect of type of cue for implicit endorsement of careers for women*

Effect	<i>MS</i>	<i>df</i>	<i>F</i>	<i>p</i>	$\eta_G^2$
Type of cue	.005	1	.276	.603	<.001
Error	.582	35			

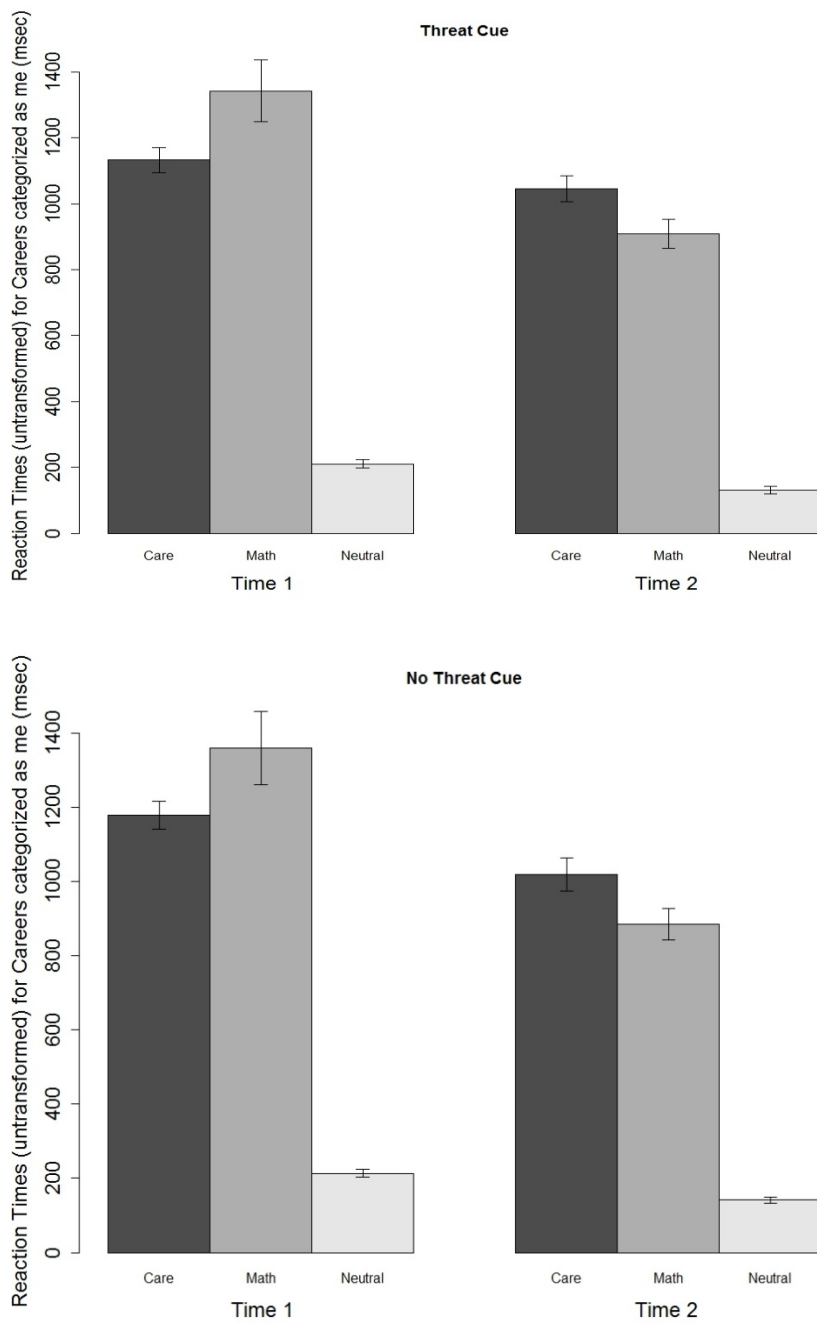


Figure 4. *The interaction of time, domain, and type of cue on reaction times for careers categorized as “me” for women*

Explicit endorsement of math careers. Next, a mixed factorial ANOVA with the number of careers within each domain categorized as “me” in Time 1 versus Time 2 as the outcome variable showed no significant three-way interaction,  $F(2, 128) = .132, p = .877, \eta_G^2 < .001$ . Figure 5 shows the three-way interaction. Similarly, the two-way interactions of type of cue and time [ $F(1, 64) = .286, p = .594, \eta_G^2 < .001$ ], type of cue and career domain [ $F(2, 128) = .822, p = .442, \eta_G^2 = .04$ ], and time and career domain [ $F(2, 128) = 1.277, p = .282, \eta_G^2 < .001$ ] did not attain statistical significance.

There was a significant main effect of career domain,  $F(2, 128) = 447.784, p < .001, \eta_G^2 = .26$ . Women categorized more care ( $M = 4.35$ ) and neutral ( $M = 4.64$ ) careers than math careers ( $M = 1.33$ ) as “me” (see Table 5 for descriptives and Table 6 for ANOVA results). The main effects of time [ $F(1, 64) = .082, p = .776, \eta_G^2 < .001$ ] and type of cue [ $F(1, 64) = .020, p = .887, \eta_G^2 < .001$ ] did not attain statistical significance (see Table 7).<sup>11</sup> Figure 5 graphically represents the three-way interaction.

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<sup>11</sup> Weighted contrast analysis using Bonferroni’s adjustment on career domains for Time 1 showed significant number of careers differences between math and care careers ( $p < .001$ ), care and neutral careers ( $p < .001$ ), but not math and neutral careers ( $p = .620$ ). Similar significant differences were found for career domains in Time 2, between math and neutral ( $p < .001$ ), care and neutral ( $p < .001$ ), and math and care ( $p < .001$ ) careers. This contrast does not include participants who chose none of the individual careers as being “me.”

Table 5

*Descriptives for number of careers categorized as “me” across career domains and time for women*

Time	Career Domain	Mean [95% CI]	Std. Error
1	Math	1.44 [.96, 1.92]	.24
	Care	4.64 [4.03, 5.26]	.21
	Neutral	4.29 [3.55, 5.04]	.37
2	Math	1.21 [.79, 1.64]	.21
	Care	4.69 [3.98, 5.40]	.35
	Neutral	4.40 [3.63, 5.16]	.38

Table 6

*Mixed ANOVA for explicit endorsement of careers for women*

Effects	<sup>1</sup> MS	df	F	p	Greenhouse-Geisser	$\eta^2_G$
Time	.056	1	.082	.776	.56	< .001
Time * Cue	.198	1	.286	.594	.286	< .001
Domain	447.784	2	42.599	<.001	42.599	.26
Domain * Cue	8.643	2	.822	.442	.822	.04
Time * Domain	1.025	2	1.277	.282	1.277	< .001
Time * Domain * Cue	.106	2	.132	.877	.865	< .001
Error	.802	128				

<sup>1</sup>MS for sphericity assumed

Table 7

*Between subjects main effect of type of cue for explicit endorsement of careers for women*

Effect	<i>MS</i>	<i>df</i>	<i>F</i>	<i>p</i>	$\eta_G^2$
Type of cue	.342	1	.020	.887	< .001
Error	16.891	64			

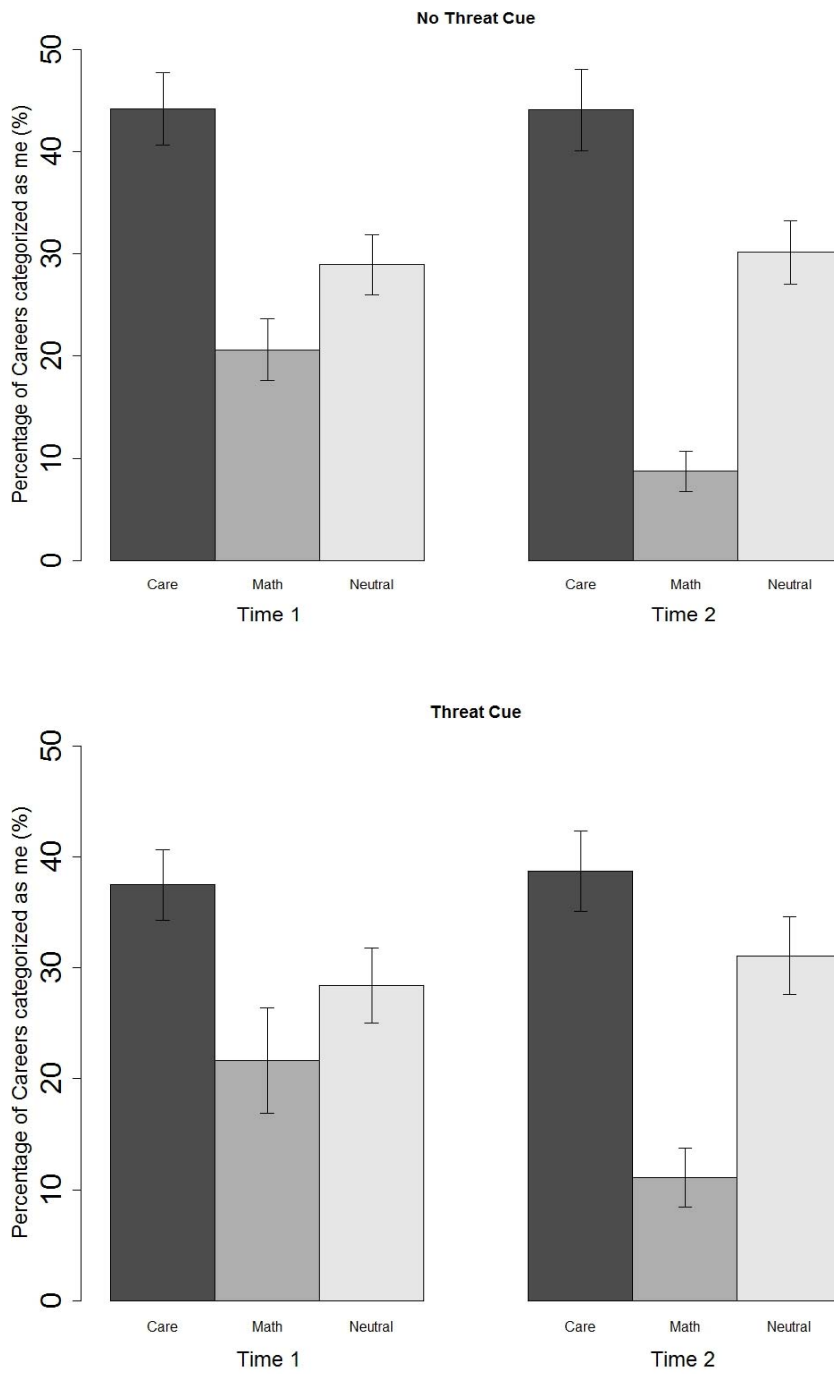


Figure 5. *The interaction of time, domain, and type of cue on the percentage of careers categorized as “me” for women*

