Implicit Stereotypes: An Explanation for the Lack of Female Leadership in the STEM Fields?

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IMPLICIT STEREOTYPES: AN EXPLANATION FOR THE LACK OF FEMALE LEADERSHIP IN THE STEM FIELDS?

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ABSTRACT

The purpose of this study was to investigate why there is a lack of female leadership in the STEM fields. Literature shows that there are a variety of gender stereotypes that may be an impediment to women seeking leadership roles in the STEM fields. The present study combined information about gender stereotypes regarding leadership ability and gender stereotypes regarding math and reasoning ability in attempt to explain the lack of female participation and leadership in the STEM fields. An implicit association test (IAT) was administered to measure implicit gender stereotypes about leadership, and IAT scores had the expected positive relationships with neosexism and modern sexism. There were significant gender differences in IAT scores, neosexism, modern sexism, and concern about discrimination. However, all groups of participants indicated stereotypical associations pairing men with leadership traits and women with follower or supporter traits. STEM status made no difference in participants’ subscription to implicit gender leadership stereotypes. Implications of negative leadership stereotypes for women in the workplace are discussed, along with limitations, suggestions about how to attenuate the effects of gender stereotypes in the workplace, and directions for future research.
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IMPLICIT STEREOTYPES: AN EXPLANATION FOR THE LACK OF FEMALE LEADERSHIP IN THE STEM FIELDS?

Woman remain underrepresented in the science, technology, engineering and mathematics (STEM) fields. While women make up half of the U. S. college-educated workforce, they make up only 29% of the science and engineering workforce (National Girls Collaborative Project, 2018). Women are also underrepresented in leadership positions. For example, women make up about 44% of the S&P 500 labor force, but account for only 36% of first- and mid-level officials, 25% of senior-level officials and managers, 20% of board seats, and 6% of the CEOs of those companies (Warner & Corley, 2017). Representation is even worse in the technology sector, where women make up only 20% of all executive, senior officers and managers. In summary, STEM careers and leadership positions both remain stereotypically male.

Because of their underrepresentation in some domains, women frequently encounter negative gender stereotypes in the workplace, and nowhere is this more evident than in the stereotypically male-oriented STEM fields (López-Sáez, Puertas, & Sáinz, 2011). In the STEM fields, female leaders not only have to counter stereotypes suggesting that they are incompetent and unsuccessful managers, but they must also counter stereotypes that women do not excel at mathematics and science (Ebert, Steffens, & Kroth, 2014; Latu et al., 2011; Smeding, 2012). The purpose of the present study is to further investigate why there is a lack of female leadership in the STEM fields by synthesizing literature on gender stereotypes about leadership and gender stereotypes about mathematical and reasoning aptitude. No other study to date could be found that
has attempted to combine this information to explain the lack of female participation and leadership in the STEM fields.

**Explanations for the Underrepresentation of Women in STEM**

Women’s underrepresentation in the STEM fields has been a concern for many years in the United States, and more recently, some countries in Europe (e.g., France) have begun to examine the phenomenon as well (Smeding, 2012). Researchers have offered various explanations for why women are underrepresented in STEM, including gender differences in mathematical ability and aptitude, gender differences in ability self-concepts, and a lack of female interest in STEM (Parker, Van Zanden, & Parker, 2018; Wang, Eccles, & Kenny, 2013).

Previous research has found that ability differences are not to blame for the lack of representation of women in STEM (Wang et al., 2013). In fact, females outperform males at most levels of education (Parker et al., 2018). For example, Wang and colleagues (2013) found that females in their sample of 12th graders were more likely to be high in both math and verbal ability, while males were more likely to have high math but moderate verbal ability. Additionally, Wang and colleagues (2013) found that all students in the high-math, high-verbal ability group were less likely than those in the high-math/moderate-verbal ability group to hold jobs in STEM by the age of 33, regardless of gender. Additionally, there were no gender differences in math ability within each ability pattern group. Their findings suggest that it is not a gendered lack of interest or ability in the STEM fields that predicts STEM occupation, but rather gender differences in ability patterns. In other words, women who were high in math ability were
more likely to also be high in verbal ability, while this was not true for men. Students in the high-math/moderate-verbal group might perceive their math ability as much greater than their verbal ability, and consequently chose to pursue math-related fields. On the other hand, students in the high-math/high-verbal group did not perceive as great of a difference between their math and verbal ability, and consequently chose to pursue a wider range of occupations. As a result, fewer women in their sample chose to pursue the STEM fields, not because a lack of interest or ability, but because more women than men were in the high-math/high-verbal ability pattern group and consequently had a wider range of career options.

Other research has pointed to gender differences in ability self-concepts to explain the lack of female representation in STEM. For example, Parker and colleagues (2018) investigated gender differences in ability self-concepts for math, literacy, and general academic domains when controlling for academic ability in high schoolers in Australia. They found, from historical data from the 1980s to the 1990s, that boys consistently had higher math ability self-concepts than girls, even when controlling for academic achievement (i.e., comparing equally able boys and girls), and despite a trend toward a decreasing gender gap in math achievement. These results are consistent with the assimilation theory of self-concept. The assimilation theory of self-concept suggests that people who have internalized stereotypes about their group will alter their beliefs and behaviors to better match the widely accepted stereotypes about their group. This explains why the high school girls in the study had lower math ability self-concepts, on average, than the high school boys, even when controlling for achievement level. In other
words, boys and girls of the same ability level still had differing math ability self-concepts, favoring boys, because they had internalized the stereotype that boys are good at math and girls are not.

Although there are many factors that may explain women’s underrepresentation in STEM, there is empirical evidence that gender stereotypes contribute, at least in part, to the lack of women in the STEM fields. Wang and colleagues (2013) found that gender differences in STEM field choice were not explained by differences in math ability, but rather by differences in ability patterns between the genders. More precisely, women who were high in math ability were more likely to also be high in verbal ability, and therefore had a wider range of career choices. Additionally, Parker and colleagues (2018) found that gender differences in math ability self-concepts were best explained by the assimilation theory of self-concept. Perhaps the math-able women in the study by Wang and colleagues (2013) were also affected by internalized gender stereotypes about math ability, which could have encouraged them to choose non-STEM careers over STEM careers when they had a choice. In summary, it is worthwhile to examine the effects of gender stereotypes on women’s pursuit of and leadership within the STEM fields, even if other factors also affect women’s choice of field.

Implicit and Explicit Stereotypes

Smeding (2012) defines a stereotype as “the association of a group concept (e.g., men) with a given attribute concept (e.g., STEM)” (p. 618). Gender stereotypes suggesting that women have lower ability levels in the areas of mathematics and reasoning could be part of the reason for the discrepancy in representation between
women and men in the STEM fields. Greenwald and colleagues (2002) suggest that stereotypes are embedded within a social knowledge structure, in which concepts are linked through various associations of varying strength. Stereotypes can be present at both the implicit and explicit levels of cognition. Implicit stereotypes, or associations, are “not necessarily conscious and open to inspection” (Steffens, Jelenec, & Noack, 2010, p. 947), meaning that people may not be able to examine their own implicit biases the way they might be able to describe their explicit beliefs about a group of people. Explicit stereotypes, on the other hand, are defined as “social cognitions referring to a shared social knowledge in a given cultural context” (Smeding, Quinton, Lauer, Barca, & Pezzulo, 2016, p. 817). In other words, explicit stereotypes are specific associations between groups of people and attributes, and these associations are easily accessible to people in a given social context. Implicit stereotypes differ from explicit stereotypes because they are nonconscious associations between certain groups and attributes, and an individual may or may not be aware of these associations. It is important to note that both explicit and implicit stereotype beliefs can affect behavior (Smeding, 2012; Steffens et al., 2010).

**Measuring Implicit Stereotypes.** Because people cannot necessarily access their implicit associations, including implicit stereotypes, through introspection, researchers have developed several different methods to measure implicit stereotypes without using an explicit self-report scale. Some of these measures include mouse-tracking sorting tasks, paper-based sorting tasks, and traditional computerized implicit association tests (Smeding et al., 2016; Mast, 2004; Sriram & Greenwald, 2009). Mouse-tracking sorting
tasks ask participants to click and drag words into categories on either side of a computer screen (Smeding et al., 2016). The participants are presented with a series of congruent trials, where stereotypical associations are paired together on either side of the screen (e.g., math/male on the left and female/language on the right), and then they are presented with a series of incongruent trials, in which non-stereotypical associations are paired together on either side of the screen (e.g., math/female and language/male). Participants are given words that can be sorted into one of the four categories. Then, the mouse movements of participants sorting the words are recorded and compared between congruent and incongruent trials. Mouse sorting tasks allow for more variation and nuance in results compared to some other methods of detecting implicit associations. However, these tasks also require advanced computer software to track, aggregate, and compare mouse movements across participants, and the data they generate can be labor-intensive to analyze.

