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# Exploring Gender Identification Effects on Stereotype Threat

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Exploring Gender Identification Effects on Stereotype Threat

Lauren Westendorf

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of the  
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in Psychology

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Table of Contents

Abstract ..... 5

Introduction..... 6

    Techniques for Reducing Stereotype Threat..... 8

    Implicit Identity and Stereotype Threat ..... 11

    Levels of and Variations in Gender ..... 14

Method ..... 17

    Participants ..... 17

    Materials ..... 18

        Gender identity Implicit Association Task ..... 18

        Explicit gender measures ..... 18

            Collective Gender Self-Esteem Scale ..... 18

            Public Collective Gender Self-Esteem..... 19

            Gender Self-Esteem ..... 19

            Gender Identification Importance ..... 19

            Gender Affinity ..... 20

            Personality Femininity and Masculinity ..... 20

            Feminine and Masculine Socialization ..... 20

        Stereotype threat prime ..... 21

        Spatial cognition tasks ..... 21

        Demographics and manipulation checks ..... 22

    Procedure ..... 22

Results..... 22

    Gender group differences..... 23

    Analyses of variance ..... 23

    Explicit gender correlations ..... 24

    Explicit and implicit gender correlations ..... 25

    Gender and spatial rotation correlations ..... 26

Discussion ..... 27

References..... 34

Tables ..... 39

Table 1: Number and Gender of Participants By Recruitment Type.....	39
Table 2: Cross Tabulation of Gender Identity and Experimental Condition.....	40
Table 3: T-Tests for Mean Difference on Gender and Performance Measures.....	41
Table 4: Cronbach’s Alpha Reliability for Gender Measures.....	42
Table 5: Means Across Conditions for Gender Groups and Total Sample.....	43
Table 6 :Correlations Among Gender Measures.....	44
Table 7: Correlations Among Gender Measures.....	45
Table 8: Correlations Among Gender Measures.....	46
Table 9: Correlations Between Gender Measures and Spatial Rotation.....	47
Appendices.....	48
Appendix A: Gender Identity Definitions.....	48
Appendix B: Category Labels and Stimuli for the Implicit Association Test.....	50
Appendix C: Transcript of Instructions for Experimental Conditions.....	51
Appendix D: Collective Self-Esteem Statements and Subscales.....	54
Appendix E: Bem Sex Role Inventory Descriptors.....	55
Appendix F: Gender Importance Statements.....	56
Appendix G: Gender Affinity.....	57
Appendix H: Sample Object Memory Array.....	58
Appendix I: Sample Spatial Rotation Trial.....	59
Appendix J: Demographics Questionnaire and Gender Socialization Measures.....	60

### Abstract

Stereotype threat impairs performance in situations where a stereotype holds that one's social group will perform poorly. A study of women's college students examined whether this effect influenced performance on spatial cognition tasks when participants were presented with threat on the basis of gender socialization. Transgender and cisgender participants, all designated female at birth, were randomly assigned to one of four stereotype threat conditions and were asked to complete two spatial cognition tasks. Three of the conditions described the task as traditionally displaying gender differences favoring males, due to differences in gender socialization of young boys and girls. Of those three, one empowered all participants through their identity as a women's college student, and another empowered non-cisgender participants through their non-female identity. Participants also completed measures of implicit and explicit gender identity. Stereotype threat was predicted to decrease performance of cisgender and non-cisgender participants in the classic threat condition, but not in the women's college empowerment condition. Performance was expected to vary as a function of gender identity in non-cisgender empowerment condition. Implicit and explicit gender identification were also predicted to correlate. No significant effect of condition was found. The relation between implicit gender identification and different measures of explicit gender varied for cisgender and non-cisgender participants. Discussion includes consideration of framing factors that may have influenced results for the two groups.

*Keywords:* stereotype threat, gender identity, implicit gender, transgender

### Exploring Gender Identification Effects on Stereotype Threat

Imagine the first female student admitted to Yale in 1969, the year the university became co-ed. Walking into her multivariable calculus class as the only woman in a room full of men, she is the only representation of her gender in a sea of stereotypes pushing against her. If she is not successful, her failure will serve to reinforce these beliefs, and this threat is present in every question she asks or problem she attempts. Her identity is threatened, and this threat will persist throughout this class, her college years, and as long as those stereotypes exist. Social identity theory states that identity is multifaceted, extending beyond how we see ourselves as individuals to include how we perceive ourselves as a member of various social categories, such as gender. People are motivated to preserve positive social identities because a threat to a social identity via unfavorable comparison to an out-group is akin to the threat of being compared to another individual unfavorably (Tajfel, 1981; Tajfel & Turner, 2004). Stereotypes, because they implicitly contrast one group to others, create the potential for social identity threat. Thus, the mere presence of negative stereotypes can lead an individual to feel that their positive self-identity is being threatened, which may lead to unintended consequences that could ironically perpetuate the stereotype an individual is justly anxious about.

Stereotype threat arises from the fear of confirming a negative stereotype about one's social group. If negative stereotypes are salient for a specific group, members of that group tend to become anxious about confirming these negative stereotypes, which in turn inhibits their ability to perform at their highest capacity (Steele & Aronson, 1995). Further research has supported the theory that the discrepancy between an individual's true potential for achievement and their worsened performance under stereotype threat can be explained by the anxiety about performance that arises from stereotype threat. Osbourne (2001) found that anxiety accounted for

41% of racial group-level differences between Whites and Latinos and Whites and African Americans, with regard to academic performance. Stereotype threat can be the result of situational pressure alone, and does not necessarily need to be a product of internalized feelings of inferiority or a history of stigmatization. As evidence of this, white men performed more poorly on a math test, due to stereotype threat, when compared to Asian American men, a minority group stereotyped to excel in math (Aronson, Lustina, Good, Keough, Steele, & Brown, 1999).

Despite the large research literature on stereotype threat as a function of race, stereotype threat is not only activated when racial stereotypes are activated. Due to prevalent attitudes associating women with poor math aptitude and ability, gender is a stigmatized identity in the context of math performance and thus susceptible to stereotype threat. Indeed, research has suggested that women perform worse on difficult tests when told that the test has produced significant gender differences in performance, specifically when gender stereotypes about women's lower performance already exist for that type of test (Spencer, Steele, & Quinn, 1999). This effect has been replicated not only in the lab, but also in the field, even within populations of highly motivated and successful women intending science and mathematics professions. Good, Aronson, and Harder (2008) compared performance on test items from the Graduate Record Examination (GRE) for upper level college mathematics students and found that, in a control group, men and women performed equally well, but in a stereotype-nullifying condition where the GRE was explicitly presented as free of gender differences, women outperformed their male counterparts in that condition, as well as both male and female participants in the control condition. This result implies that stereotype threat may inhibit even high achieving women in the academic pipeline for mathematics professions.

### **Techniques for Reducing Stereotype Threat**

Because the mechanism through which stereotype threat appears to operate involves a threat to one's social identity, there are several effective techniques to reduce stereotype threat effects by decreasing the identity threat for particular individuals. First, stereotype threat can be reduced by "boosting" the stigmatized identity: that is, by reminding participants that a stereotype is just that, a stereotype, that does not apply to all or even most individual members of their social group. In one study, reminding female participants of the achievements of other women alleviated stereotype threat. These achievements were made salient by either stating that females make better research participants or by having participants read about four women who had achieved success in architecture, law, medicine, and invention (McIntyre, Paulson, & Lord, 2003). Similarly, another study suggests that female math performance can be buffered from stereotype threat by the presence of a competent female experimenter during testing (Marx & Roman, 2002).

In addition to identity boosting, stereotype threat can be reduced by reframing achievement such that it is no longer attached to the salient stereotype. In a 2002 study, Aronson, Fried, and Good found that, by reframing the concept of intelligence as malleable, African-American college students experiencing stereotype threat showed increased academic performance, engagement, and enjoyment. Through this reframing, the salient stereotype was no longer threatening, since the definition of achievement had been altered and was no longer unattainable. This effect has similarly been replicated with female, minority, and low-income adolescents (Good, Aronson, & Inzlicht, 2003).