The effects of threat on IAT for women. An independent *t*-test on the type of cues was expected to show that women who experienced the women-math threat cue were more likely to make stronger “me-care,” and “other-math” associations (represented by a more negative *D* score). The Levene’s test for the homogeneity of variances was not violated,  $F(1, 67) = .008, p = .929$ . The analysis showed no significant difference in the *D* score based on the type of cue,  $t(67) = .201, p = .841, d = .005$ . Women showed a slight preference for care association over math association, as indicated by the negative mean and standard deviations of *D* scores in Table 8. This parallels the findings on the mixed ANOVA model, where the type of cues did not have a significant effect on the outcome variable.

Table 8

*Independent t-test of IAT D score by type of cue for women*

	No threat <i>M (SD)</i>	Threat <i>M (SD)</i>	<i>t</i>	<i>df</i>	<i>d</i>
<i>D</i> Score	-.112 (.473)	-.134 (.450)	.201	67	.005
<i>CI(95%)</i>	[-.282, .059]	[-.284, .016]			

Note. *M* = Mean, *SD* = Standard deviation, *CI* = Confidence interval.

Predicting math-related SCC under threat. These hypotheses examined whether women’s reaction times (log transformed) in Time 2 is predicted by their explicit math categorization in Time 2, moderated by whether or not threat was activated, through a moderated multiple regression. Step 1 consisted of reaction times in categorizing math

careers in Time 1, number of math careers categorized in Time 2, type of cue, and domain identification with math, and Step 2 was comprised of the following interactions: (1) type of cue and domain identification with math, (2) type of cue and math reaction times at Time 1, (3) type of cue and number of math careers at Time 1. Reaction time in categorizing math careers as “me” in Time 2 served as the outcome variable. All continuous variables were centered. For this hypothesis, the lack of self-concept consistency will be shown by the low predictability of number of math careers categorized as “me” in Time 2 by the reaction times in Time 1.

For Step 1, the regression equation significantly predicted the reaction times for categorizing math careers as “me” in Time 2,  $F(4, 37) = 3.572, p = .012, R^2 = .289, 95\% CI [0.09, .478]$  (adjusted  $R^2 = .212$ ). The reaction times for categorizing math careers as “me” in Time 1 ( $\beta = .465, p = .002$ ), significantly predicted the outcome measure.

For Step 2, the regression equation significantly predicted the reactions times for categorizing math careers as “me” in Time 2,  $F(6, 35) = 2.373, p = .05, R^2 = .289, 95\% CI [.094, .484]$  (adjusted  $R^2 = .167$ ). Similar to Step 1, only one predictor, the reaction times for categorizing math careers as “me” in Time 1 significantly predicted the reaction times for categorizing math careers as “me” in Time 2 ( $\beta = .456, p = .023$ ). However, the  $F$  change statistic for the Step 2 did not attain statistical significance ( $p = .985$ ), which makes the findings of the model negligible. Table 9 summarizes the findings from this analysis.



Table 9

*Summary of Moderated Regression Analysis for Variables Predicting Math-related SCC for Women (N = 68)*

Variable	Step 1			Step 2		
	<i>B</i> [CI 95%]	<i>SE B</i>	$\beta$	<i>B</i> [CI 95%]	<i>SE B</i>	$\beta$
Type of cue	.023 [-.041, .088]	.032	.109	-.023 [-1.715, 1.670]	.834	-.106
Number of math careers in Time 2	.012 [-.011, .035]	.011	.212	.012 [-.012, .035]	.012	.206
RT for math careers as “me” Time 1	.421 [.162, .680]	.128	.465***	.412 [-.012, .035]	.174	.456*
Math domain identification	.003 [-.004, .009]	.003	.145	.002 [-.006, .010]	.004	.129
Type of cue * RT for math Time 1				.014 [-.531, .560]	.269	.211
Type of cue * Math identification				.001 [-.010, .012]	.005	.031
<i>R</i> <sup>2</sup> (adjusted <i>R</i> <sup>2</sup> )		.289 (.212)			.289 (.167)	
<i>F</i> for change in <i>R</i> <sup>2</sup>		3.752*			.015	

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ ; *B*[CI 95%] = Unstandardized coefficient beta [95% confidence interval]; *SE B* = Standard error of unstandardized coefficient beta;  $\beta$  = Standardized coefficient beta.

### Analyses for Men

Implicit endorsement of care careers. To test the hypotheses for men, a 2 (time: Time 1 and Time 2) x 3 (career domain: math, care, and neutral) x 2 (type of cues: men-care threat cue and no threat) mixed factorial ANOVA was conducted. It was expected that men exposed to the men-care threat cue (i.e., “*why men are not as successful as women in care-related careers*”) would show slower reaction times for care careers after the threat has been activated (Time 2), in comparison to the no threat condition.

First, the three-way interaction between the independent variables of time, career domain, and type of cues attained statistical significance,  $F(2, 40) = 7.061, p = .002, \eta_G^2 = .068$ . The first contrast analysis, comparing across Time 1 and Time 2 (weighted against reaction times for neutral careers), showed that there was a significant difference in math reaction times ( $p = .004$ ) in the threat versus no threat conditions. The second contrast analysis, comparing reaction times for care careers across Time 1 and Time 2 (weighted against reaction times for neutral careers), did not attain statistical significance ( $p = .08$ ) in the threat versus no threat condition. Figure 6 provides a graphical representation of these effects.

There was a significant two-way interaction between time and domain,  $F(2, 40) = 17.623, p < .001, \eta_G^2 = .153$ . The contrast analysis, comparing across Time 1 and Time 2 (weighted against reaction times for neutral careers), showed significant differences in math careers reaction times ( $p = .005$ ). The second contrast analysis for this interaction, comparing across Time 1 and Time 2 (weighted against reaction times for neutral careers), showed significant differences in care careers reaction times ( $p < .001$ ).

Participants showed faster reactions times for math careers in Time 2 versus Time 1 and categorized neutral and math careers faster than care careers in across Time 1 and 2.

There was a significant main effect of time,  $F(1, 20) = 36.558, p < .001, \eta_G^2 = .032$ . Participants showed faster reactions times in Time 2 versus Time 1 across all domains. The main effect of career domain attained statistical significance,  $F(2, 40) = 867.271, p < .001, \eta_G^2 = .951$ . Participants showed faster reaction times for neutral ( $M = 2.12$ ) than math ( $M = 3.04$ ) and care ( $M = 3.05$ ) careers.<sup>12</sup> See Table 10 for descriptives, Table 11 for mixed ANOVA results and Table 12 for between subjects effect. Figure 6 graphically represents the three-way interaction.

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<sup>12</sup> Weighted contrast analysis using Bonferroni's adjustment on career domains for Time 1 showed no significant reaction time differences between math and care careers ( $p = .967$ ), but found significant differences between care and neutral careers ( $p < .001$ ), and math and neutral careers ( $p < .001$ ). For Time 2, there were no significant differences between math and care careers ( $p = .224$ ), but there were significant differences between math and neutral ( $p = .001$ ), and care and neutral ( $p < .001$ ). This contrast does not include participants who chose none of the individual careers as being "me."

Table 10

*Descriptives for reaction times (log transformed) across career domains and time for men*

Time	Career Domain	Mean (95% CI)	Std. Error
1	Math	3.10 [3.05, 3.15]	.02
	Care	3.07 [3.02, 3.11]	.02
	Neutral	2.25 [2.20, 3.00]	.02
2	Math	2.98 [2.95, 3.01]	.02
	Care	3.03 [2.98, 3.08]	.03
	Neutral	2.00 [1.91, 2.09]	.05

Table 11

*Mixed ANOVA for implicit endorsement of careers for men*

Effects	<sup>1</sup> MS	df	F	p	$\eta^2_G$
Time	.587	1	36.558	<.001	.032
Time * Cue	.013	1	.789	.385	.009
Domain	12.349	2	867.271	<.001	.951
Domain * Cue	.013	2	.890	.419	.252
Time * Domain	.115	2	17.623	<.001	.153
Time * Domain * Cue	.046	2	7.061	.002	.068
Error	.007	40			

<sup>1</sup>MS and p are for sphericity assumed.