Another method used to detect implicit associations is a paper-based sorting task (Mast, 2004). This task involves a long list of words that are associated with one of four categories; for example, “male”, “female”, “hierarchical”, and “egalitarian”. On either side of the column of words to be sorted, there are columns of check-boxes. In the stereotype-congruent portion, categories with stereotypical associations are paired together (e.g., male with hierarchical on the left and female with egalitarian on the right). In the incongruent portion, these check-box column categories are swapped (e.g., female/hierarchical on left versus male/egalitarian on right). For each portion of the test, participants are told to correctly categorize as many words as possible in 30 seconds. The
assumption behind this test is that it will be easier for participants to categorize words in the stereotype-congruent condition; therefore, they will sort a greater proportion of the words within the time limit in the stereotype-congruent condition compared to the incongruent condition. Paper-based sorting tasks are beneficial in that they are easy to administer and make it very easy to randomize the order of the two conditions. However, like most paper and pencil scales, the paper-based sorting task is more vulnerable to self-presentation effects and faking.

Last, computerized implicit association tests (IATs) have most commonly been employed to detect and assess people’s implicit beliefs and biases, and the current study will use a computer-administered implicit association test similar to those mentioned in Sriram and Greenwald’s 2009 study. Computerized IATs also involve sorting words into categories on either side of the screen. In the stereotype-congruent condition, stereotypically associated categories are on the same side of the screen (e.g., male/science on the left and female/humanities on the right) (Sriram & Greenwald, 2009). Conversely, in the stereotype-incongruent condition, categories that are not stereotypically associated appear on the same side of the screen (e.g., female/science on the left and male/humanities on the right). Participants are asked to press a corresponding key on the keyboard to sort the presented word into the categories on one side of the screen or the other. To sort the word to the left side of the screen, the participant presses the “E” key, and to sort the word to the right side of the screen, the participant presses the “I” key. Computerized IATs compare the reaction times, or latencies, of participants between the stereotype-congruent and the stereotype-incongruent conditions. Participants tend to have
slower sorting reaction times when categories they do not normally associate are paired together.

**Using IATs in Psychological Research**

IATs are frequently used to measure implicit stereotypes, beliefs, and associations (Greenwald, Nosek, & Banaji, 2003). As stated previously, IATs are meant to measure implicit processes rather than explicit processes. Implicit processes refer to automatic and unintentional reactions to environmental stimuli, while explicit reactions are more controlled, deliberate and conscious (Steffens et al., 2010). IATs are more useful than explicit measures in many situations because IATs are resistant to the participants’ self-presentation (i.e., when participants try to appear socially desirable and manage the impressions they are making) (Greenwald et al., 2003). IATs are also useful because they do not depend upon participants’ ability to be introspective about their beliefs and associations, and many studies have shown how useful the IAT can be in assessing a wide variety of socially significant associations. However, it is important to note that a comparable explicit measure to the IAT is often administered either before or after the IAT (the order of administration makes no significant difference) for additional analysis and comparison purposes (Nosek, Greenwald, & Banaji, 2005).

Computerized IAT scores are based on participants’ reaction times for two categorization tasks that differ in instructions for using two different response keys on a regular computer keyboard (Greenwald et al., 2003). Each of the two response keys are used to classify the presented stimuli to a different “group” on the screen. To further clarify the IAT procedure, the following is an example of an IAT trial where “bugs” are
being classified with “bad” and “flowers” are being classified with “good”. The words “bugs” and “bad” would remain on the left side of the screen while the words “flowers” and “good” would remain on the right side of the screen. Then, a series of words would appear. If the first presented word was “beetle” then the participant would press the left response key to correspond with the left side of the screen (“bugs”). The participant would likewise press the right response key to categorize the word “rose” to the right side of the screen (“flowers”). Similarly, “nice” would be sorted to the right to correspond with “good”, and “nasty” would be sorted to the left to correspond with “bad.” Then, in the next block, the condition would switch, and “bugs” would be paired with “good” while “flowers” would be paired with “bad.” To obtain an IAT score, participant response times from the first and second blocks would be compared to determine if the participant more readily associated “bugs” or “flowers” with “good” or “bad”.

The previous example is a very simplified version of an IAT. Typically, IATs have seven blocks, including some practice blocks and some test blocks, along with practice single discrimination blocks (i.e., only sorting flowers versus insects or good versus bad) (Greenwald et al., 2003). Despite their apparent complexity, IATs are easy to administer and have relatively good reliability (Nosek, Greenwald, & Banaji, 2005). IATs have become effective tools for assessing implicit biases, beliefs, stereotypes, associations, and attitudes without the use of explicit measures that require introspection.

Although IATs are useful on their own, they are generally paired with related explicit measures for validation and comparison purposes (Nosek et al., 2005). In the present study, the explicit measures of stereotypes that will be used are neosexism,
modern sexism, and concern for discrimination. Modern sexism is characterized by a denial of the continuing discrimination against women, antagonism towards women’s demands and pushes for greater equality, and a lack of support for polices designed to help women (e.g. policies to help women in education and at work) (Swim, Aikin, Hall, & Hunter, 1995). Neosexism is similar to modern sexism, but it is broader in scope. Neosexism is characterized by concern about changing gender roles (i.e. women leaving their jobs to raise children), the perceived special treatment of women, resistance to women’s demands for equality, negative perceptions of women as bosses, a lack of concern about discrimination against women in the workforce, and a lack of support for policies regarding women in the workplace (Tougas, Brown, Beaton, & St-Pierre, 1999).

Last, the concern for discrimination construct relates to how concerned an individual is about gender discrimination in society in general (Devine, Forscher, Austin, & Cox, 2012).

**Controversy Over the IAT.** Despite the IAT’s widespread use, some researchers have raised issues about whether the IAT truly measures attitude, or argue that if the IAT does measure attitude, that distinguishing between implicit and explicit attitudes is not meaningful or worthwhile, because they are essentially two sides of the same construct (Nosek & Smyth, 2007). To partially confront these issues, Nosek and Smyth (2007) conducted a multitrait-multimethod analysis using seven different IAT measures. The four samples that they used in the study all used a combination of at least four of the following IATs: Flower-Insect, Creation-Evolution, Democrat-Republican, Humanities-Science, Straight-Gay, Thin-Fat, and White-Black. In addition to these attitude IATs,
participants completed comparable explicit measures. Using a wide variety of relatively unrelated attitudes allowed Nosek and Smyth (2007) to isolate the unique effects of the measurement methods (i.e., implicit versus explicit) in their analysis, which contributed to the construct validation of the IAT as a measure of attitude.

After they partitioned out the variance due to methods of measurement, Nosek and Smyth (2007) still found that implicit and explicit attitudes were correlated with each other across the different traits (i.e., attitudes) assessed. Nosek and Smyth (2007) conducted a series of structural modeling analyses to distinguish between systematic method variance and actual attitude variance. They found that in an oblique model, in which latent variables were allowed to correlate, specifying two factors (i.e., implicit and explicit) per attitude was superior to specifying only one factor per attitude. This finding suggests that implicit and explicit attitudes are, in fact, distinct from one another. Overall, Nosek and Smyth (2007) contributed to the validation of the IAT in that their findings suggested that the IAT is indeed measuring attitude, and that it is worthwhile to distinguish between implicit and explicit attitudes because they are distinct but related constructs.

**Empirical Support for the Presence of Gender Stereotypes**

As noted previously, the underrepresentation of women in STEM can be partially attributed to explicit and implicit gender stereotypes. As women pursue careers in STEM, these gender stereotypes can negatively affect them, especially if they aspire to hold leadership positions. Namely, these include the stereotypes that women are worse at mathematical and logical reasoning than men, are perceived as less competent than men,
and are not as suitable for leadership positions as men (Ebert, Steffens, & Kroth, 2014; Latu et al., 2011; Smeding, 2012).

Previous research has suggested that negative gender and STEM-related stereotypes can undermine girls’ and women’s self-perceptions of how well they could perform in careers that are in stereotypically masculine disciples and their interest in even pursuing these disciplines (Kiefer & Sekaquaptewa, 2007). Additionally, the mere threat of confirming negative female stereotypes can undermine math performance and achievement in girls (Huguet & Régnier, 2007). For example, in females, stronger implicit gender bias regarding math is negatively associated with math-identification (i.e., identifying with math), math performance, and positive affect toward math (Nosek, Banaji, & Greenwald, 2002). The opposite is true for males, who benefit from current math-gender stereotypes (i.e., math = male, math ≠ female). In males, stronger, more stereotypic implicit math-gender associations are positively associated with math-identity and performance on math-related tasks. These findings are potentially troubling to the progress of women in the STEM fields, as the intensive use of mathematics is one thing the STEM fields all have in common (Steffens et al., 2010).

Many researchers have attempted to determine when these negative gender stereotypes about math and reasoning ability are first evident. For example, a study on German schoolchildren by Steffens, Jelenec, and Noack (2010) found that girls as young as nine years old subscribe to implicit gender stereotypes about math ability. Additionally, when older adolescents completed an implicit association test, adolescent girls also showed stronger gender stereotyped beliefs about math ability than adolescent
boys did. Moreover, these implicit math-gender stereotypes predicted academic self-concepts, academic achievement, and enrollment preferences for girls in the sample across age groups. At age nine, the girls in the sample already showed implicit ability self-concepts leaning toward language and away from math, and gender differences in implicit math self-concepts were significant between the ninth graders in the sample. However, implicit math-gender stereotypes did not predict any of these outcomes for boys, with the exception of academic achievement. Overall, the authors suggest that implicit gender stereotypes are an important reason behind the high attrition rate of female students in math-intensive fields as they progress through school.