Another strategy of stereotype threat reduction is to dissociate the individual from the stigmatized identity. Research by McGlone and Aronson (2006) suggests that reminding members of stigmatized groups of their membership in groups for which there are positive performance expectations can mitigate stereotype threat. Priming different social identities before the Vandenberg Mental Rotation Test, a standardized test of spatial reasoning, confirmed this hypothesis. Reminding students of achieved identities—those earned through merit (i.e. private college student) as opposed to ascribed beyond their control (i.e. race, sex)—subdued threat created by negative stereotypes about other social identities, such as gender. Additionally, this effect is not only found for achieved identities, but for ascribed identities as well. Shih, Pittinsky, and Ambady (1999) found that highlighting different social identities within the same individual—specifically gender and ethnicity in Asian American females—could moderate performance. Priming of gender identity caused detrimental effects on math performance as compared to the control condition, while priming of Asian identity actually improved performance, although attempts to replicate these effects have produced mixed results (Gibson, Losee, & Vitiello, 2014; Moon & Roeder, 2014).

Affirmation and adjustment of group identity is not the only method of buffering performance. Individual self-affirmation can also bolster performance in the face of stereotype threat. Martens, Johns, Greenberg, and Schimel (2006) found that, consistent with the stereotype threat literature, female participants primed with stereotype threat performed more poorly on a difficult math test than female participants in a similar control condition free of salient stereotype threat. However, researchers also found that affirming a valued attribute diminished stereotype threat and led to equal performance between the two groups. This self-affirmation was only

effective in improving the performance of women under threat and not of men completing the same task.

This lack of improvement on male performance implies that affirmation does not lead to general improved performance, but is instead specifically decreasing stereotype threat.

Stereotype reduction through empowerment has also proven effective specifically within a sample of women's college students. A previous study conducted in a research methods course at Wellesley College found that Wellesley students, despite their status in a female dominated environment with an emphasis on female achievement, were nonetheless susceptible to stereotype threat (Westendorf, Irons, & Sit, 2014). Participants in the study were randomly assigned to read sample admissions letters that primed the college environment as empowering, competitive, both, or neither. Participants in all four conditions were then exposed to stereotype threat and asked to complete several logic tests. Participants in a fifth, control condition were not exposed to either prime or stereotype threat. Only participants in the empowerment present condition did not display decreased performance due to stereotype threat as compared to the control condition.

Reframing the threat as a challenge can also reduce stereotype threat effects. In a 2010 study, stereotype threat was induced by asking Black school children to report race before completing a math test (vs. reporting after the test) and by reminding undergraduates that they graduated from high schools that are poorly represented at their prestigious university. In both cases, stereotype threat was diminished or eliminated when the threat was subtly phrased as a challenge, suggesting that perhaps competition could help to reduce stereotype threat if phrased as a challenge (Alter, Aronson, Darley, Rodriguez, & Ruble, 2010). The presence or absence of

negative consequences has also been shown to contribute to whether a situation is perceived as a threat or a challenge (Keller & Bless, 2008).

### **Implicit Identity and Stereotype Threat**

So far, only effects of conscious group identity have been discussed as a moderator of stereotype threat effect, but implicit attitudes can also affect the extent to which a threat affects performance. Implicit attitudes are unconscious cognitive processes whereby a thinker's judgment is unintentionally influenced by past experience (Greenwald & Banaji, 1995). Implicit attitudes manifest in actions or judgments influenced by an unconscious and automatically activated evaluation. The Implicit Association Test (IAT) seeks to measure implicit attitudes through the differential association of two concepts with an attribute (Greenwald, McGhee, & Schwartz, 1998). This task assumes that it is cognitively easier to pair two concepts that are more closely associated on an implicit level than two that are not, and compares the relative strength of association of two concepts and their converse via reaction time. The IAT has been proven sensitive to various types of evaluative differences, including those that are nearly universal (flower/insect and pleasant/unpleasant), those expected to display individual differences (male/female with self/other for male and female participants), and those consciously disavowed (black/white and pleasant/unpleasant for explicitly unprejudiced subjects). For example, most people have strong implicit associations between flowers and pleasant words, and insects and unpleasant words, relative to flower/unpleasant and insect/pleasant associations. As a result, they are faster to associate the first two pairings, and the difference in reaction times when asked to associate the first two in comparison to the second two provides the measure of implicit association.

As it has gained credibility, the use of the IAT has become much more common in recent decades for the access of implicit attitudes, specifically to measure evaluative attitudes, stereotypes, and identity. Evaluative attitudes are measured with an IAT using two contrasting concepts, such as weapons and harmless objects, with pleasant and unpleasant words. Such an IAT would theoretically reveal a participant's implicit attitudes toward weapons in comparison to harmless objects. Stereotypes can be measured with an IAT pairing a concept pair, such as weapons and harmless objects, with contrasting social groups, such as white and black faces. This IAT would compare the strength of implicit association an individual possesses with regards to weapons/Black and harmless objects/White versus weapons/White and harmless objects/Black. Another type of IAT to measure a more general implicit evaluation of a social group as compared to another could include Black/White faces and pleasant/unpleasant words. The last category mentioned, identity, is measured with an IAT pairing a concept or social group with the concepts self and other. For example, a Black/White identity IAT would include Black/White faces, as well as words like "me" and "myself" for self and "they" and "them" for other. The results of this IAT would reveal the preferential implicit association that an individual held for the Black or White social group with regards to their own identity. This access to implicit attitudes, stereotypes, and identity has open the door for new research directed toward understanding how these associations can have an unconscious effect on stereotype threat effects.

Kiefer and Sekaquaptewa (2006) found that the effect of implicit gender-math stereotyping, as measured by a male/female and math/humanities IAT, significantly moderated stereotype threat effects on math performance, such that stronger associations between mathematics and males predicted higher levels of stereotype threat and decreased performance,

regardless of the strength of association between the concepts of self and gender or of self and math. In a second study, implicit stereotyping was found to interact with explicit gender identification, measured by a modified version of Lutanen and Crocker's (1992) collective self esteem subscale, such that women low in both factors performed better than women high on one or both factors. (Kiefer & Sekaquaptewa, 2007).

Nosek, Banaji, and Greenwald (2002) used several different IATs to explore associations between gender and math. The first was a math attitude IAT, which compared the associations of math (vs. arts) with positive and negative attributes. The second was a math identity IAT, comparing associations of math (vs. arts) with self/other. The third, a math-gender stereotype IAT, assessed the speed of association with math and the concepts of male/female. The final IAT explored gender identity and compared pairings of male/female with the concepts self/other. Negative attitudes toward math and a stronger association of males and math were found in both male and female participants. In fact, the interaction of implicit stereotypes and explicit gender identification significantly predicted implicit and explicit math attitudes as well as implicit gender identity and explicit math performance, as measured by SAT scores. Stronger associations between male/math, indicative of stronger stereotypes, combined with explicit female gender identification to predict negative implicit and explicit math attitudes, implicit association with the female gender, and lower SAT scores. The implicit strength of female identity was also associated with increased math negativity and decreased math-female identification.

This is not the only study to employ the IAT as a means to measure strength of gender identity implicitly. Aidman and Carroll (2003) utilized both a gender attitude IAT and a gender identity IAT to find that, in a sample of college students, female participants exhibited gender

bias, which was significantly associated with their implicit gender identity. Positive correlations were found in both studies between explicit and implicit gender identity (Nosek, Banaji, & Greenwald, 2002; Aidman & Carroll, 2003).

In relation to stereotype threat, previous research suggests that gender identification strength—the extent to which an individual associates themselves with their gender—may moderate stereotype threat effects. Schmader (2002) found that women who placed greater importance on gender identity performed more poorly than their male counterparts on a stereotype relevant task when primed with stereotype threat, but those who placed less importance on gender identity or who were not primed with stereotype threat showed no difference in comparison to male participants.

### **Levels of and Variations in Gender**

Although compelling, current research on implicit and explicit gender correlation is confined to research with participants identifying within the gender binary, despite research outside the field supporting the notion that gender extends beyond the male-female binary. In contemporary Western discourse, the terms *sex* and *gender* are often conflated through interchangeable usage, particularly in casual conversation, despite describing distinct and arguably entirely discrete concepts (Diamond, 2002). The term *sex* is the biological designation of a person as male, female, or intersex (having both male and female characteristics) on the basis of anatomical characteristics (Newman, 2002). *Gender*, on the other hand, is a social and psychological construct encompassing roles and cultural representations that are imposed on or adopted by an individual. *Gender assignment* is the act by which an individual is assigned a gender, which in most cultures, occurs at birth (Bornstein, 1994). These assignments include designated female at birth (DFAB) and designated male at birth (DMAB). In the traditional

binary model, there are two sexes and two genders, and ‘normality’ is described as the conformation of gender to sex, despite the two concepts remaining analytically distinct (Newman, 2002). Occasionally, however, this gender assignment at birth does not align with an individual’s *gender identity*, what gender they feel themselves to be. In this case, when one’s gender identity and assigned sex are incongruent, the term *transgender* is used (Serano, 2007). This umbrella term encompasses a variety of more specific and occasionally overlapping categories including *transsexual* (identifying as and transitioning to the opposite sex than that assigned at birth), *genderqueer* or *non-binary* (identifying as neither male or female), and *genderfluid* or *bigender* (identifying as both male and female in varying contexts). Conversely, the term *cisgender* refers to those individuals whose gender identify conforms to their gender assignment at birth.