Table 12

*Between subjects main effect of type of cue for implicit endorsement of careers for men*

Effect	<i>MS</i>	<i>df</i>	<i>F</i>	<i>p</i>	$\eta_G^2$
Type of cue	.001	1	.168	.686	<.001
Error	.006	20			

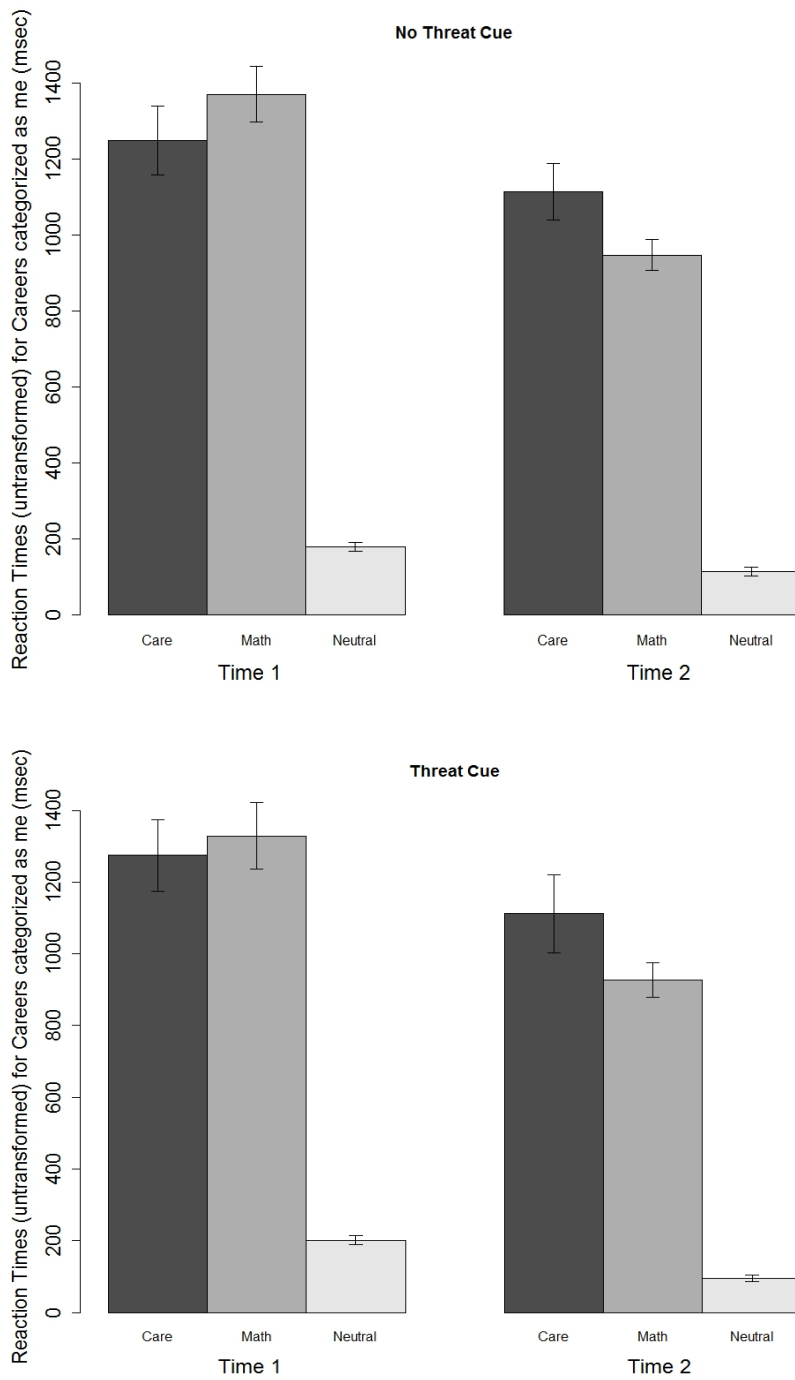


Figure 6. *The interaction of time, domain, and type of cue reaction times for careers categorized as “me” for men*

Explicit endorsement of care careers. A mixed factorial ANOVA to examine the effects of independent variables on the number of careers categorized as “me” in Time 1 versus Time 2 showed a significant three-way interaction between time, domain, and type of cue,  $F(2, 84) = 3.231, p = .044, \eta_G^2 = .003$  (see Figure 7). The first contrast analysis, comparing across Time 1 and Time 2 (weighted against number of neutral careers), showed that there was a significant difference in number of math careers categorized as "me" ( $p = .028$ ) in the threat versus no threat conditions. The second contrast analysis, comparing across Time 1 and Time (weighted against number of neutral careers), did not attain statistical significance for the number of care careers categorized as “me” ( $p = .55$ ). The highest number of careers categorized as “me” were math careers at Time 1 of the no threat session ( $M = 3.76$ ). Table 13 provides a summary of the descriptives. The two-way interactions between time and type of cue [ $F(1, 42) = .027, p = .871, \eta_G^2 = <.001$ ], career domain and type of cue [ $F(2, 84) = .317, p = .729, \eta_G^2 = .042$ ], and time and career domain [ $F(2, 84) = 1.369, p = .260, \eta_G^2 = .001$ ] did not attain statistical significance.

The main effect of time on the number of careers categorized as “me” was significant,  $F(1, 42) = 12.921, p = .001, \eta_G^2 = .007$ . Overall, men categorized more careers as “me” in Time 1 ( $M = 2.42$ ) versus Time 2 ( $M = 2.04$ ). The main effect of career domain also attained statistical significance,  $F(2, 84) = 14.487, p <.001, \eta_G^2 = .137$ . Overall, men categorized significantly more math ( $M = 3.31$ ) than care ( $M = 1.08$ ) careers ( $p < .001$ ) as well as significantly more neutral ( $M = 2.29$ ) than care careers ( $p < .001$ ). Table 14 summarizes the interaction and main effects for this model. The main effect for

type of cue on the number of careers categorized as “me,” did not attain statistical significance,  $F(1, 42) = .229, p = .635, \eta_G^2 = .003$ , as shown in Table 15.<sup>13</sup>

Table 13

*Descriptives for number of careers categorized as “me” across career domains and time for men*

Time	Career Domain	Mean [95% CI]	Std. Error
1	Math	3.60 [2.64, 4.56]	.48
	Care	1.17 [.76, 1.58]	.20
	Neutral	2.48 [1.81, 3.14]	.33
2	Math	3.01 [2.02, 4.01]	.49
	Care	.99 [.63, 1.37]	.18
	Neutral	2.10 [1.48, 2.72]	.31

<sup>13</sup> Weighted contrast analysis using Bonferroni’s adjustment on career domains for Time 1 showed significant differences between the number of math careers and neutral careers ( $p = .035$ ), care and neutral careers ( $p < .001$ ), and math and care careers ( $p < .001$ ). Significant differences were found for career domains in Time 2, between math and care ( $p = .002$ ), care and neutral ( $p = .001$ ), but not for math and care ( $p = .366$ ) careers.



Table 14

*Mixed ANOVA for explicit endorsement of careers for men*

Effects	<sup>1</sup> MS	df	F	p	$\eta_G^2$
Time	9.489	1	12.921	.001	.007
Time * Cue	.02	1	.027	.871	<.001
Domain	108.858	2	14.487	<.001	.137
Domain * Cue	2.381	2	.317	.729	.042
Time * Domain	.909	2	1.369	.260	.001
Time * Domain * Cue	2.144	2	3.231	.044	.003
Error	.664	84			

<sup>1</sup>MS and p are for sphericity assumed.

Table 15

*Between subjects main effect of type of cue for explicit endorsement of careers for men*

Effect	MS	df	F	p	$\eta_G^2$
Type of cue	3.563	1	.229	.635	.003
Error	15.588	42			

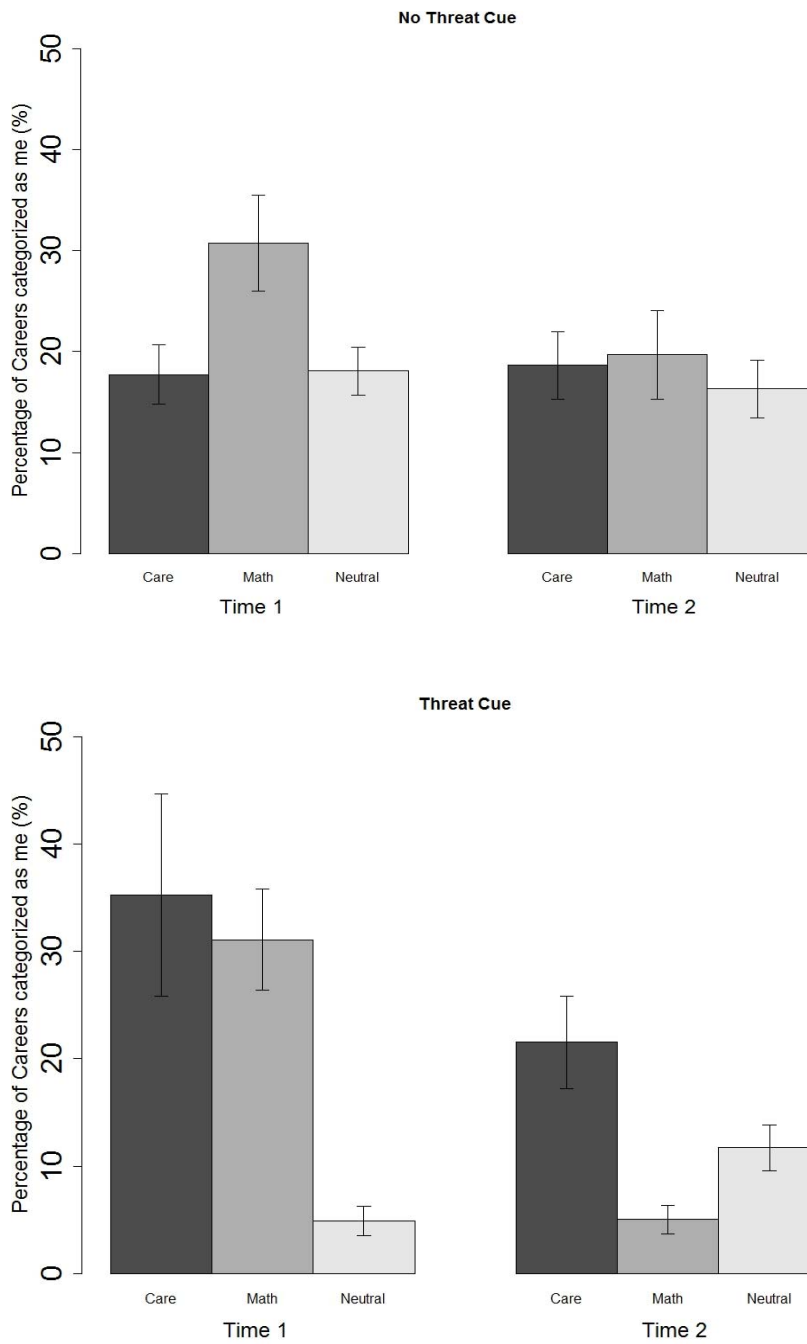


Figure 7. *The interaction of time, domain, and type of cue on percentage of careers categorized as “me” for men*

The effects of threat on IAT for men. Finally, an independent  $t$ -test on the type of cues was expected to show that men who experienced the men-care threat cue were more likely to make stronger “me-math,” and “other-care” associations (represented by a more positive  $D$  score). The Levene’s test for the assumption of equality of variances was not violated,  $F(1, 51) = 1.998, p = .164$ . The analysis showed no significant difference in the  $D$  score based on the type of cue,  $t(51) = -.861, p = .393, d = -.233$ . Men showed a slight preference for math associations over care association, as represented by the positive mean and standard deviations of  $D$  scores in Table 16.