In a similar vein of research, López-Sáez and colleagues (2011) conducted a study to investigate why female students in the Spanish school system tended to choose other high schools over the Technological high school. The Spanish secondary school system is divided into four high schools: Technology, Humanities and Social Science, Natural and Health Science, and Arts. The Technology high school is associated with engineering while the Natural and Health Sciences high school is associated with the medical professions. In this study, the researchers found that the Technology high school was perceived as less feminine and more masculine than the other schools. Students rated hypothetical female students who attended each high school on a semantic differential measure with 18 positive-negative adjective pairs (e.g. capable-incapable, fun-boring, ugly-beautiful), and hypothetical girls who attended the Technology high school were more negatively assessed with this measure than hypothetical girls who attended the other high schools. Additionally, there is evidence that these negative attitudes were gender-
based because overall attitudes toward hypothetical male students did not change significantly based upon their chosen high school. Adding to this, male students appeared to have more positive attitudes towards hypothetical boys who attended the Technological high school than hypothetical boys who attended the other high schools. These results suggest that students who do not conform to gender stereotypes are more negatively evaluated than students who do conform to gender stereotypes.

In a follow-up to the above study, using an implicit association test, López-Sáez and her colleagues (2011) found that the idea of a female doctor was perceived more positively than the idea of a female engineer. From these results, the researchers concluded that Spanish female students who enjoy science and mathematics and want to go into the STEM fields are constrained to choosing the Natural and Health Sciences high school rather than the Technological high school if they want to avoid negative social consequences for going against gender stereotypes. These gender stereotype constraints have likely resulted in the current situation in Spain, where 72% of all university engineering students are male.

Despite negative gender stereotypes, however, some women do succeed in the STEM fields. Smeding (2012) investigated this concept further by comparing French female engineering students’ implicit gender stereotypes about math to those of their male counterparts in engineering. The engineering students’ implicit gender-math stereotypes were compared to those of humanities students. In support of her hypothesis, Smeding (2012) found that female engineering students had weaker implicit gender stereotypes about math than the other three groups of students (i.e. male engineering,
female humanities, and male humanities students). The author suggested that when women succeed in the STEM fields, they develop more counter-stereotypical implicit beliefs about women and math. Alternatively, STEM women may have more counter-stereotypical implicit beliefs to begin with, and this contributes to their success in STEM (Smeding, 2012).

In the same article, Smeding (2012) discussed the development of a new measure to assess implicit gender-reasoning stereotypes. Implicit gender-reasoning stereotypes suggest that women are worse at logical reasoning than men, and thus are less rational and more emotional. Similar to the initial study on gender-math stereotypes, the follow-up study found that female engineering students held weaker implicit gender-reasoning stereotypes than all three other groups of students (i.e., male engineering, female humanities, and male humanities students). Smeding also found that implicit gender-reasoning stereotypes were negatively related to math grades for female humanities students, but not for female engineering students. These results indicate that implicit gender stereotypes are negatively related to math performance in some, but not all women. The author suggests that these results indicate that women who have weaker implicit gender-STEM related stereotypes in the first place are later more successful in the STEM fields; however, due to the design and purpose of the study, no definite causal relationship could be concluded from these results.

Collectively, the aforementioned studies indicate that women’s mathematical and reasoning abilities are, in many scenarios, negatively stereotyped at an implicit level.
Moreover, these stereotypical beliefs begin at an early age and have an enormous impact later in life by constraining the fields in which women choose to pursue their careers.

Not only do women in the STEM fields have to cope with being counter-stereotypical to their professions, but, if they want to pursue management positions in these fields, they must also confront stereotypes that women are less competent managers and leaders (Latu et al., 2011). One study by Latu and colleagues (2011) found that male college students were more likely to implicitly associate men with successful managerial traits and women with unsuccessful managerial traits. Although female college students were more likely to associate women, rather than men, with successful managerial traits in this study, the effect size for women’s association of women with successful managerial traits was much smaller than the effect size obtained by men associating men with successful traits. These results indicate that women, like men, have an in-group bias in favor of their own gender, but this bias in women is attenuated by traditional gender roles that associate men with management careers and women with subordinate positions.

A follow-up study by Latu and her colleagues (2011) found that the greater a participant’s implicit associations between men and managerial success were, the higher his/her salary recommendations were for a hypothetical male employee. However, no such relationship was present for a hypothetical female employee. In other words, regardless of how much a participant associated women with successful management, he/she still did not recommend a higher salary for a hypothetical female employee. The researchers suggest that greater associations of women with successful managerial traits did not predict higher salary projections for a hypothetical female employee because
successful female managers may be liked less due to their perceived violation of gender stereotypes and norms. If nothing else, these results imply that implicit gender stereotypes and biases could impact salary allocations in organizations. An additional consideration is that implicit biases about whether women are successful managers or not seem to vary on the basis of the gender of the evaluator (i.e., women have an implicit bias in favor of women being successful managers while men do not). This could be a major disadvantage to women when they are being evaluated for management positions by men, given that the majority of management positions in the United States are filled by men (Warner & Corley, 2017).

One major impediment to women pursuing top management positions is another gender stereotype—that women are less competent overall than men (Ebert, Steffens, & Kroth, 2014). There is empirical evidence that women are generally perceived as warmer, but less competent than men (Ebert et al., 2014). Although greater perceptions of warmth may be beneficial in some situations, competence (which is stereotypically male) is often a major factor when choosing leaders and managers in the workplace. A study by Ebert and colleagues (2014) reexamined these stereotypes in a German sample of students, managers, and university visitors. The results of their study were somewhat similar to those of Latu and colleagues’ (2011), in that there was in-group bias present on an implicit association test measuring attitudes about women’s competence versus men’s. Females rated women as being more competent, and males rated men as being more competent (Ebert et al., 2014). Additionally, like the Latu et al. (2011) study, the Ebert et al. (2014) study found a larger effect size of men rating men as competent compared to
women rating women as competent. This suggests that females’ in-group bias is still somewhat attenuated by the existing stereotype that women are less competent, while men’s in-group bias is strengthened by it. This, again, could lead to issues in the workplace if women are being evaluated as less competent than their male counterparts by male supervisors. This could be especially problematic for women employed in the male-dominated STEM fields.

One final stereotype that may be an impediment to women seeking leadership positions is the stereotype that women are egalitarian and men are hierarchical (Mast, 2004). There is research showing that men are perceived to be more dominant, assertive, competitive, and prepared to be authority figures than are women. Building on this research, Mast (2004) conducted a study to determine if there was an implicit stereotype about gender and social structure orientation (i.e., hierarchical structure versus egalitarian structure). Hierarchy refers to a social structure in which a group is organized by differences in dominance between individuals, while an egalitarian social structure is not organized by dominance differences between individuals. On an implicit association test, Mast (2004) found that men were more readily perceived as hierarchical while women were more readily perceived as egalitarian. Importantly, the results also showed that men displayed stronger implicit gender stereotypes about hierarchy than women did. These gender stereotypes about social structure could be detrimental for women seeking top leadership positions in hierarchical organizations. Women may be passed over in favor of men for promotions to higher leadership positions, and previous research has also shown
that women are less motivated to obtain leadership positions in hierarchical environments.

**Purpose and Hypotheses**

The purpose of the present study is to synthesize research about gender stereotypes regarding leadership ability and math ability to explain why women are underrepresented in STEM and, more specifically, leadership positions in STEM. Although studies have examined, separately, leadership stereotypes and STEM-related stereotypes about women, extant literature has yet to combine these two research areas. Moreover, I am assessing these stereotypes at the implicit level. Gender and field of study will be used as the grouping variables in the present study, and the use of the IAT will serve as a within-subjects manipulation due to its design (i.e., comparing latencies of stereotype-congruent versus stereotype-incongruent conditions). Based on the previous research, a series of relevant hypotheses were generated to be tested in this study.

Some of the aforementioned studies have presented evidence that women may not be as readily perceived as leaders as men are. Although Latu and colleagues (2011) found that men associated men with successful managerial traits, and women associated women with successful managerial traits, this effect size was much smaller for the women, suggesting that gender stereotypes about leadership may attenuate women’s perceptions of themselves as leaders. Mast (2004) found that men were more readily perceived as hierarchical than women, and she suggested that women may be more reluctant to pursue management positions in hierarchical organizations because of this stereotype. Last, Ebert and colleagues (2014) found evidence of self-serving bias in perceptions of
competence, but they also found that the effect size for women perceiving women as competent was smaller than that for men perceiving men as competent, suggesting that gender stereotypes about competency inhibit women’s views of themselves as competent.

Given this evidence:

**Hypothesis 1.** Across all participants, there will be an implicit stereotype in favor of men as leaders and women as followers.