Explicit, or conscious, gender is comprised of more than just nominal gender identity. There are many aspects to explicit gender identity that have been studied in a wide range of studies. The Bem Sex Role Inventory (BSRI) has been used to measure how stereotypically masculine and feminine a person’s personality is by asking individuals to rate the extent to which they believe stereotypically masculine or feminine personality traits describe them (Bem, 1981). Group membership, a concept studied in the context of various social groups, has previously been measured with the Collective Self-Esteem Scale (CSE), which indexes several aspects of group membership self-esteem (Luhtanen & Crocker, 1992). The questions on the CSE are divided into four subscales measuring an individual’s perceived worthiness as a member of their social group, their personal or private evaluation of their social group, their perceptions of how other’s perceive their social group, and the importance of their social group membership to their overall identity. In addition to the last CSE subscale, gender identification importance has been

measured by measuring individual's agreement with various statements regarding gender importance, such as *I often think of myself in terms of my gender* (Wilson & Liu, 2003).

Gender affinity, another aspect of explicit gender identity, is the extent to which an individual would like to be a member of and considers themselves to be similar to a particular gender group (Damburn, Duarte, & Guimond, 2004).

There are many different aspects of explicit gender that are being explored in current research, and some researchers are specifically interested in targeted aspects, which then guides their choice in measure. Previous research has not examined the specific correlations among these measures and there is presently no standard measurement for explicit gender. If all of these constructs and measures are indeed part of a higher order construct of explicit gender identity, then we would predict that they would all correlate positively. Currently, however, there is little theory and even less evidence about how they should relate; thus, including all of these constructs will allow us to explore the extent to which they converge on the same central concept, or seem to be getting at importantly different concepts.

As highlighted previously, current research suggests the implicit and explicit gender identity are related, but the literature is limited. Furthermore, what little research that does exist focuses exclusively on cisgender samples. Research and discussion of implicit transgender identity is important by itself, but it is especially relevant to understanding gender socialization as it relates to vulnerability to stereotype threat. Despite varying gender identification, DFAB participants by definition were all assigned female as their gender at birth, and were thus also likely to have been socialized as female in early childhood, the stage in development when gender norms are introduced. Because of this, it is possible that DFAB individuals of all gender identities are susceptible to stereotype threat when it is invoked on the basis of gender

socialization. That is, if a task is framed as one that produces gender differences on the basis of how you were socialized as a child, as opposed to current gender identity, even those who do not identify as female may display the detrimental performance effects of stereotype threat. DFAB transgender participants can serve as an important contrast to cisgender females in the effort to sort out the role of early gender socialization as it relates to stereotype threat. Furthermore, as mentioned previously, highlighting other, non-stigmatized identities can protect against stereotype threat, so priming current gender identity or identity as a women's college student may serve to diminish these negative effects, thus providing insight into the possibility of stereotype threat effects based on past experience being diminished by current identity.

The objective of this study is to examine the effect of gender identification on stereotype threat susceptibility in a women's college environment. I hypothesize that participants, all of whom were socialized in early childhood as female, will be susceptible to stereotype threat under some conditions, and that this effect will be reduced through priming of the empowerment aspect of their private college student identity. I also expect that participants with a more female gender identity, or for whom their female identity is more important, will be more susceptible to stereotype threat. Additionally, I expect that non-cisgender students will not be susceptible to stereotype threat when non-female gender identities are empowered. Furthermore, I expect that there will be a positive correlation both between explicit and implicit measures of gender identity and among measures of explicit gender identity.

## **Method**

### **Participants**

A total of 193 women's college students participated in this study. 19 participants were excluded from analysis due to incomplete data. 53 female undergraduate students from

Wellesley College, enrolled in 100- and 200-level psychology courses at Wellesley College, participated for course credit. An additional 93 students from Wellesley College, 10 students from Smith College, and 2 students from Mount Holyoke College completed the study for payment. In addition to these 158 in-person participants, 16 current Wellesley College students and recent Wellesley College alumni completed the study online for payment. All participants were designated female at birth, and of the 174 participants with complete data, 136 self-identified as female, 7 self-identified as (trans)male, 29 self-identified as gender-nonconforming (i.e., they checked “other” and then wrote in their preferred status designation), and 2 chose not to disclose their gender, but indicated with their pronouns that they were not cisgender. 52 first-years, 48 sophomores, 25 juniors, 46 seniors, and 3 alumni participated. Six participants were transfer students and one student was a Davis Scholar. Number and gender of participants by recruitment type and cross tabulation of gender identity and experimental condition can be found in Tables 1 and 2, respectively.

## Materials

**Gender identity Implicit Association Task.** The Implicit Association Test (IAT; Greenwald et al., 1998) was used to measure implicit gender identity. This interactive, computerized task combined two semantic discrimination tasks—discriminating between *self/other* word categories and *male/female* word categories—and was designed to assess the strength of automatic association between *self* and *male/female*. As is detailed in the appendix, *self* words included *I, Me, My, Mine, Myself*, while *other* words included *They, Them, Their, Theirs, Themselves*. *Male* words included *He, Him, His, Himself*, and *Masculine* and *female* words included *She, Her, Hers, Herself*, and *Feminine*. After practice trials with each of the two discrimination tasks separately, they were combined into a single task with one category label

from each concept on the both the left-hand and right-hand side of the screen (e.g. *male* and *self* on the left hand side and *female* and *other* on the right hand side. Participants were presented with a randomly selected target word from one of the two categories and asked to select the key that corresponded to the correct side of the screen. The *male* and *female* category labels were then switched and, after a single category practice trial, participants were once again asked to complete a combined category trial. Implicit gender identity is interpreted as the discrepancy in response time for the two combined trials (Farnham et al., 1999). Scores on the IAT have a theoretical range from -2 to +2, with negative scores indicating a higher association with male and self, and positive scores a higher association with female and self. The actual range of scores for this sample was -.96 to 1.39.

**Explicit gender measures.** The explicit gender measure questionnaire was designed specifically for this study as a means of measuring facets of self-declared gender identity. The questionnaire was composed of explicit gender measures adapted from four previous studies.

**Collective Gender Self-Esteem Scale.** Participants first completed a gender specific adaptation of Luhtanen and Crocker's Collective Self Esteem Scale (CSE; Luhtanen & Crocker, 1992) addressing four aspects of gender group self-esteem. Participants rated their agreement with statements about gender on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree). Each statement from the questionnaire falls into one of four subscales—Membership Self-Esteem (how one feels about their worthiness as a member of their gender; e.g., *I am a worthy member of the gender I identify with*), Private Collective Self-Esteem (one's personal evaluation of their gender group collectively; e.g., *I feel good about the gender I identify with*), Public Collective Self-Esteem (one's perception of how others perceive their gender group collectively; e.g., *Overall, my gender is considered good by others*), and Importance to Identity (the importance of

one's gender group to one's overall identity; e.g., *The gender I identify with is an important reflection of who I am*). Responses for each subscale were averaged, resulting in four composite ranging from 1 to 7.

***Public Collective Gender Self-Esteem.*** The Public Collective Self-Esteem subscale from the Collective Gender Self-Esteem Scale comprises the *Public Collective Gender Self-Esteem* measure of one's perception of how others perceive one's gender. The measure had a theoretical range of 1 to 7, and an actual range of 1.75 to 7.

***Gender Self-Esteem.*** The Membership Self-Esteem and Private Collective Self-Esteem subscales from the Collective Gender Self-Esteem Scale were highly correlated ( $r$ 's  $> .75$  in the overall sample and cisgender participants,  $r = .51$  for non-cisgender participants). Therefore, the two scales were added to form the *Gender Self-Esteem* score used in analyses as a measure of positive feelings about one's gender. The resulting scores had a theoretical range of 2 to 14, and an actual range of 5.5 to 14.