Table 16

*Independent t-test of IAT D score by type of cue for men*

	No threat $M (SD)$	Threat $M (SD)$	$t$	$df$	$d$
$D$ Score	.120 (.420)	.200 (.243)	-.861 <sup>a</sup>	51	-.233
$CI(95\%)$	[-.053, .293]	[.106, .294]			

Note.  $M$  = Mean,  $SD$  = Standard deviation,  $CI$  = Confidence interval for mean.

Predicting care-related SCC under threat. These hypotheses explore whether men’s reaction times (log transformed) in Time 2 is predicted by their explicit care categorization in Time 2, following cue activation through a moderated multiple regression. Step 1 consisted of reaction times in categorizing care careers in Time 1, number of care careers categorized in Time 2, and type of cue. The following interactions comprised Step 2: (1) type of cues and domain identification, (2) type of cues and reaction times at Time 1, and (3) type of cues and number of care careers at Time 1.

Reaction times in categorizing care careers as “me” in Time 2 was the outcome variable. All continuous variables were centered. For this hypothesis, the lack of self-concept consistency will be shown by the low predictability of number of care careers categorized as “me” in Time 2 by the reaction times in Time 1.

For Step 1, the regression equation significantly predicted the reaction times for categorizing care careers as “me” in Time 2,  $F(4, 40) = 4.349, p = .005, R^2 = .303, 95\% CI [0.10, .502]$  (adjusted  $R^2 = .233$ ). The reaction times for categorizing care careers as “me” in Time 1 ( $\beta = .532, p < .001$ ), significantly predicted the outcome measure.

For Step 2, the regression equation significantly predicted the reactions times for categorizing care careers as “me” in Time 2,  $F(2, 38) = .237, p = .021, R^2 = .312, 95\% CI [.108, .516]$  (adjusted  $R^2 = .203$ ). Similar to Step 1, only one predictor, the reaction times for categorizing care careers as “me” in Time 1 significantly predicted the reaction times for categorizing care careers as “me” in Time 2 ( $\beta = .556, p = .023$ ). However, the  $F$  change statistic for the Step 2 did not attain statistical significance ( $p = .790$ ), which makes the findings of the model negligible. Table 17 summarizes the findings from this analysis.

Table 17

*Summary of Moderated Regression Analysis for Variables Predicting care-related SCC for Men (N = 45)*

Variable	Step 1			Step 2		
	<i>B</i> [CI 95%]	<i>SE B</i>	$\beta$	<i>B</i> [CI 95%]	<i>SE B</i>	$\beta$
Type of cue	.001 [-.063, .065]	.032	.005	.119 [-1.535, 1.773]	.817	.532
Number of care careers in Time 2	.013 [-.010, .035]	.011	.162	.013 [-.010, .035]	.011	.162
RT for care careers as “me” Time 1	.502 [.245, .760]	.128	.532***	.525 [.178, .872]	.172	.556***
Care domain identification	-.004 [-.011, .003]	.003	-.154	-.002 [-.011, .008]	.005	-.062
Type of cue * RT for care Time 1				-.042 [-.574, .491]	.263	-.580
Type of cue * Care identification				-.004 [-.018, .000]	.007	-.140
<i>R</i> <sup>2</sup> (adjusted <i>R</i> <sup>2</sup> )		.303 (.233)			.312 (.203)	
<i>F</i> for change in <i>R</i> <sup>2</sup>		4.349***			.237	

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ ; *B*[CI 95%] = Unstandardized coefficient beta [95% confidence interval]; *SE B* = Standard error of unstandardized coefficient beta;  $\beta$  = Standardized coefficient beta.

### Exploratory Analyses

The present study did not directly compare gender. Thus, one of the exploratory analyses examined gender differences in the self and other associations in the IAT. The exploratory analyses further examined whether there were gender- and college major-based differences in domain identification (as well as based on type of cue). Additionally, the analyses examined gender differences in perception of masculinity and femininity of careers as well as in domains and assessment of certain career-related abilities.

#### Gender Differences in IAT Scores

The hypothesis tested earlier showed no statistically significant differences in IAT scores based on type of cue, for both men and women. Generally, men showed a slight preference for math associations over care associations, while women show a preference for care associations over math associations. An independent *t*-test examined whether gender had a significant effect on the IAT *D* scores (in addition to the earlier examination of the effects of type of cue on *D* scores). The results showed a significant difference in *D* scores between men and women,  $t(119.81) = 3.970, p < .001, d = .711$ .<sup>14</sup> Table 18 summarizes the findings.

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<sup>14</sup> Levene's test of homogeneity was violated,  $F(1, 120) = .9354, p = .003$

Table 18

*Independent t-test of IAT D score by gender*

	Men <i>M (SD)</i>	Women <i>M (SD)</i>	<i>t</i>	<i>df</i>	<i>d</i>
<i>D Score</i>	.162 (.337)	-.124 (.458)	3.970 <sup>a</sup>	119.81	.711
<i>CI(95%)</i>	[.069, .255]	[-.234, -.014]			

Note. *M* = Mean, *SD* = Standard deviation, *CI* = Confidence interval for mean.

### Domain Identification Questionnaire

The two sub-scales, the math and care sub-scales, showed some significant differences when compared across several demographic variables. Participants rated four math-related and four care-related items each on a scale of 1 (*not at all good*) to 10 (*very good*).

Gender and type of cue. Gender and type of cue did not significantly interact to affect identification with the domain of math,  $F(1, 136) = 2.330, p = .129, \eta_G^2 = .02$ .<sup>15</sup> The main effect of gender showed that men ( $M = 16.91$ ) identified with the domain of math more than women ( $M = 13.99$ ),  $F(1, 136) = 6.830, p = .01, \eta_G^2 = .05$  (see Table 19). For the domain of care, gender and type of cue did not show a significant interaction,  $F(1, 134) = 2.164, p = .144, \eta_G^2 = .01$ .<sup>16</sup> The main effect of gender attained statistical significance, where women ( $M = 27.33$ ) showed more identification with care than men ( $M = 22.45$ ),  $F(1, 134) = 34.869, p = .000, \eta_G^2 = 0.20$  (see Table 20).

<sup>15</sup> Levene's test of homogeneity was not violated,  $F(3, 136) = .483, p = .695$ .

<sup>16</sup> Levene's test of homogeneity was not violated,  $F(3, 134) = .138, p = .937$ .

Table 19

*Descriptives for gender by type of cue interaction on identification with domain of math*

Gender	Type of cue	Mean [95% CI]	Std. Error	<i>n</i>
Men	No threat	16.58 [14.26, 18.90]	1.18	31
	Threat	17.24 [14.84, 19.64]	1.22	29
Women	No threat	15.37 [13.35, 17.39]	1.02	41
	Threat	12.62 [10.54, 14.69]	1.05	39

Table 20

*Descriptives for gender by type of cue interaction on identification with domain of care*

Gender	Type of cue	Mean [95% CI]	Std. Error	<i>n</i>
Men	No threat	23.36 [21.65, 25.06]	.86	31
	Threat	21.54 [19.74, 23.33]	.91	28
Women	No threat	27.03 [25.52, 28.53]	.76	40
	Threat	27.64 [26.12, 29.16]	.77	39

College major.<sup>17</sup> Four categories of college majors (STEM, care, undecided, and other) were compared against participants' domain identification. College major did not have a significant effect on participants' identification with the domain of math,  $F(3,$

<sup>17</sup> The categorization of college majors here parallels the earlier categorization procedure used in the Participants section.



130) = .112,  $p = .953$ ,  $\eta_G^2 = .002$ .<sup>18</sup> STEM ( $M = 14.84$ ) majors did not significantly differ in their math identification from care ( $M = 14.97$ ), undecided ( $M = 15.07$ ), and other ( $M = 16.00$ ) majors (see Table 21). Similarly, participants did not significantly differ in their identification to the domain of care,  $F(3, 130) = .978$ ,  $p = .405$ ,  $\eta_G^2 = .02$ ,<sup>19</sup> across STEM ( $M = 25.16$ ), care ( $M = 26.05$ ), undecided ( $M = 25.22$ ), and other ( $M = 23.08$ ) majors (see Table 22).

Table 21

*Descriptives for the effect of college major on identification with domain of math*

College Major	Mean [95% CI]	Std. Error	<i>n</i>
STEM	14.84 [13.08, 16.61]	.89	57
Care	14.97 [12.81, 17.14]	1.09	38
Undecided	15.07 [12.51, 17.64]	1.30	27
Other	16.00 [12.44, 19.56]	1.80	14

<sup>18</sup> Levene's test of homogeneity was violated,  $F(3, 132) = 3.574$ ,  $p = .016$ .

<sup>19</sup> Levene's test of homogeneity was not violated,  $F(3, 130) = 2.242$ ,  $p = .086$ .