López-Sáez et al. (2011) found that the Technology high school in Spain was perceived as more masculine and less feminine than the other high schools, and hypothetical female students who attended the Technology high school were more negatively assessed than hypothetical female students who attended the other high schools. Additionally, hypothetical male students who attended the Technology high school were perceived more positively than hypothetical male students who attended the other high schools. Moreover, research by Steffens and colleagues (2010) suggests that children as young as nine years old hold gender stereotyped beliefs about math, and these stereotyped beliefs can affect girls’ math performance and self-ability concepts about math. Due to reasons like those presented in the literature, there is an imbalance between women and men in the STEM fields, and because of this imbalance, students in the STEM fields would have had less opportunity to see role-model female leaders in the field. However, research by Smeding (2012) found evidence of self-serving bias regarding math and reasoning abilities in both women and men in the STEM fields (i.e., both women and men in STEM associated their own gender with higher math/reasoning ability). Based on this evidence, the following hypotheses were tested:
**Hypothesis 2a.** Students in STEM will have stronger implicit stereotypes overall in favor of men as leaders and women as followers.

**Hypothesis 2b.** Men in the STEM fields will have stronger implicit stereotypes in favor of men as leaders and women as followers.

**Hypothesis 2c.** Women in STEM will have stronger implicit stereotypes in favor of women as leaders and men as followers.

In studies that use an IAT, a related explicit measure is generally administered along with the IAT for validation and comparison purposes (Nosek et al., 2005). This study includes neosexism, modern sexism, and concern for discrimination as explicit measures. Both the neosexism and modern sexism scales have items that are concerned with women’s roles in the workplace and women’s demands for equality. Given this research and evidence:

**Hypothesis 3.** Neosexism scores will be positively correlated with implicit stereotyping in favor of men as leaders and women as followers.

**Hypothesis 4.** Modern sexism scores will be positively correlated with implicit stereotyping in favor of men as leaders and women as followers.

**Hypothesis 5.** Concern for discrimination scores will be negatively correlated with implicit stereotyping in favor of men as leaders and women as followers.

*Control Variables*

Moreover, to assess additional variables that may have an impact on both IAT scores and explicit measure scores, I am assessing Big Five personality, political
orientation, and self-presentation tendencies. These variables may be incorporated into the analyses as covariates. I am assessing self-presentation tendencies because previous research has found that explicit measures of stereotypes are vulnerable to self-presentation bias (Greenwald et al., 2002; Smeding, 2012), so it follows that social desirability scores will be correlated with scores on the neosexism, modern sexism, and concern for discrimination scales. I am including a measure of political orientation because previous research has found that conservative self-identification is linked to endorsement of sexist statements, and that the belief structures that comprise political conservatism, like social dominance orientation, for example, may be linked to sexist attitudes (Kim & Tidwell, 2014). Therefore, political conservatism may be positively correlated with IAT scores and explicit sexism scores in the present study. Last, I am assessing Big Five personality traits because previous research has found that agreeableness and openness are strong predictors of prejudice (or lack thereof) against outgroups (Akrami, Ekehammar, & Yang-Wallentin, 2011). Based on this research, I expect that agreeableness and openness will both be negatively correlated with sexism and perhaps IAT scores as well.

METHOD

Participants

Participants consisted of 190 undergraduate students (65% female, 35% male; 52% STEM majors, 48% non-STEM majors) in introductory psychology courses. Students were awarded extra credit in their courses for participation in this study.
**STEM Categories.** Students were divided into STEM and non-STEM groups based on guidelines set forth in an institutional reporting toolkit by the National Science Foundation (NSF) (NSF, 2005). For this sample, the STEM fields included majors in animal/veterinary sciences, biochemistry, bioengineering, biological sciences, chemical engineering, chemistry, civil engineering, computer engineering, computer science, economics, electrical engineering, general engineering, genetics, industrial engineering, mathematical sciences, mechanical engineering, microbiology, physics, political science, pre-pharmacy, and psychology. The majors in the sample could have also been divided into four categories that were also recommended by the NSF (one of which would have partitioned out social sciences), but when data were analyzed using this alternative breakdown, there were no significant differences in the main effects. Therefore, binary categories (STEM vs. non-STEM) were used for simplicity and parsimony.

**Procedure**

All data for this study were collected via an anonymous online survey. All measures, including the computerized IAT and the explicit measures of bias, were distributed via Qualtrics online survey software. The survey took approximately 20 minutes for students to complete.

First, participants were presented with an informed consent outlining the benefits and risks associated with completing the survey. The risks were minimal—the only risk is that of participants’ confidential information being compromised, but this risk was minimized by the investigators’ use of an anonymous survey link. The informed consent outlined, in vague terms, that the study was about student attitudes and gender
stereotypes, but the words “gender discrimination” were not used. Once participants agreed to the informed consent, they completed a brief demographics questionnaire, with which they provided information about their gender identity, age, major, academic college, and race/ethnicity. Participants’ responses about which college they were part of and which major they were in were used to determine whether they were STEM or non-STEM students. Participants then answered a question about whether they had ever completed an IAT before, and then they completed the IAT task, as described later. Once they completed the IAT, participants responded to a series of questionnaires, including the explicit measures of sexism and the additional scales. First the participants completed the neosexism scale, then the concern for discrimination scale, and then the modern sexism scale. Participants also responded to a shortened measure of the lexical big five personality inventory, a liberal-conservative political identification scale, and a shortened social desirability scale. Finally, participants were asked to provide their email if they wished to participate in any follow-up studies, but this response was not required.

**Measures**

The measures in this study consisted of a computer-administered IAT developed by faculty members at Clemson University, the Tougas, Brown, Beaton, and Joly (1995) neosexism scale, the Devine, Forscher, Austin, and Cox (2012) concern about discrimination scale, the Swim, Aikin, Hall, and Hunter (1995) modern sexism scale, a short form of the big five lexical personality inventory by Donnellan, Oswald, Baird, and Lucas (2006), a liberal-conservative self-identification scale developed and used by
American National Election Studies (ANES), and a shortened version of the Marlowe-Crowne social desirability scale described in Reynolds (1982).

**Implicit Association Test (IAT).** The IAT used in this study was designed to measure implicit stereotypes about men being leaders and women being followers. This IAT consists of four blocks, and participants press the ‘E’ key if the word in question belongs to the category on the left, and they press the ‘I’ key if the word belongs to the category on the right side of the screen. First, there is one practice block (B1) with 16 trials pairing male names (Josh, Brandon, Ian, Peter) with words associated with leadership (ambitious, determined, leader, dynamic, assertive) on the left of the screen and pairing female names (Donna, Emily, Katherine, Debbie) with words associated with supporters (sympathetic, helpful, supporter, understanding, compassionate) on the right. Then, there is a test block (B2) of 16 trials pairing male names with words associated with leadership on the left of the screen and pairing female names with words associated with supporters on the right. Next, there is a practice block (B3) of 16 trials pairing female names with leadership words on the left and pairing male names with supporter words on the right. Last, there is a test block (B4) of 16 trials pairing female names with leadership words on the left and male names with supporter words on the right.

Research has shown that the order of blocks (i.e. gender-stereotypic pairings first or not gender-stereotypic pairings first) can affect IAT effect size, especially if the congruent (in this case, gender-stereotypic) block is first (Nosek et al., 2005). However, this was controlled for by counterbalancing the order of blocks assigned to participants (i.e. alternating whether the gender-stereotypic block was first or not). Additionally, it
should be noted that the order of blocks only affects IAT effect size; it does not affect reliability, relations with explicit measures, or vulnerability to extraneous influences.

After each participant completed the IAT, the response times for each trial on the IAT were recorded, and to measure implicit bias, each participant’s response times from the stereotype-congruent sections (i.e., male/leader pairings) were compared with response times from the counter-stereotypical sections (i.e. female/leader pairings). In this particular study, participant scores on the IAT were calculated using the updated algorithm described in Greenwald, Nosek, and Banaji’s 2003 article. To summarize the algorithm, a pooled standard deviation of response times (latencies) from B4 and B2 was calculated, and a pooled standard deviation of latencies from B3 and B1 was calculated. Then, the mean difference between B4 and B2 latencies was divided by its appropriate standard deviation, and the mean difference between B3 and B1 latencies was divided by its appropriate standard deviation. These two resulting quotients were averaged to obtain a participant’s IAT score. Positive scores on this IAT indicate implicit stereotyping in favor of male/leader, female/supporter pairings, while negative scores on this IAT indicate implicit stereotyping in favor of female/leader, male/supporter pairings. An IAT score of 0 would indicate no bias in either direction (i.e., equal associations of men and women with leadership and supporter roles). In the current sample, IAT scores generally ranged from -1 to 1, with only a few individuals who were slightly beyond this range.

**Neosexism.** The neosexism scale by Tougas et al. (1995) was the first scale to which participants were exposed. It consists of 11 items/statements that participants rate the degree to which they agree or disagree with using a 7-point Likert scale (1 = strongly
disagree, 7 = strongly agree). Items 2 and 11 are reverse coded. Some examples of items included on this scale are “It is difficult to work for a woman boss” and “Women shouldn’t push themselves where they are not wanted.” Higher scores on this scale indicate higher levels of neosexism. Appendix A contains a screenshot of the full measure. For the current sample, $M = 2.54$, $SD = .934$, $\alpha = .842$.