***Gender Identification Importance.*** Participants were asked to rate the extent of their agreement with four statements about gender (i.e. *I often think of myself in terms of my gender*), adapted from Wilson and Liu (2003), on a 7-point Likert scale from 1 (Strongly Disagree) to 7 (Strongly Agree). Because they were highly correlated ( $r$ 's  $> .65$  in the overall sample and for both cisgender and non-cisgender participant groups separately), scores for the first three of these four statements were averaged into one score from 1 to 7 and summed with the Importance to Identity subscale from the Collective Gender Self-Esteem Scale to create the *Gender Identification Importance* measure used in analyses. The resulting scores had a theoretical range of 2 to 14, and an actual range of 2.33 to 14.

***Gender Affinity.*** Derived from Damburn, Duarte & Guimond (2004), participants rated, on four 7-point Likert scales from 1 (None) to 7 (A lot), the extent to which they “would like to be a member of a male/female group” and how much they consider themselves to ‘have in common with males/females’. These items combine to form the *Gender Affinity* scale, which measures how strongly a participant desires to be a part of a female versus a male group. Commonality with and desire to be a part of a male group were subtracted from communality with and desire to be part of a female group, respectively, two scores ranging from -6 to +6. These two scores were then averaged to create the Gender Affinity scale. The resulting scores had a theoretical range of 2 to 14, and an actual range of -3.50 to 6.

***Personality Femininity and Masculinity.*** Participants completed the Bem Sex Role Inventory (Bem, 1981) designed to assess self-reported stereotypically masculine and feminine personality traits by asking participants to rate themselves on a series of masculine (e.g., *Assertive*), feminine (e.g., *Sympathetic*), or androgynous/filler adjectives (e.g., *Happy*) on a scale from 1 (Never) to 7 (Always). The results for this measure form two scales, *personality femininity* and *personality masculinity*. Traditionally, these two scales are combined into a composite score (masculinity minus femininity), but the two were not correlated ( $r$ 's < .08 in the overall sample and for both cisgender and non-cisgender participant groups separately), suggesting that they represent two unipolar scales as opposed to a single, bipolar scale from masculine to feminine. Additionally, in previous literature, this scale has also been used to measure psychological androgyny (defined as being high on both masculine and feminine, as this sample is), but there are both conceptual and psychometric issues with that scoring. Thus, the two concepts will remain distinct for this study. Each scale had a theoretical range of 1 to 7, and an actual range of 2.75 to 6.35 for femininity and 3.2 to 6.3 for masculinity.

***Feminine and Masculine Socialization.*** In addition to the gender measures in the explicit gender questionnaire, the demographics questionnaire at the end of the study included two 7-point Likert scales measuring how stereotypically masculine and feminine participants consider their gender socialization as a child to be from 1 (*not at all*) to 7 (*very*). These two scores comprise the measures *Feminine Socialization* and *Masculine Socialization* and had actual ranges of 1 to 7 and 1 to 6 for this sample, respectively.

**Stereotype threat prime.** Participants were presented with one of four randomly assigned instructions that primed a stereotype threat condition. In the control condition, only the instructions for the task were given. In each of the three stereotype threat conditions, these instructions were appended with a statement highlighting possible gender differences in performance on these tasks, stemming from early stereotypical gender socialization: *“Tests like this traditionally produce gender differences favoring males. These differences develop from early stereotypical gender socialization—how teachers and parents teach boys to be boys and girls to be girls.”* In the first experimental condition, these were the only statements. In the second, the instructions also included a disclaimer that participants who do not identify as female do not show these effects. In the fourth condition, a different disclaimer was included, stating that students at women’s colleges do not show this gender effect. (Full text for each condition in Appendix C)

**Spatial cognition tasks.** Participants completed two types of spatial cognition tasks. In the first, an object location memory task adapted from James & Kimura (1997), participants were given one minute to study an array of objects. After the minute was up, they were then presented with a different array of the same objects, with some object location changes. Participants were asked to highlight the objects that had moved in red, and unmoved objects in green. This task

was repeated twice with different response object arrays. For the second spatial cognition task, a computerized version of the Revised Purdue Spatial Visualization Test (Yoon, 2011), participants were given twenty minutes to complete up to 30 spatial rotation tasks with multiple-choice responses. Two measures of spatial cognition were used to contrast stereotype threat effects on a task that typically shows gender differences (spatial rotation) and a task that does not (object memory location); however, comments from participants and examination of the data indicated that at least 35 participants did not follow the instructions for the object location memory task, so all spatial cognition scores used in analysis will come from performance on the spatial rotation task, referred to as *Spatial Rotation Performance*. Possible scores from this measure ranged from 0 to 30, with an actual range of 8 to 29.

**Demographics and manipulation checks.** Participants completed a demographics questionnaire including prompts for age, class year, status as a transfer student or Davis Scholar, gender identity, preferred gender pronouns, ethnicity, and the gender socialization measures, mentioned previously. Lastly, this section also included three manipulation checks (*What do you think is the major purpose of this study?; Did anything seem unusual, and if so, why?; Were you suspicious of anything?*). Most participants either believed the cover story or were only mildly suspicious of the purpose of the study. All participants who correctly identified the study as one of stereotype threat and gender identification were already excluded from analysis for incomplete data.

All measures can be found in the appendix.

## **Procedure**

Following the informed consent procedure presented by the researcher, participants performed the gender identity IAT and then completed all explicit gender measures. Next,

participants were randomly exposed to one of the four stereotype threat conditions via computerized task instructions. Following this prime, participants completed all spatial cognition tasks and then completed the demographics questionnaire. Participants were tested in groups of one to ten and were fully debriefed verbally immediately at the end of the testing session and a written debriefing was emailed or handed to participants after the session was over.

### Results

Responses from a total of 174 participants with complete data, 136 cisgender and 38 non-cisgender identifying, were used for data analysis. Means and standard deviations for all variables in each of the samples, along with the alpha values for each of the measures, can be found in Tables 3 and 4, respectively.

After reviewing each of the explicit gender subscales and combining highly correlated measures, t-tests were used to compare means on spatial rotation performance, implicit gender identity, and eight aspects of explicit gender identity for the cisgender and non-cisgender groups. Correlations among all ten of these measures were run for the full sample and for the cisgender and non-cisgender populations separately. A one-way ANOVA was run to test for the effect of condition, and a 2 x 4 ANOVA tested whether there was an interaction between gender identity and condition.

**Gender group differences.** Results from t-tests comparing cis-gender and non-cisgender participants can be found in Table 3. Cisgender participants scored significantly higher on Implicit Gender Identity, Gender Affinity, Gender Self-Esteem, and Public Collective Gender Self-Esteem than their non-cisgender counterparts. Thus, cisgender participants had a more female implicit gender identity, a stronger desire to be a part of a female group, greater self-esteem about the gender they identify with, and more positive judgments about how other's

perceive their gender. No significant differences in means were found for Personality Femininity/Masculinity, Feminine/Masculine Socialization, or Gender Identity Importance, suggesting that participants of both gender groups have similar levels of stereotypically feminine and masculine personality traits, rated their gender socialization as similarly feminine and masculine, and did not vary in the importance of their gender to their overall identity.

**Analyses of Variance.** A one-way ANOVA found no effect of condition on spatial rotation performance in the full sample or either of the gender subsamples. A 2x4 (cisgender x condition) ANOVA found a significant main effect of cisgender identity on spatial rotation performance, but there was no significant effect of condition on performance and no interaction effect. The lack of power due to our small sample may have contributed to this lack of significance, so the patterns of the means will be discussed later in the next section. Results of these tests can be found in Table 5.

**Explicit Gender Correlations.** Because of the large number of explicit gender measures, it is possible that some of the significant correlations found were due to a Type I error, but most discussed in this paper reached significance levels of at least  $p < .01$ , and that more stringent p-value provides some protection against Type 1 error. More generally, especially given the small number of non-cisgender participants in this study, focus in this project is on looking at whether there are coherent patterns of correlations that might be pursued in future work. The correlations among explicit gender measures can be found in Tables 6, 7, and 8. Gender Self-Esteem, a composite of Membership Self-Esteem and Private Collective Self-Esteem subscales from the modified Collective Self-Esteem scale, measures the extent to which a person feels positively about their gender, with more positive scores indicating higher Gender Self-Esteem and thus more positive feelings. Gender Self-Esteem correlated positively with Gender Affinity among

cisgender participants, but not among non-cisgender participants, suggesting that for cisgender participants, greater positive feeling toward the female gender is associated with a greater desire to be a part of a female group. The same correlational pattern was found between Gender Self-Esteem and both Personality Feminine and Personality Masculine. Ambiguous phrasing in the gender self-esteem measure may be a possible explanation for a lack of correlation among non-cisgender participants, and will be discussed later in the paper.