Table 22

*Descriptives for the effect of college major on identification with domain of care*

College Major	Mean [95% CI]	Std. Error	<i>n</i>
STEM	25.16 [23.74, 26.57]	.72	57
Care	26.05 [24.30, 27.81]	.89	37
Undecided	25.22 [23.17, 27.28]	1.04	27
Other	23.08 [20.11, 26.04]	1.50	13

#### Gender and Careers Questionnaire

Participants answered questions on the masculinity and femininity levels associated with the careers of interest in the present study. They answered the following question: “*How feminine or masculine would you categorize the following careers as?*” as well as the following question for the items on the domain identification questionnaire: “*In your opinion, are men or women better at the following tasks?*” For the first question, a higher score indicates a more feminine perception. For the second question, a higher score is indicative of a woman being better. Participants rated these questions on a scale of 1 (*Masculine*) to 7 (*Feminine*).

Masculinity and femininity of careers. The perceptions of genderization of math careers did not show significant differences across gender and type of cue,  $F(1, 124) = .221, p = .639, \eta_G^2 = .002$ .<sup>20</sup> The analysis did not show a significant main effect of gender,  $F(1, 124) = 1.937, p = .166, \eta_G^2 = .02$ . Men ( $M = 44.91$ ) did not rate math careers as being

<sup>20</sup> Levene’s test of homogeneity was not violated,  $F(3, 124) = 2.654, p = .052$ .

significantly more masculine than women did ( $M = 42.35$ ). Table 23 summarizes the descriptives for math careers. For the perceptions of masculinity and femininity of care careers, the interaction between gender and type of cue did not attain statistical significance,  $F(1, 129) = .011, p = .916, \eta_G^2 < .001$ ,<sup>21</sup> but there was a main effect of gender,  $F(1, 129) = 9.458, p = .002, \eta_G^2 = .007$ . Men ( $M = 63.43$ ) rated care-related careers as being less feminine than women did ( $M = 67.37$ ).<sup>22</sup> Table 24 summarizes the descriptives for care careers.

Table 23

*Descriptives for gender by type of cue interaction on perceptions of masculinity-femininity of math careers*

Gender	Type of cue	Mean [95% CI]	Std. Error	<i>n</i>
Men	No threat	45.00 [41.21, 48.79]	1.92	29
	Threat	44.82 [40.88, 48.75]	1.99	27
Women	No threat	43.31 [39.90, 46.71]	1.72	36
	Threat	41.39 [37.98, 44.79]	1.72	36

<sup>21</sup> Levene's test of homogeneity was not violated,  $F(3, 129) = 2.159, p = .096$ .

<sup>22</sup> Further analyses across the four categories of college majors showed no significant differences for both math-related [ $F(1, 120) = .922, p = .432, \eta_G^2 = .023$ ] and care-related [ $F(1, 125) = 1.015, p = .388, \eta_G^2 = .002$ ] careers.

Table 24

*Descriptives for gender by type of cue interaction on perceptions of masculinity-femininity of care careers*

Gender	Type of cue	Mean [95% CI]	Std. Error	<i>n</i>
Men	No threat	63.13 [60.52, 65.75]	1.32	30
	Threat	63.77 [60.96, 66.58]	1.42	26
Women	No threat	67.20 [64.94, 69.46]	1.14	40
	Threat	67.59 [65.22, 69.92]	1.19	37

Domains and assessment of ability. For the second question, gender and type of cue showed no significant interaction in math-related domain ratings,  $F(1, 136) = 2.330$ ,  $p = .129$ ,  $\eta_G^2 = .002$ . A main effect of gender,  $F(1, 136) = 6.830$ ,  $p = .010$ ,  $\eta_G^2 = .005$ , showed that men ( $M = 16.90$ ), in comparison to women ( $M = 14.03$ ), believed women to be better at math-related domains.<sup>23</sup> Table 25 summarizes the descriptives for math-related domains. Similarly, the interaction between gender and type of cue did not significantly affect the assessment of abilities in care-related domains,  $F(1, 134) = 2.164$ ,  $p = .144$ ,  $\eta_G^2 = .001$ .<sup>24</sup> Women ( $M = 27.33$ ), in comparison to men ( $M = 22.49$ ), rated women as being significantly better at care-related domains,  $F(1, 134) = 34.869$ ,  $p = .000$ ,  $\eta_G^2 = .20$ . Table 26 summarizes the descriptives for care-related domains.

<sup>23</sup> The descriptives for this analysis showed some interesting trends. Men under threat rated women as better at math-related domains ( $M = 17.24$ ) than men not under threat ( $M = 16.58$ ). Women under threat rated women as being worse at the math-related domains ( $M = 12.62$ ) than women not under threat ( $M = 15.37$ ).

<sup>24</sup> Levene's test of homogeneity was not violated,  $F(3, 134) = .138$ ,  $p = .937$ .

Table 25

*Descriptives for gender by type of cue interaction on domains and assessment of ability for math*

Gender	Type of cue	Mean [95% CI]	Std. Error	<i>n</i>
Men	No threat	16.58 [14.26, 18.90]	1.18	31
	Threat	17.24 [14.84, 19.64]	1.22	29
Women	No threat	15.37 [13.35, 17.39]	1.02	41
	Threat	12.62 [10.54, 14.69]	1.05	39

Table 26

*Descriptives for gender by type of cue interaction on domains and assessment of ability for care*

Gender	Type of cue	Mean [95% CI]	Std. Error	<i>n</i>
Men	No threat	23.36 [21.65, 25.06]	.86	31
	Threat	21.54 [19.74, 23.33]	.91	28
Women	No threat	27.03 [25.52, 28.53]	.76	40
	Threat	27.64 [26.12, 29.16]	.77	39

## CHAPTER 5

### DISCUSSION

The present study examined the effects of career-related negative stereotypes (i.e., math for women and care for men) on self-concept consistency through implicit and explicit measures of self-concept consistency for both men and women.

#### Implicit Endorsement of Careers

Men were affected by negative stereotypes at the unconscious level, whereas women were not. Male participants told that men are usually not as successful as women in care-related careers, unconsciously disassociated more from care careers as shown by the differences in reaction times. Generally, research has not focused on men and job-related stereotypes, but the present study showed that the activation of negative stereotypes about men in female-genderized jobs (i.e., care-related jobs) can have a negative impact at an unconscious level, specifically the extent to which they unconsciously associate with care careers.

Conversely, women did not show any differences in their unconscious associations with math careers, whether or not the negative stereotype was active in the environment. Overall, women showed an unconscious preference for neutral careers over care careers, regardless of the presence of the negative stereotype. This finding may be indicative of women's evolving perceptions of the careers they see themselves in, where women may not favor math careers, they also showed more of a preference for care careers and neutral careers (e.g., reporter, writer, photographer, which are not usually considered care-related). While they may unconsciously prefer neutral over care careers,

they also showed a lack of preference for math careers, which supports previous findings on women and math-related careers (Nguyen & Ryan, 2008; Schmader et al., 2013).

The findings of the present study pertaining to the implicit endorsement of careers for men showed that men are just as susceptible as women to the effects of stereotype threat (as shown for women in the study by Schmader and colleagues, 2013). Men's unconscious view of themselves is affected by negative stereotypes about their expected performance in a gender atypical vocation. For women, the findings contradicted the findings of Schmader and colleagues (2013). Their study showed that women's self-concept became more inconsistent when a threatening cue was activated in their environment, an effect that was not found in the present study.

#### Explicit Endorsement of Careers

The negative stereotype about men and care careers significantly affected men across time and type of career domain, where men categorized more care careers as "me" prior to threat activation in comparison to after threat activation, an effect not found for men not under threat. Men were more likely to choose fewer care careers as being relevant to themselves after being informed of the negative stereotype that men are not as successful in care careers as women, in comparison to those who were not informed. The findings pertaining to men is a novel one as presently there are few experimental studies examining the effect of stereotype threat on associations with care-related careers among men. Alternatively, women did not show differences in their conscious selection of careers after being informed of the negative stereotype of women in math careers.

Generally, women chose care and neutral careers over math careers, but this selection of careers did not differ significantly after the activation of threat.

The present study showed that explicit changes in the working self-concept are affected by threatening environmental cue for men, but not for women. The lack of an effect for women could potentially be attributed to the level of importance placed in math careers to begin with, as shown by the high percentage of women did not select any math careers as being “me,” it is likely that the importance of math was not salient among women in the present sample.

Past research examining the stereotype threat effects among women differs from the present study in that most research studies on stereotype threat experienced by women recruit participants from highly-ranked universities, where academic competition is much higher than mid to lower-ranked universities. As the women in the present study are not from a highly ranked institution, the general importance placed on math may be lower, thus leading to a higher selection of care and neutral careers, but not math careers. They may not necessarily be stereotype threatened as their academic environment does not make the negative stereotype salient. The lack of importance placed on math also parallels findings on the effect of math domain identification on the extent to which women are susceptible to stereotype threat (Spencer et al., 1999; Steinberg et al., 2012), which was also examined in the present study.

#### Predicting Self-Concept Consistency under Threat

Men who were under threat (i.e., told about the negative stereotype) showed no significant shifts in their self-concept consistency across time at the conscious or



unconscious levels (as shown by unconscious care career choices in Time 1 predicting the conscious care career choices in Time 2). Their level of identification with the domain of care also did not influence the shift in self-concept consistency. Overall, participants' unconscious (i.e., reaction times) and conscious care career selection in Time 1 influenced the unconscious care career selection in Time 2. Similarly, women under threat showed no significant shifts in their self-concept consistency across time at both the conscious or unconscious levels. Overall, participants' unconscious (i.e., reaction times) and conscious math career selection in Time 1 influenced the unconscious math career selection in Time 2, but the activation of the threatening cue or the level of identification with the domain of math did not influence this relationship.

As the working self-concept is expected to be sensitive to environmental cues and activates relevant aspects of the self in order to facilitate the achievement of a goal (Kawakami et al., 2012; McConnell et al., 2012), the present study showed that the threatening environmental cues in particular, did not play a significant role in predicting the shift of the working self-concept across time. However, the threatening cue affected both implicit and explicit career choices of men, but not that of women.