**Concern for Discrimination.** The concern for discrimination scale by Devine, et al. (2012) was the next series of statements to which participants responded. The original scale was created to measure concern for racial discrimination, but for the purpose of this study, the scale was modified to measure concern for gender discrimination rather than racial discrimination. It deserves noting that it is not uncommon to base new gender discrimination measures on current racial discrimination measures (see e.g., Swim et al., 1995). Research suggests that there are “structural similarities between modern racism and modern sexism” and that the “specific beliefs that underlie modern racism and modern sexism… may be similar” (Swim et al., 1995, 199-200). Given this evidence, modifying the concern for racial discrimination scale to create a concern for gender discrimination scale was considered appropriate. The modified scale consists of four items, and participants rated the extent to which they agree or disagree with each statement using a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree). Three items were reverse coded. Then, response values on this scale were averaged, where higher numbers indicate a greater concern for gender discrimination. For the modified scale, using the current sample, $M = 6.65$, $SD = 2.13$, skew = -.18, and $\alpha = .899$. A screenshot of the measure used in the present study can be found in Appendix B.
**Modern Sexism.** The Swim, et al. (1995) modern sexism scale consists of eight items divided into three subcategories. The subcategories are as follows: denial of continuing discrimination (the first five statements), antagonism towards women’s demands (statements six and seven), and resentment about special favors for women (the eighth statement). Participants are again asked to rate the extent to which they agree or disagree with each statement on a seven-point Likert scale (1 = strongly agree, 7 = strongly disagree). Some examples of the items contained on this scale are “Women often miss out on good jobs due to sexual discrimination,” “It is easy to understand the anger of women's groups in America,” and “Over the past few years, the government and news media have been showing more concern about the treatment of women than is warranted by women's actual experiences” (this last item is reverse scored). On this scale, also, larger scores relate to higher levels of modern sexism. A screenshot of the full measure can be found in Appendix C. Swim and colleagues’ modern sexism scale seeks to differentiate between “old-fashioned” and “modern” sexist beliefs about women. “Old-fashioned” sexism is characterized by endorsing traditional gender roles, condoning differential treatment between men and women, and endorsing stereotypes of lower competence in females. Modern sexism, on the other hand, is characterized by the denial of continuing discrimination, antagonism towards women’s demands, and not supporting government policies that are designed to help women. However, in this study, only the modern sexism portion of the scale was used. For the current sample, $M = 3.26, SD = 1.11, \alpha = .858.$
**Big Five Personality Inventory.** Next, participants responded to a shortened version of the Big Five lexical personality inventory (Donnellan, Oswald, Baird, & Lucas, 2006). This is simply a shortened measure of the well-known “Big Five” personality model (i.e., measuring extraversion, openness, emotional stability, conscientiousness, and agreeableness). This measure consists of 20 items that participants rate their level of agreement with on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). There are four items pertaining to each of the five personality facets measured by the scale. Over the course of five different studies conducted by the original authors, they found acceptable levels of internal consistency ($\alpha$ at or well above .60) similar to other measures of the Big Five. A screenshot of the measure used in the present study can be found in Appendix D.

**Liberal-Conservative Self-Identification.** Next, participants identified themselves on a liberal to conservative self-identification scale (ANES, 2015). The scale used in the present study was developed by the American National Election Studies (ANES) organization (ANES, 2015). This is an eight-point scale ranging from “extremely liberal” to “extremely conservative” with options for “moderate, middle of the road” and “don’t know, haven’t thought about it.” A screenshot of the scale used in the present study can be found in Appendix E.

**Social Desirability.** The last measure used in this study was a short version of the Marlowe-Crowne social desirability scale, created and validated by Reynolds (1982). This short version of the social desirability scale has 13 items, and it is answered on a true-false basis. All items on the shortened scale can be found in Appendix F. The items
on the original Marlowe-Crowne scale were originally chosen because they describe culturally approved behaviors that occur only occasionally, but responses to these items (in either direction) have little to no implication for psychopathology. The Marlowe-Crowne scale has been used extensively in personality research over the past few decades. This short version of the Marlowe-Crowne is strongly correlated with the original Marlowe-Crowne scale with a significant $r$ of .93, and it has also been found to have acceptable internal consistency reliability ($\alpha = .76$) (Reynolds, 1982). Moreover, this short version of the scale by Reynolds was further validated in a study by Zook and Sipps (1985), who found no significant gender differences in scores on the scale and an overall Kuder-Richardson 20 coefficient of .74. Both of these results are concurrent with what Reynolds found in his initial 1982 study. Both of the studies consider Reynolds’ 13-item short form of the Marlowe-Crowne social desirability scale to be a viable alternative to the original.

RESULTS

Descriptive statistics of the study variables, along with intercorrelations between study variables, can be found in Table 1. Means and standard deviations of all study variables, broken down by gender, can be found in Table 2. Scale ranges for all variables can also be found in Table 2.
### Table 1. Descriptive Statistics and Intercorrelations Among Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. STEM Status</td>
<td>0.52</td>
<td>0.50</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Gender</td>
<td>0.35</td>
<td>0.48</td>
<td>.15*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Age</td>
<td>19.6</td>
<td>1.67</td>
<td>.10</td>
<td>.14</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Conservatism</td>
<td>4.21</td>
<td>1.83</td>
<td>-.16*</td>
<td>.11</td>
<td>-.01</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Social Desirability</td>
<td>7.28</td>
<td>2.73</td>
<td>-.05</td>
<td>.06</td>
<td>.06</td>
<td>.09</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Conscientiousness</td>
<td>3.49</td>
<td>0.87</td>
<td>-.06</td>
<td>-.20**</td>
<td>-.04</td>
<td>.06</td>
<td>-.18*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Agreeableness</td>
<td>3.86</td>
<td>0.70</td>
<td>.08</td>
<td>-.20**</td>
<td>.04</td>
<td>.04</td>
<td>-.15*</td>
<td>.14</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Emotional Stability</td>
<td>3.10</td>
<td>0.92</td>
<td>-.07</td>
<td>.25**</td>
<td>.00</td>
<td>.11</td>
<td>-.22**</td>
<td>.05</td>
<td>-.10</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Openness</td>
<td>3.85</td>
<td>0.74</td>
<td>.10</td>
<td>.04</td>
<td>.16*</td>
<td>-.14*</td>
<td>-.05</td>
<td>.05</td>
<td>.23**</td>
<td>.12</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Extraversion</td>
<td>3.39</td>
<td>1.01</td>
<td>-.14</td>
<td>-.05</td>
<td>-.01</td>
<td>.11</td>
<td>-.09</td>
<td>-.01</td>
<td>.11</td>
<td>.14</td>
<td>.17*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Neuroticism</td>
<td>2.54</td>
<td>0.93</td>
<td>.03</td>
<td>.51**</td>
<td>.06</td>
<td>.40**</td>
<td>.08</td>
<td>-.20**</td>
<td>-.14</td>
<td>.16*</td>
<td>-.12</td>
<td>-.01</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Modern Sexism</td>
<td>3.26</td>
<td>1.11</td>
<td>.08</td>
<td>.46**</td>
<td>.03</td>
<td>.35**</td>
<td>.03</td>
<td>-.11</td>
<td>.12</td>
<td>-.14</td>
<td>-.18*</td>
<td>-.05</td>
<td>.68**</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Concern for Discrimination</td>
<td>6.65</td>
<td>2.13</td>
<td>-.02</td>
<td>.36**</td>
<td>.01</td>
<td>-.45**</td>
<td>-.01</td>
<td>.12</td>
<td>-.01</td>
<td>-.11</td>
<td>.13</td>
<td>.03</td>
<td>-.76**</td>
<td>-.70**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>14. IAT Score</td>
<td>0.19</td>
<td>0.35</td>
<td>.00</td>
<td>.30**</td>
<td>.03</td>
<td>.08</td>
<td>.06</td>
<td>-.15*</td>
<td>-.07</td>
<td>-.06</td>
<td>.02</td>
<td>.08</td>
<td>.18*</td>
<td>.18*</td>
<td>-.1</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. STEM is coded as 0 = Non-STEM, 1 = STEM. Gender is coded 0 = female, 1 = male. N = 190.

**Significant at the .05 Level (two-tailed)

### Table 2. Means and Standard Deviations of Study Variables by Gender

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female (n = 124)</th>
<th>Male (n = 66)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM Status</td>
<td>0.46</td>
<td>0.50</td>
</tr>
<tr>
<td>Conservativeism</td>
<td>4.06</td>
<td>1.88</td>
</tr>
<tr>
<td>Social Desirability Score</td>
<td>7.17</td>
<td>2.76</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>3.61</td>
<td>0.82</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>3.96</td>
<td>0.64</td>
</tr>
<tr>
<td>Emotional Stability</td>
<td>2.93</td>
<td>0.91</td>
</tr>
<tr>
<td>Openness</td>
<td>3.83</td>
<td>0.73</td>
</tr>
<tr>
<td>Extraversion</td>
<td>3.42</td>
<td>0.99</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>2.20</td>
<td>0.79</td>
</tr>
<tr>
<td>Modern Sexism</td>
<td>2.88</td>
<td>1.00</td>
</tr>
<tr>
<td>Concern for Discrimination</td>
<td>7.21</td>
<td>2.08</td>
</tr>
<tr>
<td>IAT Score</td>
<td>0.12</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Note. n = sample size within condition. n = 65 for male Neuroticism scores.