Masculine Socialization, on the other hand, correlated positively with Gender Self-Esteem for non-cisgender participants, but not for cisgender participants. This positive correlation implies that higher perceived masculine gender socialization is associated with higher gender self-esteem among non-cisgender participants. Feminine Socialization correlated positively with Gender Self-Esteem in cisgender participants, but negatively in non-cisgender participants. Thus, more feminine gender socialization is associated with more positive feelings about personal gender in cisgender participants, but with less positive feelings in non-cisgender participants. Finally, Gender Self-Esteem correlated negatively with Public Collective Self-Esteem, (i.e., judgments of how others perceive one's gender), in non-cisgender participants, but these variables did not correlate among cisgender participants. In other words, for non-cisgender participants, more positive feelings toward one's gender are associated with a more negative perception of how others view that gender.

Gender Self-Esteem, along with Personality Femininity, also correlated positively with Gender Identity Importance in cisgender, but not non-cisgender, participants. In other words, more positive feelings toward one's gender, as well as more stereotypically feminine personality traits, were associated with higher importance of gender to overall identity in cisgender participants but not non-cisgender participants. Therefore, the more positive a female feels about

her gender, the more important her gender is to her identity. Additionally, more stereotypically feminine personality traits were also associated with higher gender importance in females. Gender Identity Importance also correlated negatively with Gender Affinity in cisgender participants, but correlated positively with Gender Affinity in non-cisgender participants. The more important a person's gender is to their overall identity, the more they want to be a part of a female group if they are female, or the less they want to be a part of a female group if they are not female.

**Explicit and Implicit Gender Correlations.** Results from correlations between implicit gender and explicit gender measures can be found in Tables 7 and 8. Implicit Gender Identity, or a person's unconscious preferential association of self with female (positive scores) as compared to self with male (negative scores), correlates negatively with gender identity importance for non-cisgender participants, suggesting that those with less female implicit gender identity consider their gender to be more important to their overall identity. The opposite pattern, with a slightly smaller effect, was found for cisgender participants: the more female their implicit identity, the more important their gender was to their identity. Implicit Gender Identity also correlated positively with Gender Affinity and Personality Femininity in non-cisgender participants, but showed no correlation in their cisgender counterparts, implying that a more male implicit gender identity is associated with less desire to be a part of a female group and less stereotypically feminine personality traits in non-cisgender participants. The lack of positive correlation in cisgender participants may be due to a lack of relative variance in the Implicit Gender Identity for cisgender participants. In other words, because cisgender participants scored higher (more female) on the implicit identity measure, with less variance than the non-cisgender participants, there is little room for a correlation between the two variables for the cisgender

sample. Implicit Gender Identity had a very small positive correlation with gender identity importance in cisgender participants, but showed no other correlations.

**Gender and Spatial Rotation Correlations.** Results from correlations between spatial rotation performance and implicit and explicit gender measures can be found in Table 9. Personality Femininity and Feminine Socialization correlated negatively with Spatial Rotation Performance in non-cisgender participants, but showed no correlation in cisgender participants: lower levels of stereotypically feminine personality traits and less feminine gender socialization were associated with higher spatial rotation performance in non-cisgender participants. Masculine Socialization showed a similar pattern, correlating positively with performance in non-cisgender participants, so that more masculine perceived gender socialization was associated with higher spatial rotation performance. Implicit Gender Identity and Public Collective Gender Self-Esteem also showed a small negative correlation with Spatial Rotation Score in non-cisgender participants; thus, a more male implicit gender identity was associated with higher spatial rotation performance among these participants.

### **Discussion**

The initial purpose of this study was to analyze the effect of different types of stereotype threat on performance among cisgender and non-cisgender women's college students. The effect of condition was not statistically significant for the full sample or for the cisgender and non-cisgender subgroups separately. In a 2 x 4 analysis of variance, cisgender identity had a significant effect on spatial rotation performance, with non-cisgender participants scoring higher than cisgender participants; but again, the effect of condition was not significant, and neither was the interaction between cisgender identity and condition.

Nevertheless, the differing patterns of the means across conditions for the cisgender and non-cisgender participants, though not statistically significant, are intriguing. Currently, there is very little research on non-cisgender individuals in the context of stereotype threat, and the current sample is not very large (especially in the case of non-cisgender participants), which makes finding significant effects less likely. Given both of those considerations, it seems reasonable to explore the pattern of performance results in the service of future hypothesis generation, despite the lack of statistical significance. Among cisgender participants, performance on the spatial rotation task was higher in the traditional stereotype threat condition, but remained fairly constant across the control, the condition affirming women's college students, and the condition affirming non-cisgender individuals. For non-cisgender participants, mean performance was also slightly higher in the classic threat condition than in the control condition, but highest performance was found in both affirmation conditions. Non-cisgender participants performed best when their identity as either a women's college student or transgender individual was affirmed.

The performance increase in the classic threat condition as compared to the control condition for all participants could be due to a mental framing of the stereotype threat prime as a challenge rather than a threat (Alter, Aronson, Darley, Rodriguez, & Ruble, 2010). As women's college students, this sample was already primed to reject assertions of male cognitive superiority, and therefore may have been boosted by such an assertion instead of inhibited. The greater difference in performance between these two conditions in cisgender as compared to non-cisgender participants, if it were to show up consistently in future research, might be explained by the lack of targeted affirmation of non-cisgender participants at women's colleges. In other words, if cisgender participants are experiencing a boost in their performance when challenged,

it may stem from their internalized affirmation of women from their college environment. The non-cisgender participants, however, do not identify as female, and thus may not benefit as much from this internalization of female equality. Alternatively, the lack of stereotype threat effects may be consistent with previous findings that suggest having a competent female researcher administering the test reduces the effect of threat on performance.

Performance in the college affirmation condition improved for non-cisgender participants and decreased in cisgender participants as compared to the classic threat condition. Assuming that the boost in performance experienced by the cisgender participants was due to the stereotype threat prime being interpreted as a challenge, it follows that cisgender participants would not perform as well in this condition since the affirmation of their women's college identities removes the perceived challenge that has previously increase performance. In other words, because there was no longer a threat to their identity, cisgender participants no longer had a threat to view as a challenge, and therefore they may have only benefited from the removal of any internalized belief in the stereotype threat. Affirming important aspects of one's identity has been shown in previous research to counteract stereotype threat effects, which is consistent with the cisgender participants' pattern of similar performance in the control and college affirmation conditions.

Previous research has also shown that high-achieving women can experience boosts in performance when told a test does not show gender differences, which may help explain the non-cisgender performance pattern. Non-cisgender participants performed best in the two affirmation conditions, wherein either their identity as a women's college student or a non-cisgender individual was affirmed. These affirmations may have gone beyond simply counteracting the negative effect of stereotype threat and subsequently increased performance.

There were significant performance differences between the two gender groups, with non-cisgender participants scoring higher on the spatial rotation tasks than their cisgender counterparts. As expected, differences were also found between these groups on gender identity scores. Cisgender participants have more female implicit gender identities, as well as a stronger desire to be part of a female group than non-cisgender participants. Keeping in mind the current adversity faced by non-cisgender individuals in society, the higher gender self esteem and more positive judgments of how others perceive one's gender found in cisgender participants is unsurprising. Interestingly, there were no significant differences in the degree of stereotypically masculine and feminine personality traits between the cisgender and non-cisgender participants. This could be due to the nature of our sample, specifically women's college students, which includes individuals possessing high amounts of both nurturing and analytical qualities. Average feminine and masculine gender socialization did not systematically vary between the two groups, an expected result given that all participants were classified as female in early childhood. Lastly, gender identity importance did not vary as a function of gender identity, meaning that cisgender and non-cisgender participants, on average, placed equal importance on gender in terms of their overall identity.