One reason women remained unaffected by the threat could be the subtle differences in the cues experienced by women in both the threat and no threat conditions. The research study by Schmader and colleagues (2013) and several other studies (see Nguyen & Ryan, 2008; Picho et al., 2013) employing the threat-no threat cue manipulation with women found significant differences in their outcome measures (including math test performance, reaction times to math and care careers, and conscious

selection of math and care careers) based on the type of cue, which was not shown in the present study.

Thus, an alternative explanation for the lack of significant effects across the threat and no threat condition is the role of subtle cues in the present study, which can affect the responses in the outcome measures (Nguyen & Ryan, 2008). In the present study, the cue was adapted from previous research (Schmader et al., 2013), thus did not differ drastically. However, women across all conditions chose more care and neutral careers than math careers indicating a lack of an inclination toward math careers. In both the threat and no threat conditions, women completed the domain identification questionnaire after the first career categorization task and cue activation, which contained math-related domains such as “algebra” and “calculus.” These domains could have acted as subtle cues negating the effect for the type of cue manipulation, similar to the findings of the meta-analysis by Nguyen and Ryan (2008). Thus, the effects of math-related negative stereotypes are present for women in both conditions as subtle cues from the experiment itself may have become a threat.

Alternatively, the effects of stereotype threat can vary by studies. One study showed that the effects of stereotype threat can be very task-specific and the findings for individual research studies can show much variability (Wicherts, Dolan, & Hessen, 2005). In the present study, the career categorization task and IAT were implemented on the Qualtrics platform. This implementation raised several data collection issues, such as incomplete responses that were possibly not due to participants' non-response and glitches in the coding of scores for some participants. Presently, there

is no precedence for effective measurement of reaction time in Qualtrics. A recent review of Qualtrics (provided by Qualtrics itself) claimed that it can measure reaction time effectively (Qualtrics, 2014), but independent reviews say otherwise (see Cavallaro, 2014). These issues may have compromised the quality of the data obtained. In the present study, any minor glitches due to the ineffectiveness of Qualtrics, especially since reaction time is measured in milliseconds, could have a significant impact on the results. Future studies could use research software such as DirectRT and Inquist, which are better suited for reaction time measurement, to ensure there are no such instrumentation issues. Thus, the present study's findings are different from some past studies possibly due to the differences in the task implementation (as a possible additive function to the effects of subtle cues), thus making a direct comparison of the findings with other studies difficult.

The present findings pertaining to men suggest that men, as opposed to women, may be less conscious of care-related threats as they are threats that are less common in daily life (Bosson et al., 2004; Koenig & Eagly, 2005), in comparison to women's math-related threat. Similar to the findings with women, the type of cue did not significantly moderate the change in self-concept consistency. Only reaction times for care careers in Time 1 uniquely predicted math reaction times in Time 2, which contradicts the hypothesis tested by Schmader and colleagues (2013), with regards to the lack of shift self-concept consistency shown through a lack of predictive relationship between reaction times in Time 1 and 2.

The current study provides evidence for how the activation of care-related negative stereotypes can lead to disassociation with care-related outcomes. However, for

women, math-related negative stereotypes may be more indoctrinated and prevalent in their environment in comparison to men. This premise can potentially explain why the threat was ineffective for women, but not for men.

#### Limitations and Suggestions for Future Direction

The results of the present study should be interpreted with caution, given the low degrees of freedom and issues with missing data. The significant results despite the small degrees of freedom for all the hypotheses are indicative of the possibility that the significant findings being due to chance. Replication of the present study as well as a larger sample size could aid in understanding the extent to which the low degrees of freedom influenced the final results.

One limitation of this study is the inability to know whether the threat was activated, beyond probing for suspicion in the post study questionnaire and recall of instructions.<sup>25</sup> Participants did not significantly differ in the amount of time spent reading the instructions. Furthermore, the manipulation checks showed that a large percentage of participants mentioned the gender comparison in the threatening cue condition, but it is not clear that noticing that the instructions mentioned gender (or not) would directly relate to whether participants felt stereotype threat. Generally, the lack of effective manipulation checks appears to be an issue for the field as a whole to consider, as even the leading stereotype threat researchers have difficulty with manipulation checks (T. Schmader, personal communication, October 17, 2013).

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<sup>25</sup> As illustrated in the manipulation checks section.

Parallel to the issue of threat activation is the appropriateness of the threat cue. For men, the care-related threat may not be a strong enough threat to create the experience of stereotype threat (unlike the threat elicited by the math-related threat for women). Rather, the care-related threat may be more relevant to status- or pay-based threats, rather than skills-based. As STEM-related careers usually pay more and are of higher status (Georgetown University Center on Education and the Workforce, 2011), the threat to care-related abilities or skills may not have negatively impact men. This was not the case for gay men, who when reminded of their stigmatized identity, showed performance deficits in childcare-related tasks (Bosson et al., 2004). Conversely, heterosexual men, who did not report their sexual orientation, were more likely to experience stereotype threat than those who did report it (Bosson et al., 2004). These findings indicate that for heterosexual men, affirming their heterosexuality does not negatively impact their performance in care-related outcome measures. Thus, it is possible that men are more affected by identity-based threats such as threats of sexual orientation or other attributes related to masculinity than skill-related threats, particularly in relation to care-related careers. This premise can be further explored through the use of a status-related threat, rather than a care-and skill-related one.

An additional issue with the effectiveness of the threat cue is the use of mixed-gender groups during the data collection of the present study. It is possible that single gender research sessions may have shown different results. However, previous research findings on the issue of whether stereotype threat is most likely to occur in single vs. mixed-gender groups is mixed, with majority favouring mixed-gender groups. The study

by Spencer and colleagues (1999) utilized mixed-gender groups and found significant stereotype threat effects for women. Several studies also suggest that women in single gender groups are affected less by stereotype threat (Ben-Zeev & Kirtman, 2012; Huguet & Regner, 2007). One study examining different gender group combinations found that women in men-majority groups experienced the most performance deficit, whereas women in women-majority groups experienced some deficits, but not as significant as those of women in the men-majority groups (Inzlicht & Ben-Zeev, 2000). Men in women-majority groups did not show significant differences compared to men in the men-majority groups (Inzlicht & Ben-Zeev, 2000). As past studies showed that threat can be elicited in the mixed-gender groups, it is possible that the lack of significant effects for women in the present study is attributable to an overall experience of threat as a result of being in mixed-gender groups. The inclusion of a gender group experimental manipulation would not have been feasible due to the study's large design, but the implications of this should be considered when interpreting the findings of the present study.

The career categorization task posed several limitations in the present study. Although there has been evidence to support the use of the task in self-concept research (Markus, 1977; Schmader et al., 2013), it does not discount the possibility that other tasks provide a better indicator of self-concept consistency. The overall faster reaction times in Time 2 in comparison to Time 1 may be indicative of practice effects. Thus, improvements are necessary in the career categorization to measure changes in self-concept consistency effectively.

Alternatively, stereotype threat may only affect individuals in a performance-based situation, where anxiety increases from the anticipation of completing an evaluation task or test (Schmader et al., 2013). The participants of the present study were not given any indication that they would complete an evaluative task or test at the end of the session. Therefore, the effects of cognitive load as an anxiety-producing factor in the integrated process model of stereotype threat (Schmader et al., 2008) possibly did not affect participants in the present study through the use of the career categorization task, which led to the lack of significant findings of women. Similarly, men require a care-related diagnostic test in order to create a performance-based environment, which can be implemented by informing participants that they will be taking a social sensitivity test (Koenig & Eagly, 2005) or an emotional intelligence test.

One suggestion with regards to the career categorization task is to use careers that are comparable and achievable by participants. For example, certain careers require very specialized knowledge and skill sets, while others do not. These differences should be explored in detail prior to implementation. Furthermore, the present design employs several tasks through the study session. Thus, it may be relevant to consider the motivational differences among participants in completing relevant and irrelevant tasks (Jamieson & Harkins, 2011). Participants may have responded differently based on their perception of importance of each task. For example, men may have taken the career categorization after the threat activation more seriously, so as not to show their “femininity” for the fear of being seen as less manly (Koenig & Eagly, 2005). This

suggestion can be implemented by having fewer tasks or adding an additional manipulation of informing participants of task's relevance).

An additional task-related measure-related limitation is the use of the IAT. The predictive validity of the IAT is less certain when motivational factors (e.g., need for cognition) are unaccounted for. There is also a lack of strong evidence that the IAT effects are indeed implicit as the IAT does show a weak correlation with traditional (i.e., explicit) measures (see Blanton et al., 2009; Fazio & Olson, 2003; De Houwer, Teige-Mocigemba, Spuryt, & Moors, 2009 for detailed exploration of these issues). The results from these past studies indicate while the IAT is a good measure of associations between concepts, there is also evidence to suggest that the scoring, norming, and application of the *D* score lacks real world validity (see Blanton & Jaccard, 2006 for review), thus it may not provide a comprehensive view of working self-concept measurements, especially since the working self-concept is dependent on a person's goals and motivations. Therefore, it is uncertain whether the IAT actually measures the stereotypical associations that an individual has.

There is also the possibility of differing responses elicited by the domain identification measure in men and women, specifically the possibility of underreporting of actual interest in care-related careers among men. As a result of the prevalence of the women and math negative stereotype, women may identify less with the domain of math (as shown in the present study as well). However, men who identify strongly with the domain of care may see themselves as having a greater chance of being feminized or emasculated by others, which could lead to underreporting of their actual identification



with the domain of care. The average responses in the domain identification questionnaire do point to such a possibility, where men identified more with the domain of math than care.

Future studies examining the impact of genderization of careers can apply the shifting standards model in understanding how within-sex standards for the roles played by men and women can lead to the formation of gender stereotypes (Bosak, Sczesny, & Eagly, 2012). For example, daughter of mothers who endorse gender stereotypical attitudes about girls and math are more susceptible to experiencing stereotype threat-related math underperformance, which was not found when the mothers rejected those gender stereotypes (Tomasetto, Alparone, & Cadinu, 2011). Similarly, fathers have a stronger effect on how sons view themselves (i.e., self-concept) than mothers do (McGrath & Repetti, 2000). The findings of these studies illustrate that sometimes girls and boys look to individuals of their own gender as a standard for themselves, indicating that genderization is not always a result of comparing oneself with the standards of the opposite gender.