*IAT scores: higher scores indicate more bias in favor of men as leaders and women as followers.
Group Differences

To examine the nature of the sample, \( t \)-tests were conducted to determine if there were significant differences between groups (i.e., gender and STEM status groups) in personality variables, social desirability scores, and political identification. There were no significant gender differences in social desirability, political identification, extraversion, or openness. However, women (\( M = 3.96, SD = 0.64 \)) were significantly more agreeable than men (\( M = 3.67, SD = 0.77 \)), \( t(188) = 2.722, p < .01 \), Cohen’s \( d = 0.41 \). Women (\( M = 3.61, SD = 0.82 \)) were also significantly more conscientious than men (\( M = 3.25, SD = 0.92 \)), \( t(188) = 2.755, p < .01 \), Cohen’s \( d = 0.41 \). Last, women (\( M = 2.93, SD = 0.91 \)) reported significantly less emotional stability than men (\( M = 3.41, SD = 0.86 \)), \( t(188) = -3.535, p < .01 \), Cohen’s \( d = 0.54 \). There were no differences between STEM and non-STEM students in social desirability, extraversion, agreeableness, conscientiousness, emotional stability, or openness. However, STEM students (\( M = 3.93, SD = 1.84 \)) were significantly less conservative than non-STEM students (\( M = 4.50, SD = 1.79 \)) students, \( t(188) = 2.168, p < .05 \), Cohen’s \( d = 0.31 \).

Selection of Covariates

Correlational analyses showed that conscientiousness was significantly negatively correlated with IAT score, \( r(190) = -0.148, p = 0.041 \), and significantly negatively correlated with neosexism, \( r(189) = -0.202, p = 0.005 \). Additionally, conservativism was significantly positively correlated with neosexism, \( r(189) = 0.395, p < 0.001 \), and modern sexism, \( r(190) = 0.349, p < 0.001 \), and significantly negatively correlated with concern for discrimination, \( r(190) = -0.452, p < 0.001 \). Emotional stability was significantly positively correlated with concern for discrimination, \( r(190) = -0.452, p < 0.001 \).
correlated with neosexism, $r(189) = .160, p = .028$. Openness was significantly negatively correlated with modern sexism, $r(190) = -.178, p = .014$. Because of these significant correlations, I chose to add conscientiousness as a covariate in the analysis of covariance (ANCOVA) with gender and STEM status as the grouping variables and IAT score as the dependent variable, and I chose to add conservativism, conscientiousness, emotional stability, and openness as covariates in the multivariate analysis of covariance (MANCOVA) with neosexism, modern sexism, concern for discrimination, and IAT score as the dependent variables.

**Testing Hypotheses 1, 2a, 2b, and 2c**

**ANCOVA.** A factorial analysis of covariance (ANCOVA) was conducted with gender (male vs. female) and major (STEM vs. non-STEM) as the grouping variables and IAT score as the dependent variable controlling for conscientiousness. The main effect of STEM status on IAT score was nonsignificant, $F(1, 185) = 1.248, p = .265$. However, the main effect of gender on IAT score was significant, $F(1, 185) = 17.869, p < .001$. Women ($M = 0.115, SD = 0.311$) had significantly less bias in favor stereotypic pairings (i.e., male/leader, female/follower) than men ($M = 0.335, SD = 0.366$) did. The interaction between gender and STEM status was nonsignificant, $F(1, 185) = 1.615, p = .205$.

**Testing Assumptions for ANCOVA.** Levene’s test on the factorial ANCOVA was nonsignificant, indicating that the error variance of the IAT scores was homogenous across groups. Graphing the model’s fitted values against the residuals resulted in a random scatter, indicating that the assumption of error independence was not violated. A
Shapiro-Wilk test on the residuals was significant, indicating that the assumption of the normal distribution of errors was violated. However, Tabachnick and Fidell (2013) state, “Univariate $F$ is robust to modest violations of normality as long as there are at least 20 degrees of freedom for error in a univariate ANOVA…” (p. 293). The present $F$ tests include 185 degrees of freedom for error in the ANCOVA.

**T-tests.** Across all groups, IAT scores were positive and significantly different from 0, $t(189) = 7.60, p < .001$. This indicates that across all participants there was implicit bias in favor of men as leaders and women as followers, thus supporting hypothesis 1. Across all students in STEM, IAT scores were positive and significantly different from 0, $t(97) = 5.10, p < .001$. This indicates that STEM students, overall, had implicit bias in favor of men as leaders and women as followers, thus supporting hypothesis 2a. Across male STEM students, IAT scores were positive and significantly different from 0, $t(40) = 5.53, p < .001$. This indicates that male STEM students had implicit bias in favor of men as leaders and women as followers, thus supporting hypothesis 2b. However, it should be noted that male students in STEM did not have significantly different IAT scores from male students in non-STEM majors, $t(64) = 1.41, p = .164$. Across female STEM students, IAT scores were positive and significantly different from 0, $t(56) = 2.85, p < .01$. This indicates that female STEM students had implicit bias in favor of men as leaders and women as followers, thus hypothesis 2c, which proposed that female STEM students would have counter-stereotypical biases, was not supported. Additionally, it should be noted that female STEM students’ IAT scores
were not significantly different from female non-STEM students’ IAT scores, $t(122) = -0.25, p = .802$.

**Testing Hypotheses 3, 4, and 5**

Correlational analyses were conducted to test hypotheses 3, 4, and 5. In support of hypothesis 3, neosexism was significantly and positively correlated with IAT score, $r(189) = .177, p = .015$. In support of hypothesis 4, modern sexism was significantly and positively correlated with IAT score, $r(190) = .179, p = .013$. However, hypothesis 5 was not supported. Concern for discrimination was not significantly negatively correlated with IAT score, $r(190) = -.099, p = .175$.

**Additional Analyses**

A multivariate analysis of covariance (MANCOVA) was conducted with gender and STEM status as the grouping variables and modern sexism, neosexism, concern for discrimination, and IAT score as the dependent variables, while controlling for conservatism, conscientiousness, emotional stability, and openness. A test on the overall model suggested that STEM status did not have a significant impact on the linear combination of the dependent variables, $F(4, 178) = 1.246$, Pillai’s trace = .046, $p = .293$. However, the test on the overall model suggested that gender had a significant impact on the dependent variables, $F(4, 178) = 19.107$, Pillai’s trace = .300, $p < .001$, partial $\eta^2 = .300$. The interaction between gender and STEM status was only marginally significant, $F(4, 178) = 2.162$, Pillai’s trace = .046, $p = .075$, partial $\eta^2 = .046$.

**Testing Assumptions for MANCOVA.** Box’s $M$ test for the MANCOVA was significant at the .05 level, indicating that the assumption of homoscedasticity could be
violated. However, Olson (1979) suggests that Pillai’s criterion is relatively robust to violations of homoscedasticity, so Pillai’s criterion was used when reporting the results of the MANCOVA. Moreover, Tabachnick and Fidell (2013, p. 294) suggest that results should be interpreted with caution when Box’s $M$ is significant at the .001 level. However, the Box’s $M$ test of the present analysis was significant only at the .05 level. Additionally, a multivariate Shapiro-Wilk test on the data was significant, indicating that the assumption of multivariate normality was violated. However, Seo, Kanda, and Fujikoshi (1995) found in their Monte Carlo studies that the MANOVA is robust to non-normality when overall $N$ is equal to only 40 (with 10 participants per group). For the present study, overall $N$ is 189, and the smallest group includes 25 participants.

**DISCUSSION**

The primary purpose of this study was to shed further light on gender stereotypes and how they affect women’s opportunities in the workplace, specifically if they are in the STEM fields. This study used implicit measures of stereotypes because implicit measures are not vulnerable to participants’ attempts at impression management, yet implicit beliefs and associations can still affect people’s actions and decisions, even if they are semiconscious (Greenwald et al., 2003; Latu et al., 2011).

**Discussion of Hypotheses and Results**

In the present study, it was hypothesized that female STEM students’ implicit endorsement of gender-leader stereotypes would be counter-stereotypical (i.e., in favor of female/leader, male/supporter), and therefore they would have lower IAT scores than female non-STEM students. It was also hypothesized that male STEM students’ implicit
endorsement of typical gender-leader stereotypes would be greater than male non-STEM students’ endorsement. However, these hypotheses were not supported. Instead, all groups of students, regardless of gender or STEM status, endorsed typical gender-leader stereotypes that pair men with leadership traits and women with follower or supporter traits, and STEM status made no difference in the level of students’ endorsement of gender-leader stereotypes.