Beyond identification as a cisgender or non-cisgender individual, other aspects of psychological gender also influenced performance among participants. For cisgender participants, less desire to be a member of a female group was linked to higher spatial rotation scores. This finding is consistent with Schmader (2002), which found that women who placed greater importance on gender identity performed more poorly than their male counterparts on a stereotype relevant task when primed with stereotype threat, but those who placed less importance on gender identity or who were not primed with stereotype threat showed no

difference in comparison to male participants. In contrast, higher spatial rotation scores in *non-*cisgender participants were correlated with less female implicit gender identity, less stereotypically feminine personality traits and feminine gender socialization, and more masculine socialization. One speculation about the cause of this relationship between socialization and higher spatial rotation scores could be that non-cisgender participants grew up engaging in more masculine activities (e.g. throwing a ball) and that may have contributed to the development of a higher level of spatial cognition.

In addition to differing correlations of gender measures with spatial rotation performance, cisgender and non-cisgender participants displayed divergent patterns in their correlations between gender identity measures as well. Non-cisgender participants with less desire to be a part of a female group were also found to have less stereotypically feminine personality traits. The cause of this correlation is unclear, but this pattern did not arise in cisgender participants, suggesting that this may be worth further investigation. Additionally, less feminine and more masculine gender socialization also co-occurred with higher self-esteem about gender identity in non-cisgender participants, implying that gender socialization that parallels gender identity—that is, less feminine for both—could lead to higher self-esteem about gender identity. Those with less positive beliefs regarding how others view their gender identity also had higher gender identity importance. The relationship between these two measures makes sense if one keeps in mind that the non-cisgender participants in this study required enough confidence and pride in their gender identity to both acknowledge and live as their preferred gender identity, despite a less than accepting society.

In cisgender participants, higher importance of gender to overall identity, stronger desire to be a part of a female group, and more positive self-esteem about gender identity were all

related, suggesting that if being a female is important to a person's identity, she will want to be a part of a female group, and she will feel positively about belonging to the female gender.

Shifting focus to correlations between implicit and explicit gender identity, in non-cisgender participants, less female implicit gender identity co-occurred with less stereotypically feminine personality traits, a greater importance of gender to overall identity, and less desire to be a member of a female group. Therefore, the less a person implicitly identifies as female, the more important their non-cisgender identity is to their overall identity. These same individuals will also have less stereotypically feminine personalities and will be more likely to want to be a part of a male group than a female group.

In general, there were fewer correlations between measures of gender identity in the cisgender sample than there were within the non-cisgender sample, possibly due to the lack of variation with the fairly homogeneous cisgender group. The non-cisgender participants ranged in gender identity to include both transmale and non-binary individuals. A small sample size prevented further categorization by gender identity, but this range allowed for a greater variation in implicit and explicit gender identity measures, and thus more opportunity for correlations between those measures. This greater variation may not always result in greater statistically significant variation on a given variable, however. It very well may be that transmen and non-binary individuals show opposite patterns for some of these gender variables, resulting in a correlation close to zero when combined. A larger sample, specifically with more non-cisgender participants, would lend itself to greater power in examining the patterns of implicit and explicit gender identity in non-cisgender participants as compared to their cisgender counterparts.

Looking back to the literature, we did find that implicit gender identity was significantly less female for non-cisgender participants, supporting previous findings of correlations between

self-described gender identity and implicit gender identity. Previous research on implicit gender identity, with only cisgender samples, has found positive correlations between explicit and implicit gender identity (Nosek, Banaji, & Greenwald, 2002; Aidman & Carroll, 2003).

Overall, some, but not all, measures of explicit gender identity correlated with implicit gender identity. In previous studies using only cisgender participants, positive correlations between explicit and implicit gender identity were found, although this results were difficult to definitively replicate with our sample (Nosek, Banaji, & Greenwald, 2002; Aidman & Carroll, 2003). In the current sample, however, there were only small correlations between implicit and explicit gender identity among cisgender participants, possibly due to the lack of variation mentioned previously. In contrast, for non-cisgender participants, implicit gender identity correlated with gender identity importance, gender self-esteem, gender affinity, feminine socialization, and feminine personality traits, despite our small sample size. One of the biggest weaknesses of this study was, as always, too small of a sample size. Moving forward, there is clearly so much potential in this novel field, looking beyond studying only cisgender participants. The study of implicit and explicit gender identity, and their effects on performance, in non-cisgender participants would not only offer the opportunity to gain insights into the minds of an understudied population, but could also help redefine our current understanding and construction of gender. There are countless continuous measures for gender identity, so why are they only being used on such a narrow subset of the gender spectrum? Clearly, there are challenges to gaining enough participants to obtain the statistical power necessary to do anything more than speculate, but non-cisgender participants could be a new frontier for psychology and the population at large.

With multiple unique measures that might relate to gender identity, our primary question is whether the pattern of correlations makes conceptual sense. Although some relationships were expected, such as the positive correlations among gender identity importance, gender affinity, and gender self-esteem in cisgender participants, it is difficult to decipher a pattern among some of the explicit measures of gender identity, as well as between these explicit measures and spatial cognition performance, making interpretation tentative. Based on previous research, we would expect that those with more feminine gender identities would be more susceptible to stereotype threat. We could also expect that cisgender participants with high gender identity importance would either be more susceptible to stereotype threat, or more likely to accept the threat as a challenge, because the more important a particular aspect of identity is to a person, the stronger the response to threats to that aspect of identity. Neither of these patterns appeared.

Less feminine and more masculine gender socialization correlated with higher performance. This supports the potential hypothesis that concrete experience from a more masculine socialization, e.g. throwing a baseball, could boost spatial cognition ability later in life.

It is not clear how Collective Gender Self Esteem should correlate with performance—since it is a new measure and nothing concrete can assumed from this data, but it is possible that a more negative judgment about how others view your gender group could spark more intense reactions to stereotype threat—manifesting as either greater susceptibility or higher rates of framing this threat as a challenge

Although we are left with more questions than answers, the current data argue that explicit measures of gender are not all getting at the same construct, because they do not all correlate with each other, nor do they show the same pattern of correlations with performance. If

further research is able to confirm that gender identity importance, gender affinity, and gender self-esteem are all differently related to performance in cisgender and non-cisgender participants, we may begin to understand how each of these measures interacts with stereotype threat and ultimately, tangible achievement. Furthermore, the patterns of correlations among these measures are not identical for cisgender and non-cisgender participants, offering evidence that gender is a complex construct worth further evaluation.

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Table 1

*Number and Gender of Participants By Recruitment Type*

Type	<i>n</i>		
	Cisgender	Non-Cisgender	Total
Wellesley Participant Pool	53	0	53
Wellesley College Online	72	21	93
Wellesley College Paid	11	5	16
Smith College	0	10	10
Mount Holyoke College	0	2	2

*Note.* Students from the Wellesley Participant Pool were 100- and 200-level psychology students participating for course credit. All other participants were recruited electronically and were paid for their participation. Cisgender includes all participants who self-identified as female; non-cisgender includes all remaining participants.

Table 2

*Cross Tabulation of Gender Identity and Experimental Condition*

Condition	<i>n</i>		
	Cisgender	Non-Cisgender	Total
No threat	33	9	42
Threat	34	12	46
College Affirmation	36	9	45
Non-Cisgender Affirmation	33	8	41
Total	136	38	174

*Note.* Cisgender includes all participants who self-identified as female; non-cisgender includes all remaining participants. No threat refers to the control condition, all three remaining conditions contained a stereotype threat prime. College Affirmation affirmed the women's college student identity of the participants, and Non-Cisgender Affirmation affirmed those who do not identify as female.

Table 3

*T-Tests for Mean Difference on Gender and Performance Measures*

	<i>M (SD)</i>			<i>t</i>	<i>p</i>
	Total Sample	Cisgender	Non-Cisgender		
Implicit Gender Identity	.41 (.41)	.50 (.35)	.10 (.46)	4.97	< .000
Personality Femininity	4.75 (.66)	4.79 (.67)	4.62 (.59)	1.41	.16
Personality Masculinity	4.72 (.73)	4.73 (.74)	4.70 (.67)	.21	.84
Feminine Socialization	4.66 (1.44)	4.68 (1.52)	4.61 (1.10)	.32	.75
Masculine Socialization	2.82 (1.17)	2.76 (1.23)	3.03 (.92)	-1.44	.16
Gender Identity Importance	10.02 (2.27)	10.02 (2.30)	10.03 (2.19)	-.03	.98
Gender Affinity	2.02 (2.09)	2.58 (1.73)	.01 (2.03)	7.79	< .000
Gender Self-Esteem	11.45 (2.03)	12.07 (1.69)	9.24 (1.54)	9.32	< .000
Public Collective Gender	4.45 (1.21)	4.62 (1.07)	3.84 (1.45)	3.09	.003
Self-Esteem					
Spatial Rotation Score	18.81 (4.91)	18.35 (4.68)	20.45 (5.39)	-2.36	.02

*Note.* Cisgender includes all participants who self-identified as female, non-cisgender includes all remaining participants.