Future studies can also examine the role of individual differences in the interpretation and experience of threat. One such individual difference variable is sensitivity of threat. Sensitivity to threat can depend on the extent of one's minority status (i.e., an ethnic and gender minority; Gonzales, Blanton, & Williams, 2002) as well as the saliency of other positive social identities (Gresky, Eyck, Lord, & McIntyre, 2005) and has varying effects on stereotype threat outcome measures such as math tests and self-reflection tasks (Gresky et al., 2005; Rydell, McConnell, & Beilock, 2009). Another

individual difference factor is self-esteem. Past research suggests that self-esteem and disengagement from academics played a combined role in influencing the experience of failure feedback for minorities (Major, Spencer, Schmader, Wolfe, & Crocker, 1998). Self-esteem can also serve as a buffer for the effect of stereotype threat among women (Rydell & Boucher, 2009). The role played by these factors can potentially aid in understanding whether the genderization of careers affects men and women in similar ways and which persons might be most affected by it.

Furthermore, the role played by genderization of careers can potentially be examined beyond cisgender populations. Research in stereotype threat and genderization has primarily focused on men and women, but not with populations that identify with alternative gender identities such as transgender women (see McKinnon, 2014 for a review). Women who identify highly with their gender show increased susceptibility to stereotype threat (Schmader, 2002). The implications of this finding for transgender women, whose identification with their gender identity may be different from cisgender women, in a genderized workforce are relatively unknown and is a line of research worth exploring.

### General Implications

The working self-concept exploration of stereotype threat reduces the risk of the overgeneralization that stereotype threat affects women and men the same way, across time. Thus far, the majority of stereotype threat research has focused on women and math-related outcome measures (see Nguyen & Ryan, 2008; Picho et al., 2013 for reviews). These findings are usually generalized to all women and across many

genderized situations. However, social policies need to consider women from different factions of societies, which requires understanding of stereotype threat at a micro level.

As one's working self-concept is tied to a particular social situation, how much one believes he or she belongs in a particular environment may influence one's assessment of his or her capabilities (Dasgupta, 2011). This assessment may lead to feelings of being an "imposter" in a situation, especially if one is in the minority with regards to gender or ethnicity. In this case, "...what feels like a free choice to pursue one life path or "possible self" over another is constrained by subtle cues in achievement environments that signal who naturally belongs there and is most likely to succeed and who else is a dubious fit" (Dasgupta, 2011, p. 231). The working self-concept view of stereotype threat accounts for variability at the individual-level, which is especially important when attempting to form effective policies for both men and women.

Most other studies examine the effects of stereotype threat (as well as being an "imposter") among female undergraduates, but not among male high school students or women and men in gender atypical careers. Research on elementary, middle school, high school students primarily examine race-based stereotype threat effects (see Alter, Aronson, Darley, Rodriguez, & Ruble, 2010; Wasserberg, 2014; but see Ambady, Shih, Kim, & Pittinsky, 2001 for both race- and gender-based examinations of stereotype threat effects). Thus, cross-sectional examination of how the effects of stereotype threat and genderization of careers and careers-related domains could aid in filling this gap. This line of research can aid in understanding how stereotype threat functions differently across situations. For example, the effects of stereotype are differential when the stakes

are higher (e.g., a test for job selection) where the higher stakes can potentially override the negative effects of stereotype threat (Wicherts et al., 2005). Furthermore, one study showed that female high students performed on par or better than their male counterparts in math-related subjects (Ganley et al., 2013).

The larger importance of this study is in understanding the complex relationship between gender stereotypes and academic or career outcomes. The activation of gender-related negative stereotypes elicits different reactions in men and women. Men are more likely to assume their masculinity or gender identity (and other related traits and attributes) is being questioned (Koenig & Eagly, 2005), whereas women are more likely to assume their abilities are being questioned (Schmader et al., 2013). The differences in reaction under threat may point to an inherent difference in motivational and cognitive process that occur between men and women. Future studies can aim to find stereotypes on which both men and women may show comparable reactions.

Alternatively, an avenue for future research is in examining cross-cultural differences in the genderization of careers, taking into consideration culturally differentiated gender roles. Results from such studies may help in forming effective strategies to decrease the genderization of careers, as there are findings that show differences in the working self-concept across cultures (Cross, Gore, & Morris, 2003; Suh, 2002)

For example, empirical evidence suggests a lack of a gender gap among computer scientists in Malaysia; women gravitate towards STEM-related careers because of the safer environment provided by these careers, which are usually office or lab-based

(Lagesen, 2007; Mellström, 2009). This particular finding potentially explains a part of the gender gap as being attributable to highly distinct gender roles in place within Malaysian society. . The U.S. scores higher on gender equality indices in comparison to Malaysia (Else-Quest, Hyde, & Linn, 2010). It is possible that the gender gap in the U.S. is a result of a “push-pull” process. For women in the U.S., gender equality is considered highly important and is a major part of women’s identity (Harrington, Van Deusen, & Humbred, 2011; Pew Research Centre, 2012), in comparison to women in Malaysia. This premise raises the possibility that women in the U.S. are more sensitive to genderization within the academic and vocational environments than women in Malaysia, making American women more susceptible to the effects of stereotype threat. Among American women, this possibility may be counteracted by increased exposure to counterstereotypic women leaders both at global (Taylor, Lord, McIntyre, & Paulson, 2011) and local (Dasgupta & Asgari, 2004) levels.

However, this particular issue warrants more cross-national studies of gender stereotyping and stereotype threat, in the hopes of understanding the interaction between gender roles and the social environment and encouraging the general population to pursue careers based on skills and abilities rather than gender. Furthermore, cultural differences in work-related values (e.g., competition, assertiveness, modesty), especially with regards to the association of these values to a particular gender (Sczesny, Bosak, Neff, & Schnys, 2004) may be an alternative avenue to explore.

Past literature on stereotype threat rarely discusses the role of choice in STEM or non-STEM career preferences among women. A recent study of sex differences in math

fields provided an alternative explanation, specifically the role of lifestyle choices in career preferences, while placing less blame on sex discrimination (Ceci & Williams, 2010). The researchers posit that STEM-related attrition rates are higher in women, but also posit that it can be attributed to both societal constraints and freedom of choice (Ceci & Williams, 2010). Thus, it is also highly possible that women are making choices that parallel their lifestyles, but choices that can be negatively construed as gender stereotype consistent.

The findings of the present study also showed that men do not benefit from the genderization process. Men are the minority in care careers such as nursing (less than 0.5 million registered men; U.S. Census Bureau, 2013), social work, (18% of registered social workers are men; U.S. Bureau of Labor Statistics, 2013) and child care (5.5% men; U.S. Bureau of Labor Statistics, 2013). Thus, even if men had an interest in care-related careers, the genderization effects are apparent in their representation. Because most STEM-related careers pay better and are considered to be of a higher status (Ceci & Williams, 2010), one way to counteract the effects of genderization is to provide similar incentives for men pursuing care-related professions and women pursuing math-related professions (i.e., making care-related jobs more high status). For example, the German government is attempting to provide children with a mixed gender environment by employing male teachers and providing them incentives, so that they choose to become child care workers (Friedmann, 2012). Empirical testing of the effectiveness of such strategies can potentially aid in the reduction of career genderization.

As care-related jobs are usually associated with emotions and social sensitivity, some studies suggest that high cognitive load, an important factor in creating stereotype threat-related underperformance in math-related settings, can facilitate social sensitivity processing (Ambady & Gray, 2002; Koenig & Eagly, 2005). The difference in how cognitive load affects social sensitivity processing may speak to a need for a modification in the integrated process stereotype threat model when it is applied to non-analytical domains, as the effects may differ when the outcome of interest is less analytical and more intuitive. Further studies on how the role of cognitive load can vary depending on the type of negative stereotype (i.e., math-related or care-related) can provide more insight in the matter.

### Conclusion

Advocates for men in care-related jobs and women in math-related jobs are all equally concerned about the effects of genderizing careers (Reeves, 2001; Rohn, 2010). However, they are not unrelated issues. The larger task at hand is to reduce the genderization of careers and focus on strategies that can aid in the reduction of the effects of genderization as whole, rather than a piecemeal fashion (see Inzlicht et al., 2011 for recommendations with regards to women and math).

However, there appears to be a silver lining, especially with regards to women and math. A longitudinal study of mathematically precocious youth over the span of 35 years showed that fewer mathematically precocious women entered math and sciences compared to men, but women still held high status careers that extended beyond just math and science careers to include law, medicine, and social sciences (Lubinski &

Benbow, 2006). Both men and women reported satisfaction with life choices, and viewed themselves as being equally successful to the other gender (Lubinski & Benbow, 2006). The authors posit that the lack of women is not a loss of talent, but a diversification of contribution within society (Lubinski & Benbow, 2006). It is unclear whether this premise can be applied in relation to men and care careers, but future studies can examine whether men holding high positions in care-related fields show similar satisfaction with their careers. Taken in a more general context, the longitudinal study showed that it is important to encourage boys and girls to choose career paths that are reflective of their abilities and skills, rather than based on gender-related expectations.