The results of the present study speak to the pervasiveness of gender stereotypes about leadership ability. While women in the current sample, to some extent, demonstrated the self-preference found in other studies (e.g., Latu et al. 2011) on the IAT detecting associations between women and leadership, they, on average, still had stronger associations between men and leadership attributes and women and follower attributes. However, it should also be noted that the leadership words used on the IAT (e.g., assertive, dynamic, determined) were very much aligned with agentic traits, whereas the supporter words used on the IAT (e.g., helpful, compassionate, sympathetic) were very much aligned with communal traits (see Eagly & Steffen, 1984 for a discussion of these basic gender stereotypes). Therefore, the IAT might really have been detecting whether participants perceived women as communal and men as agentic, and while this dichotomy of basic gender stereotypes (i.e., agentic versus communal) is closely related to gender-leadership stereotypes, they are not quite the same thing. It would be interesting for future research to use leadership-associated words that were not related to either agentic or communal traits and see if the results found in the present study were replicated under these conditions.
STEM status also did not make a difference when testing students’ implicit
gender-leadership stereotypes. There are several potential explanations for this. One is
sampling error. The current sample was around 65% female, and the women were split
relatively evenly between STEM and non-STEM majors. This could have resulted in the
overall difference between STEM and non-STEM majors’ IAT scores being non-
significant, because both groups were buffered by large numbers of women whose in-
group bias worked against commonly held gender-leadership stereotypes. However, if
this was the only reason behind the lack of difference between groups, one would expect
that STEM women would have less implicit gender-leadership bias than non-STEM
women, but this was not the case. STEM and non-STEM women’s IAT scores were not
significantly different. Additionally, in the current sample, STEM majors were
significantly more liberal than non-STEM majors, and conservatism was related to all
three explicit measures of sexism. However, conservatism was not significantly related to
IAT scores, so differences in political leanings cannot explain why there was no
significant difference between the IAT scores of the groups. Another explanation is that
being counter-stereotypical in one domain (e.g., being a woman in STEM) does not
necessarily mean that an individual will have counter-stereotypical implicit beliefs in
another domain (e.g., gender-leadership associations). Women in STEM may even view
themselves as exceptions to the rule, and therefore still subscribe to the usual gender
stereotypes, including those about leadership ability. Finally, there is the possibility that
gender-leadership stereotypes are so pervasive in American society that even women in
STEM, who are already counter-stereotypical in one domain, subscribe to these
stereotypes. Further research can be conducted to determine what is the most likely explanation of those listed here.

Additionally, it was hypothesized that the explicit measures of sexism, including neosexism, modern sexism, and concern for discrimination, would have the expected relationships with IAT scores. Neosexism and modern sexism were both significantly and positively related to IAT scores, indicating that these constructs were good parallels to the implicit gender bias that the IAT was detecting. However, concern for discrimination was not significantly related to IAT scores, so this construct might not have been related to the implicit gender bias that the IAT was detecting. Alternatively, this lack of relationship could have been a function of the scale that was used to measure concern for discrimination. As stated previously, this scale was adapted from a measure about concern for racial discrimination. It could be that the wording of these specific statements was not very adaptable to a measure about gender discrimination, and therefore the scale did not measure what was intended. The concern for discrimination measure also had only four statements to which participants responded, and one of the four statements on the concern for discrimination scale was “I am not personally concerned about discrimination against women.” Participants may have mistakenly interpreted this question, thinking it was asking something like “I am not personally affected by discrimination against women”, and men and women who had not personally experienced gender discrimination may have responded accordingly, thereby interfering with the underlying construct that this measure was assessing. Perhaps future research can develop alternative measures to assess concern about gender discrimination.
Limitations

One limitation of the present study was its lack of an explicit measure that was completely parallel to the IAT. General sexism was detected with the explicit measures, while the IAT specifically examined associations between male versus female names with leadership versus follower attributes. However, despite this limitation, neosexism and modern sexism still had the expected relationships with IAT scores. Additionally, there were unequal sample sizes across conditions. While women were relatively equally distributed between STEM \((N = 57)\) and non-STEM \((N = 66)\) majors, there were far more men in STEM majors \((N = 41)\) than non-STEM majors \((N = 25)\). The lack of non-STEM major men in the sample, compared to the other groups, could have impacted the results that were found.

Implications of Gender Leadership Stereotypes

Research on implicit gender stereotypes is important because, despite the changing work environment, women still lag behind men in many ways at work. For example, top leadership positions in organizations are generally allocated to men over women, so women are underrepresented within upper levels of management, and there is still a stubborn stereotype in existence that managers are men (Ebert et al., 2014). The results from the present study support the prevalence of this stereotype. All groups of participants, whether they were male or female or in the STEM fields or not, more readily associated men with leadership attributes and women with follower attributes.

Discouraging as these findings might be for women in the workplace, they coincide with other recent research on gender-leader stereotypes. For example, Smith,
Rosenstein, Nikolov, & Chaney (2018) conducted a study on agentic versus communal trait descriptions and gender in a predominantly male profession – the Navy. They had Navy students peer-evaluate each other on leadership attributes using a set list of descriptor terms, which were categorized as descriptive/positive or proscriptive/negative and communal/feminine, agentic/masculine, or neutral. Communal behaviors are characterized by relationship-orientation, nurturing and warmth, while agentic behaviors are characterized by task-orientation, goal-orientation, and instrumentality. Smith and colleagues (2018) found that, while men and women received similar numbers of positive attributes, women received a greater number of negative attributes than men, and most of these negative attributes that women received were rated as feminine attributes. Additionally, male Navy students received only attributes (both negative and positive) that were rated as masculine or neutral. Female Navy students, on the other hand, received mostly feminine attributes (both negative and positive) with only a couple of masculine or neutral traits added. Smith and colleagues (2018) suggest that this means feminine leadership attributes were being assigned in such a way that they maintained the current gender status hierarchy, where agentic qualities, and therefore men, are considered best suited for leadership positions.

Similarly, Patel and Biswas (2016) found that in mixed-gender Indian workplaces, male and female leaders are assigned different stereotypical attributes and are held to different standards for effectiveness. However, Patel (2016) found different results when the profession was predominantly female. Among preschool teachers, female leaders were described with predominantly masculine adjectives rather than feminine. However,
considering the context, this makes sense. There would not have been a gender hierarchy in place in a workplace with only women, therefore leaders would have been assigned whichever traits were more readily associated with leaders, and these would have been agentic, masculine attributes, based on gender stereotypes linking men with leadership positions and qualities.

Hoyt & Murphy (2016) discuss the impact of stereotype threat for female leaders. Stereotype threat is an individual’s perception of the threat of being judged poorly in a domain where negative stereotypes about their group apply. Hoyt and Murphy (2016) suggest that women are often put in a “double-bind” in workplaces, where if they are overly communal in their behavior, then they are criticized as being deficient leaders, but if they are overly agentic in their behavior, then they are criticized for violating gender roles and not being feminine enough. Gender stereotype-based threat can cause decrements in performance over time, which accumulate and can cause women’s disengagement and decreased aspiration for leadership roles. This can lead some women to leave their professions early and further increase the deficit of women in upper-level leadership positions, which only serves to perpetuate the existing gender-leader stereotypes and gender hierarchy found in many organizations.

These gender stereotypes become a self-perpetuating problem in the workplace, not only due to stereotype threat, but also because of the differing performance expectations for women and men in the workplace. For example, in heterogenous groups, like mixed-gender groups, status hierarchies can quickly appear (Fisek, Berger, & Norman, 1991). In mixed-gender groups, men are generally perceived as higher in social
status, and therefore higher performance expectations are directed toward them, and group members with the highest performance expectations are given more opportunity to perform (Fisek et al., 1991; Mast, 2004). This system only succeeds in perpetuating the hierarchy already in place. In addition to this phenomenon, men are perceived as more hierarchical than women in the first place, potentially limiting women’s opportunities to advance through the ranks in hierarchical organizations (Mast, 2004). Due to these self-perpetuating stereotypes and performance expectations, women in the workplace often receive lower ratings on their performance evaluations than their male counterparts (Latu et al., 2011). If women occupy powerful positions, then they are especially prone to being penalized in performance evaluations because their perceived violation of gender roles and norms (Hoyt & Murphy, 2016; Latu et al., 2011).

**Coping with Gender Leadership Stereotypes**

Despite these somewhat discouraging findings about the stereotypes women face regarding their leadership ability, other recent research has been concerned with finding ways for women to confront and overcome these stereotypes in the workplace. For example, Akinola, Martin, and Phillips (2018) conducted a series of studies on how to encourage female leaders to delegate tasks to subordinates. Akinola and colleagues’ (2016) findings show that women are more hesitant to delegate tasks to subordinates because they perceive it to be agentic behavior (and therefore role-incongruent), and they have greater negative associations with delegation than do men. Akinola and her colleagues suggest that emphasizing the communal and relational nature of delegation
encourages female leaders to engage in it more often and more effectively, thus improving one aspect of their management performance.