Table 4

*Cronbach's Alpha Reliability for Gender Measures*

Scale	Cronbach's Alpha
CSE Membership Self-Esteem	.76
CSE Private Collective Self-Esteem	.78
CSE Public Collective Self-Esteem	.73
CSE Importance to Identity	.79
Gender Importance	.87
Personality Femininity	.82
Personality Masculinity	.78

*Note.* CSE = Collective Self-Esteem Scale

Table 5

*Means Across Conditions for Gender Groups and Total Sample*

Condition	<i>M (SD)</i>		
	Cisgender	Non-Cisgender	Total Sample
No threat	17.94 (5.04)	19.00 (6.42)	18.17 (5.30)
Threat	19.32 (4.70)	19.92 (5.87)	19.48 (4.97)
College Affirmation	18.17 (4.51)	21.44 (5.30)	18.82 (4.80)
Non-Cisgender Affirmation	17.97 (4.55)	20.75 (3.73)	18.71 (4.61)

*Note.* Cisgender includes all participants who self-identified as female; non-cisgender includes all remaining participants. No threat refers to the control condition, all three remaining conditions contained a stereotype threat prime. College Affirmation affirmed the women's college student identity of the participants, and Non-Cisgender Affirmation affirmed those who do not identify as female.

Table 6

*Correlations Among Gender Measures*

Measure	1	2	3	4
All Participants				
1. Gender Identity Importance	--			
2. Gender Affinity	.29**	--		
3. Gender Self-Esteem	.30**	.54**	--	
4. Public Collective Self-Esteem	-.12	.11	.27**	--
Cisgender (Upper) & Non-Cisgender (Lower) Participants				
1. Gender Identity Importance	--	.38**	.49**	-.08
2. Gender Affinity	.20	--	.41**	.08
3. Gender Self-Esteem	-.16	.13	--	.15
4. Public Collective Self-Esteem	-.23	-.31	.16	--

*Note.* Cisgender includes all participants who self-identified as female, non-cisgender includes all remaining participants. Correlations for cisgender participants are displayed above the diagonal and correlations for non-cisgender participants are displayed below the diagonal.

\* $p < .05$ , \*\* $p < .01$

Table 7

*Correlations Among Gender Measures*

Measure	1	2	3	4	5
All Participants					
1. Implicit Gender Identity	--				
2. Personality Femininity	.15	--			
3. Personality Masculinity	.02	.06	--		
4. Feminine Socialization	-.04	.08	.02	--	
5. Masculine Socialization	-.03	-.08	.12	-.26**	--
Cisgender (Upper) & Non-Cisgender (Lower) Participants					
1. Implicit Gender Identity	--	.04	.04	-.11	.00
2. Personality Femininity	.35*	--	.07	.07	-.12
3. Personality Masculinity	-.06	.01	--	-.02	.15
4. Feminine Socialization	.20	.17	.26	--	-.25**
5. Masculine Socialization	.04	.21	-.02	-.36*	--

*Note.* Cisgender includes all participants who self-identified as female, non-cisgender includes all remaining participants. Correlations for cisgender participants are displayed above the diagonal and correlations for non-cisgender participants are displayed below the diagonal.

\* $p < .05$ , \*\* $p < .01$

Table 8

*Correlations Among Gender Measures*

	Gender Identity Importance	Gender Affinity	Gender Self- Esteem	Public Collective Self-Esteem
All Participants				
Implicit Gender Identity	.06	.28**	.32**	-.01
Personality Femininity	.21**	.21**	.22**	.13
Personality Masculinity	.28**	.04	.29**	.08
Feminine Socialization	.20**	.17*	.11	.10
Masculine Socialization	-.09	-.16*	-.03	-.16*
Cisgender Participants				
Implicit Gender Identity	.18*	-.02	.07	-.12
Personality Femininity	.30**	.14	.21*	.13
Personality Masculinity	.30**	.08	.44**	.12
Feminine Socialization	.20*	.22**	.20*	.15
Masculine Socialization	-.07	-.18*	-.02	-.08
Non-Cisgender Participants				
Implicit Gender Identity	-.24	.39*	.27	-.17
Personality Femininity	-.16	.31	.11	.05
Personality Masculinity	.20	-.12	-.09	-.03
Feminine Socialization	.21	.06	-.27	-.10
Masculine Socialization	-.21	.02	.29	-.35*

*Note.* Cisgender includes all participants who self-identified as female, non-cisgender includes all remaining participants.

\* $p < .05$ , \*\* $p < .01$

Table 9

*Correlations Among Gender Measures and Spatial Rotation Performance*

	Spatial Rotation Score		
	All	Cis	Non-Cis
Implicit Gender Identity	-.08	.07	-.21
Personality Femininity	-.09	.02	-.41*
Personality Masculinity	-.05	-.01	-.21
Feminine Socialization	-.21**	-.16	-.44**
Masculine Socialization	.11	.04	.30
Gender Identity Importance	-.06	-.11	.10
Gender Affinity	-.24**	-.24**	-.03
Gender Self-Esteem	-.21**	-.13	-.14
Public Collective Gender Self-Esteem	-.05	.09	-.22

*Note.* Cisgender includes all participants who self-identified as female, non-cisgender includes all remaining participants.

\* $p < .05$ , \*\* $p < .01$

## Appendix A

## Gender Identity Definitions

Name	Scale	Concept
Implicit Gender Identity	IAT ( <i>d</i> score)	Implicit Gender Identity (positive more female, negative more male)
Personality Femininity	BSRI feminine composite	Stereotypically feminine personality traits with a positive valance
Personality Masculinity	BSRI masculine composite	Stereotypically masculine personality traits with a positive valance
Feminine Socialization	Gender Socialization Stereotypically Female	Degree of feminine gender socialization as a child
Masculine Socialization	Gender Socialization Stereotypically Male	Degree of masculine gender socialization as a child
Gender Identity Importance	CSE Importance to Identity & Wilson & Liu (2003)	Strength/Importance of personal gender identity

*Note.* IAT = Implicit Association Test; BSRI = Bem Sex Role Inventory; CSE = Collective Self-Esteem.

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Gender Affinity	Damburn, Duarte & Guimond (2004)	Desire to be part of a female (positive) verses male (negative) group
Gender Self-Esteem	Membership Self-Esteem and Private Collective Gender Self- Esteem	Extent to which one feels positively about one's own gender
Public Collective Self-Esteem	CSE Public Collective Self- Esteem Subscale	Judgments of how other's perceive one's gender
Gender Identity	Male, Female, Other, No answer	Self reported gender identity

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*Note.* IAT = Implicit Association Test; BSRI = Bem Sex Role Inventory; CSE = Collective Self-Esteem.

## Appendix B

## Category Labels and Stimuli for the Implicit Association Test

Self/Other

Self: I, Me, My, Mine, Myself

Other: They, Them, Their, Theirs, Themselves

Male/Female

Male: He, Him, His, Himself, Masculine

Female: She, Her, Hers, Herself, Feminine

## Appendix C

### Transcript of Instructions for Experimental Conditions

#### No Threat

In this next section, you will be asked to complete two different types of spatial cognition tasks. In the first, you will be given one minute to study the location of several drawn objects in an image, and after that minute is up, you will be shown another image with some of the objects moved. You will be asked to indicate which objects have moved and which have not. You will be asked to complete this task twice, with a different image to study in each trial. In the second task, you will be asked to study the rotation of a three-dimensional object and then mentally rotate a second three-dimensional object in exactly the same manner. You will be given twenty minutes to complete as many as possible. Please concentrate fully and try your best.

#### Classic Stereotype Threat

In this next section, you will be asked to complete two different types of spatial cognition tasks. In the first, you will be given one minute to study the location of several drawn objects in an image, and after that minute is up, you will be shown another image with some of the objects moved. You will be asked to indicate which objects have moved and which have not. You will be asked to complete this task twice, with a different image to study in each trial. In the second task, you will be asked to study the rotation of a three-dimensional object and then mentally rotate a second three-dimensional object in exactly the same manner. You will be given twenty minutes to complete as many as possible. Tests like this traditionally produce gender differences favoring males. These differences develop from early stereotypical gender socialization—how teachers and parents teach boys to be boys and girls to be girls. Please concentrate fully and try

your best.