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## APPENDIX A

## LIST OF CAREERS IN CAREER CATEGORIZATION TASK

1. Biological scientist
2. Software engineer
3. Midwife
4. Mathematician
5. Animal caretaker
6. Audio engineer
7. Counselor
8. Electrical engineer
9. Dental hygienist
10. Economist
11. Veterinarian
12. Personal shopper
13. Special education teacher
14. Interpreter
15. Telemarketer
16. Instructor
17. Web developer
18. Translator
19. Choreographer
20. Credit analyst
21. Social worker
22. Hairstylist
23. Travel agent
24. News reporter
25. Wait staff
26. Massage therapist
27. Psychologist
28. Human Resource Manager
29. Childcare worker
30. Lawyer
31. Geologist
32. Bartender
33. Nurse
34. Dietician
35. Librarian
36. Elementary school teacher
37. Secretary
38. Homemaker
39. Singer

40. Editor
41. Actuarial scientist
42. Proofreader
43. Neuroscientist
44. Personal care aid
45. Pilot
46. Hospice caretaker
47. Flight Attendant
48. Cook
49. Physicist
50. Statistician
51. Paediatrician
52. Baker
53. Speech Therapist
54. Home Care Assistant
55. Nanny
56. Accountant
57. Chemist
58. Aerospace engineer
59. Mining engineer
60. Reporter
61. Financial Analyst
62. Artist
63. Computer scientist
64. Writer
65. Computer architect
66. Photographer
67. Administrative Assistant

## APPENDIX B

## LIST OF CONCEPTS FOR IAT

Self-related concepts: I, me, myself, mine

Other-related concepts: They, them, their, other

Math concepts: Complex, exact, factual, systematic, logical, formal

Care concepts: Nurturing, caring, sensitive, loving, friendly, warm





## APPENDIX D

## POST STUDY AND DEMOGRAPHICS QUESTIONNAIRE

Please answer the following questions:

Age:

Sex: Male / Female / Other

Sexual Orientation: Heterosexual / Homosexual / Bisexual / Other (please specify: \_\_\_\_\_)

Major:

Minor (if any):

Classification: Freshmen / Sophomore / Junior / Senior / Other (please specify: \_\_\_\_\_)

Ethnicity: European American or White / African American or Black / Asian American  
or of Asian descent / Hispanic or Latino American / American Indian or Alaska Native /  
Native Hawaiian or other Pacific Islander / Mixed ethnicity (please specify: \_\_\_\_\_) /  
Other (please specify: \_\_\_\_\_)

On scale of 1 (TOTALLY DISAGREE) to 7 (TOTALLY AGREE), please answer the following questions:

1. In your opinion, do **men** in general have more difficulties than **women** in care-related activities (e.g., nursing, preschool teaching, or social work)?
2. In your opinion, do **women** in general have more difficulties than **men** in math-related activities (e.g., physics, statistics, or engineering)?

3. In your opinion, do **women** in general have more difficulties than **men** in care-related activities (e.g., nursing, preschool teaching, or social work)?
4. In your opinion, do **men** in general have more difficulties than **women** in math-related activities (e.g., physics, statistics, or engineering)?

On scale of 1 (VERY BAD) to 7 (VERY GOOD), please answer the following questions:

1. How good do you think you are in math-related activities compared to someone of the other gender?
2. How good do you think you are in care-related activities compared to someone of the other gender?

Specifically, what did you think this study is looking at?

Have you heard of stereotype threat before?

What do you think stereotype threat is?

Have you participated in a similar study before?

Have you heard anything about this study before?

Do you have any additional comments concerning this study?

APPENDIX E  
INFORMED CONSENT  
**UNIVERSITY OF NORTHERN IOWA**  
**HUMAN PARTICIPANTS REVIEW**  
**INFORMED CONSENT**

Project Title: Differences in Career Choices.

Name of Investigator(s): Asha Ganesan

**Invitation to Participate:** You are invited to participate in a research project conducted through the University of Northern Iowa. The University requires that you give your agreement to participate in this project. The following information is provided to help you make an informed decision about whether or not to participate.

**Nature and Purpose:** The researcher intends to examine the differences in career choices.

**Explanation of Procedures:** First, you will be asked to make certain career choices. Then, you will be asked to complete a questionnaire followed by another timed task. Finally, you will be asked to complete a few demographic questions and some study-related questions. This study will take approximately 30 minutes. The data will remain anonymous.

**Discomfort and Risks:** Risks to participation are similar to those experienced in day-to-day life.

**Benefits and Compensation:** There will no direct benefits or compensation that you will receive from participating in this research.

**Confidentiality:** Information obtained during this study which could identify you will be kept confidential. The summarized findings with no identifying information may be published in an academic journal or presented at a scholarly conference. The survey program collects computer IP addresses. These will be deleted prior to data analysis and

will not be linked back to you. However, no guarantees can be made regarding the interception of data sent via the Internet by any third parties.

**Right to Refuse or Withdraw:** Your participation is completely voluntary. You are free to withdraw from participation at any time or to choose not to participate at all, and by doing so, you will not be penalized or lose benefits to which you are otherwise entitled.

**Questions:** If you have questions about the study or desire information in the future regarding your participation or the study generally, you can contact Asha Ganesan at [ganesana@uni.edu](mailto:ganesana@uni.edu) or the faculty advisor, Dr. Helen Harton at [helen.harton@uni.edu](mailto:helen.harton@uni.edu), at the Department of Psychology, University of Northern Iowa. You can also contact the office of the IRB Administrator, University of Northern Iowa, at 319-273-6148, for answers to questions about rights of research participants and the participant review process.

**Agreement:**

**I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. I am 18 years of age or older.**

**Name:**

**Signature:**

## APPENDIX F

## GENDER-BASED CAREER RATINGS QUESTIONNAIRE

How feminine or masculine would you categorize the following careers as? Please use the following scale: 1 (Masculine) to 7 (Feminine).

1. Biological scientist
2. Software engineer
3. Midwife
4. Mathematician
5. Animal caretaker
6. Audio engineer
7. Counselor
8. Electrical engineer
9. Economist
10. Veterinarian
11. Personal shopper
12. Special education teacher
13. College Instructor
14. Web developer
15. Credit analyst
16. Social worker
17. Hairstylist
18. Wait staff
19. Psychologist
20. Childcare worker
21. Geologist
22. Nurse
23. Librarian
24. Elementary school teacher
25. Secretary
26. Homemaker
27. Actuarial scientist
28. Neuroscientist
29. Personal care aid
30. Pilot
31. Hospice caretaker
32. Physicist
33. Accountant
34. Statistician
35. Paediatrician

36. Home Care Assistant
37. Nanny
38. Chemist
39. Aerospace engineer
40. Mining engineer
41. Financial Analyst
42. Computer scientist
43. Computer architect

APPENDIX G  
DEBRIEFING STATEMENT

Thank you very much for your participation in this research. You were told before participating that this research is looking at differences in career choices. More specifically, the purpose of this study was to look at how different groups of people choose certain careers depending on the type of information they are given. This is expected to vary based on how people view themselves.

The details of the study's purpose were not told to you before the study began so that you are not influenced by the true purpose while selecting the career choices.

**We're continuing to collect data on this study, so please do not share what have you have done here with other students. If anyone were to ask you, you can tell them you participated in a study looking at career choices and you had to do a career categorization task.**

If you would like more information on this research, please contact the researcher, Asha Ganesan (ganesana@uni.edu) or the faculty advisor, Dr Helen Harton (helen.harton@uni.edu).

If you have any concerns about your rights as a participant in this experiment or have any ethical issues you would like to clarify, please contact the IRB Administrator, University of Northern Iowa, at 319-273-6148.

Thank you for your participation.

## APPENDIX H

### STUDY PROTOCOL

#### Study Conditions

There are four conditions in total. All conditions will categorize careers across three different domains which are math, care, and neutral (a repeated measures factor). All conditions will also complete the career categorization twice, which adds the repeated measures factor of time (i.e., Time 1 and Time 2).

The following are the conditions based on the independent factors of gender of participants and type of stereotype threat:

- I. Condition 1: Men – men-care threat
- II. Condition 2: Men – no threat
- III. Condition 3: Women – women-math threat
- IV. Condition 4: Women – no threat

#### Study Procedure

- I. Participants will be recruited via the SONA system.
- II. On the specific session day, upon arrival, participants will be randomly assigned to a computer. The following instructions will be read by the experimenter:

*Thank you for being a part of this study. The purpose of this study is to examine differences in career choices. This study is a joint collaboration between the Department of Psychology and UNI's career advising center. You will begin with a career categorization task, followed by a short questionnaire of your interests.*



*Then, for the next part of the study, you will complete a series of questions assessing different factors in future career choices. The whole study is expected to take around 30 minutes. Please make sure you have read through the informed consent form in front you.*

*Before starting the study, I would like to remind you not to press the “BACK” button on your browser as this would disrupt the data collection process in the study. If you have any questions, please don’t hesitate to ask me. Please read the instructions for each task carefully before beginning the task. Thank you and you may begin the study.*

- III. They will provide written informed consent.
- IV. The session on the computer will begin after this, with the following sequence:
  - A. Career categorization task (at Time 1) including math, caring, and neutral careers. Measurements taken:
    - 1. Reaction times to categorizing careers
    - 2. Explicit categorization of careers
  - B. Domain identification questionnaire
  - C. Participants will be shown one of the following instructions prior to progressing to the next task (separated by conditions, to which participants will be randomly assigned):
    - 1. For women:
      - a. No threat: *As a second part of the study, you will complete a series of questionnaires assessing different factors in*

*future career choices, in addition to a few questions assessing your abilities in certain domains.*

- b. Women-math threat cue: *As a second part of the study, you will complete a series of questionnaires assessing different factors in future career choices, in addition to a few questions assessing your abilities in certain domains. The purpose of this section of the study is to understand why women are not as successful as men in math-related careers.*

2. For men:

- a. No threat: *As a second part of the study, you will complete a series of questionnaires assessing different factors in future career choices, in addition to a few questions assessing your abilities in certain domains.*
- b. Men-care threat cue: *As a second part of the study, you will complete a series of questionnaires assessing different factors in future career choices, in addition to a few questions assessing your abilities in certain domains. The purpose of this section of the study is to understand why men are not as successful as women in care-related careers.*

- D. Career categorization task (at Time 2) including math, caring, and neutral careers AND the IAT for self-other and math-care concepts, but the order will be randomly determined.
- E. Ratings of complete list of careers on whether a man or woman would be better suited for the careers.
- F. Post study questionnaire and demographics.
- G. Debriefing