### College Affirmation

In this next section, you will be asked to complete two different types of spatial cognition tasks. In the first, you will be given one minute to study the location of several drawn objects in an image, and after that minute is up, you will be shown another image with some of the objects moved. You will be asked to indicate which objects have moved and which have not. You will be asked to complete this task twice, with a different image to study in each trial. In the second task, you will be asked to study the rotation of a three-dimensional object and then mentally rotate a second three-dimensional object in exactly the same manner. You will be given twenty minutes to complete as many as possible. Tests like this traditionally produce gender differences favoring males. While these differences develop from early stereotypical gender socialization—how teachers and parents teach boys to be boys and girls to be girls—students at selective women’s colleges do not display these effects. Please concentrate fully and try your best.

### Non-Cisgender Affirmation

In this next section, you will be asked to complete two different types of spatial cognition tasks. In the first, you will be given one minute to study the location of several drawn objects in an image, and after that minute is up, you will be shown another image with some of the objects moved. You will be asked to indicate which objects have moved and which have not. You will be asked to complete this task twice, with a different image to study in each trial. In the second task, you will be asked to study the rotation of a three-dimensional object and then mentally rotate a second three-dimensional object in exactly the same manner. You will be given twenty

minutes to complete as many as possible. Tests like this traditionally produce gender differences favoring males. While these differences develop from early stereotypical gender socialization—how teachers and parents teach boys to be boys and girls to be girls. Those who do not identify as female do not display these effects. Please concentrate fully and try your best.

## Appendix D

## Collective Self-Esteem Statements and Subscales

Adapted from Lutanen and Crocker (1992)

Membership Self-Esteem

I am a worthy member of the gender I identify with. (1)

I feel I don't have much to offer to the gender I identify with. (5)\*\*

I am a cooperative participant in the gender I identify with. (9)

I often feel I'm a useless member of my gender. (13)\*\*

Private Collective Self-Esteem

I often regret that I identify with the gender I do. (2)\*\*

In general, I'm glad to be a member of the gender I identify with. (6)

Overall, I often feel that gender with which I identify is not worthwhile. (10)\*\*

I feel good about the gender I identify with. (14)

Public Collective Self-Esteem

Overall, my gender is considered good by others. (3)

Most people consider my gender, on average, to be more ineffective than other genders. (7)\*\*

In general, others respect the gender that I identify with. (11)

In general, others think that the gender I identify with is unworthy. (15)\*\*

Importance to Identity

Overall, my gender has very little to do with how I feel about myself. (4)\*\*

The gender I identify with is an important reflection of who I am. (8)

The gender I identify with is unimportant to my sense of what kind of a person I am. (12)\*\*

In general, identifying with my gender is an important part of my self-image. (16)

\*\*reverse scored items

## Appendix E

## Bem Sex Role Inventory Descriptors

## Bem (1981)

Masculine Adjectives

Self Reliant, Defends own beliefs, Independent, Athletic, Assertive, Strong Personality, Forceful, Analytical, Leadership ability, Willing to take risks, Makes decisions easily, Self-sufficient, Dominant, Masculine, Willing to take a stand, Aggressive, Acts as a leader, Individualistic, Competitive, Ambitious

Feminine Adjectives

Yielding, Cheerful, Shy, Affectionate, Flatterable, Loyal, Feminine, Sympathetic, Sensitive to other's needs, Understanding, Compassionate, Eager to soothe hurt feelings, Soft spoken, Warm, Tender, Gullible, Childlike, Does not use harsh language, Loves children, Gentle

## Appendix F

## Gender Importance Statements

Wilson &amp; Liu, 2003

My gender is very important to me (1)

I often think of myself in terms of my gender (2)

I feel a great sense of pride in my gender identity (3)

I feel I can trust persons of my gender more than people of the other gender (4)\*\*

\*\*This measure did not correlate highly with the other three, and thus was excluded from the composite score for Gender Importance.

## Appendix G

## Gender Affinity

Damburn, Duarte &amp; Guimond (2004)

Please rate the extent to which...

...you would like to be a member of a male group.

...you would like to be a member of a female group.

Please rate how much...

...you consider yourself to have in common with males.

...you consider yourself to have in common with females.

Appendix H

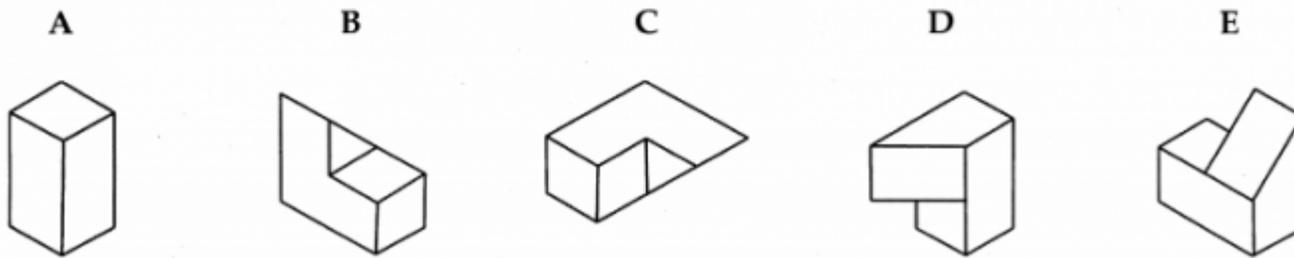
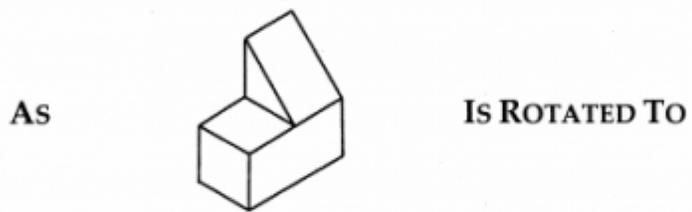
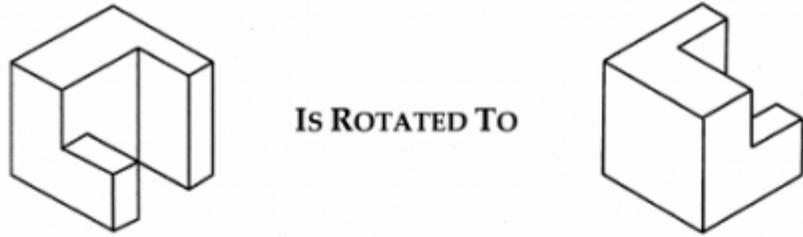
Sample Object Memory Array



Appendix I

Sample Spatial Rotation Trial

**1**



## Appendix J

## Demographics Questionnaire and Gender Socialization Measures

What is your class year?

Are you a Davis Scholar?

- Yes (1)
- No (2)

Are you a transfer student?

- Yes (1)
- No (2)

What is your age?

Gender Identity - Do you identify as:

- Male (1)
- Female (2)
- I prefer to identify as: (3) \_\_\_\_\_
- I prefer not to answer (4)

What are your preferred gender pronouns (e.g. she/her/hers, they/them/theirs, etc)?

Ethnicity - I identify as (select all that apply):

- Africa Continent (1)
- African-American/Black (2)
- African-Caribbean (3)
- Asian-American (4)
- Biracial, please specify: (5) \_\_\_\_\_
- Central American (6)
- East Asian (7)
- European Continent (8)
- Hawaiian/Pacific Islander (9)
- Hispanic (10)
- Latina/Latino (11)
- Middle Eastern (12)
- Native American/ Native Alaskan/ American Indian (13)
- South American (14)
- South Asian (15)
- South-East Asian (16)
- White/Caucasian (17)
- I identify as: (18) \_\_\_\_\_
- I prefer not to answer (19)

### Gender Socialization

Gender socialization refers to how parents and teachers teach boys to be boys and girls to be girls in a variety of ways, i.e. toys played with, clothing and activities encouraged, language used, etc.

How stereotypically feminine would you consider your gender socialization as a child?

- Not at all (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- Very (7)

How stereotypically masculine would you consider your gender socialization as a child?

- Not at all (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- Very (7)

### Manipulation Checks

What do you think is the major purpose of this study?

Did anything seem unusual, and if so, why?

Were you suspicious of anything?