Kray and Kennedy (2017) discuss gender differences in negotiation strategies and how a stubborn gender stereotype remains that women are not effective advocates for themselves. However, Kray and Kennedy (2017) suggest that this stereotype is based on a biased understanding of what it means to be a good negotiator. For example, women tend to be more ethical, cooperative, and empathetic when negotiating deals – attributes which are essential when negotiating a deal where the two parties need to maintain a relationship of mutual trust and respect. Moreover, in many situations, women match or outperform men in the results of their negotiations. However, in situations where negative gender stereotypes about women are tied to poor negotiation outcomes, women’s performance falters due to stereotype threat. For example, negotiation prowess is often judged based on agentic traits, like assertiveness, self-interest, and rationality, therefore assessment of negotiation skills is often decidedly biased against women, who stereotypically “should not” have these traits. Kray and Kennedy (2017) recommend that organizations rethink what it means to be a good negotiator, emphasizing the positive impact that more communal traits can have on negotiating deals in the workplace, thereby counteracting some of the bias against women in this area.

While emphasizing women’s skills and unique contributions to the workplace is important, as the studies by Akinola and colleagues (2018) and the article by Kray and Kennedy (2017) suggest, it is also essential that the negative gender stereotypes women face be addressed. Hoyt & Murphy (2016) suggest some remedies for stereotype threat.
First, they suggest that increased representation of women in leadership positions provides aspiring women with role models, who show them that success in the stereotyped domain is attainable and inoculate women’s sense of self against the identity threats that come with negative gender stereotypes. Second, they recommend creating identity-safe environments for women to buffer the effects of stereotype threat. Identity-safe environments are those where the validity, relevance, and acceptance of negative stereotypes is challenged. For example, women are more likely to perform well in leadership tasks when they are told it shows no gender differences, and they are more likely to engage in negotiations when the process is framed as “asking” for something rather than “negotiating” for something. Women also perform better when the previous occupant of a managerial position is described as a woman with feminine traits rather than a man with masculine traits. Last, Hoyt and Murphy (2016), like Akinola and colleagues (2018) and Kray and Kennedy (2017), emphasize the power of highlighting positive gender stereotypes about women and de-emphasizing negative gender stereotypes by explicitly valuing feminine or communal traits.

**Directions for Future Research**

Future researchers in this field should continue to investigate ways to create identity-safe environments in organizations and counteract the effects of stereotype threat on female leaders. More research should be conducted on the impact that successful female leadership role models and counter-stereotypical examples have on women’s implicit subscription to negative gender stereotypes. Additionally, Hoyt and Murphy (2016) suggest that conceptions of leadership traits are steadily becoming more
androgynous compared to what they were, despite the persisting discrimination women face in this domain. For example, the concept of transformational leadership has become more popular in recent years, and descriptions of transformative leaders include some more communal traits, such as modeling cooperation and showing empathy (Lanaj, Johnson, & Lee, 2016). Research needs to be conducted to explore the effects that these changing leaderships trends are having on women’s self-concepts as leaders.

Additional research on the foundations of implicit negative gender stereotypes would also be useful. In the present study, women in all fields still had implicit stereotypes in favor of men as leaders and women as followers, even when they were already counter-stereotypical examples in another domain themselves (i.e., women in STEM). Kray and Kennedy (2017) suggest that just-world bias may be partially to blame for both men and women’s belief in women’s inferiority in domains where they underperform men. People want to believe that outcomes are predictable and controllable and that there is some sense to the current social order or status quo. Therefore, women subscribe to negative gender stereotypes, even when it places them at a disadvantage. However, investigating alternative foundations for this phenomenon might still be a fruitful avenue for research.

Last, one major challenge for research that involves gender and/or other grouping variables is the experimenters’ lack of ability to randomly assign participants to groups. There were some unexpected between-groups differences in the present study. For example, students in STEM happened to be significantly more liberal in their political ideologies than non-STEM students. Additionally, conscientiousness was a significant
predictor of participants’ IAT scores, but women were also significantly more conscientious than men, and their IAT scores were significantly lower than men’s. Conscientiousness, in and of itself, would be an interesting avenue for investigation in the implicit bias field, since it was a significant predictor of IAT scores in this study. A cursory review of the literature linking “conscientiousness” with “implicit bias” shows that researchers have not yet thought to use conscientiousness as a predictor for the level of bias people’s IAT scores show. There could be some unique quality about conscientious people that allows them to better monitor and control their automatic responses and associations on a measure like the IAT.

Despite the interesting avenues for research that they open up, unexpected and uncontrollable differences between groups could have impacted the results that were found in the present study. Future research should use methods like propensity score analysis to predict individuals’ group membership from variables such as these so similar participants could be matched across groups, and thus, these uncontrollable group differences could be accounted for in the focal analyses.

CONCLUSION

In summary, the more that we know about the development and perpetuation of negative gender stereotypes about women, the better we will be able to confront and overcome these stereotypes, leading to greater equality for women in the workplace. There are many practical implications for this field of research as well. For example, merely awareness of implicit stereotypes and how they can affect behavior could be useful for some people, like hiring managers, who have control over who is hired for
leadership positions. Moreover, as Hoyt and Murphy (2016) discuss, there are many ways that negative gender stereotypes can be constructively addressed in the workplace by creating identity-safe environments. As research continues to investigate the foundations and implications of gender stereotypes in the workplace, more ways to change or cope with these stereotypes can be developed. Eventually, as this area of research continues to expand, equality between men and women in the workplace could become attainable.
REFERENCES


Ebert, I. D., Steffens, M. C., & Kroth, A. (2014). Warm, but maybe not so competent?—Contemporary implicit stereotypes of women and men in Germany. *Sex Roles, 70*, 359-375.


Reynolds, W. M. (1982). Development of reliable and valid short forms of the Marlowe-


(STEM): An investigation of their implicit gender stereotypes and stereotypes'

Smeding, A., Quinton, J., Lauer, K., Barca, L., & Pezzulo, G. (2016). Tracking and
simulating dynamics of implicit stereotypes: A situated social cognition

Smith, D. G., Rosenstein, J. E., Nikolov, M. C., & Chaney, D. A. (2019). The power of
language: Gender, status, and agency in performance evaluations. *Sex Roles, 80*,
159-171.


implicit math-gender stereotypes and math withdrawal in female and male


APPENDICES
## Appendix A
Neosexism Scale (Tougas et al., 1995)

Please rate each statement on the degree to which it best represents your views.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Moderately Disagree</th>
<th>Slightly Disagree</th>
<th>Neither Agree</th>
<th>Slightly Agree</th>
<th>Moderately Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universities are wrong to admit women in costly programs, such as medicine, when in fact a large number will leave their jobs after a few years to raise their children.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>To not appear sexist, many men are inclined to overcompensate women.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Women shouldn’t push themselves where they are not wanted.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>It is difficult to work for a woman boss.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Over the past few years, women have gotten more from the government than they deserve.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Women will make more progress by being patient and not pushing too hard for change.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Women’s requests in terms of equality between the sexes are simply exaggerated.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>In a fair employment system, men and women would be considered equal.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>I consider the present employment system to be unfair to women.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Discrimination against women in the labor force is no longer a problem in the U.S.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Due to social pressures, managers frequently have to hire underqualified women.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
Appendix B
Concern for Discrimination Scale (Devine et al., 2012)
### Appendix C
Modern Sexism Scale (Swim et al., 1995)

Please rate each statement on the degree to which it best represents your views.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Moderately Agree</th>
<th>Slightly Agree</th>
<th>Nor Disagree</th>
<th>Slightly Disagree</th>
<th>Moderately Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discrimination against women is no longer a problem in the United States.</td>
<td></td>
<td></td>
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<tr>
<td>Women often miss out on good jobs due to sexual discrimination.</td>
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<tr>
<td>It is rare to see women treated in a sexist manner on television.</td>
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<tr>
<td>On average, people in our society treat husbands and wives equally.</td>
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<tr>
<td>Society has reached the point where women and men have equal opportunities for achievement.</td>
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<tr>
<td>It is easy to understand the anger of women's groups in the U.S.</td>
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<tr>
<td>It is easy to understand why women's groups are still concerned about societal limitations of women's opportunities.</td>
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<tr>
<td>Over the past few years, the government and news media have been showing more concern about the treatment of women than is warranted by women's actual experiences.</td>
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</tbody>
</table>
Appendix D
Short Form of Big Five Lexical Personality Inventory (Donnellan et al., 2006)

How much do you agree with each statement about you as you generally are now, not as you wish to be in the future?

In general, I...

<table>
<thead>
<tr>
<th>Statement</th>
<th>1 = Strongly Disagree</th>
<th>2 = Somewhat Disagree</th>
<th>3 = Neither Agree nor Disagree</th>
<th>4 = Somewhat Agree</th>
<th>5 = Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Am the life of the party.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sympathize with others' feelings.</td>
<td></td>
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<tr>
<td>Get chores done right away.</td>
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<tr>
<td>Have frequent mood swings.</td>
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<tr>
<td>Have a vivid imagination.</td>
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<tr>
<td>Don't talk a lot</td>
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<tr>
<td>Am not interested in other peoples' problems.</td>
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<tr>
<td>Often forget to put things back in their proper place.</td>
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<tr>
<td>Am relaxed most of the time.</td>
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<td>Am not interested in abstract ideas.</td>
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<td>Talk to a lot of different people at parties.</td>
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<td>Feel others' emotions.</td>
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<td>Like order.</td>
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<td>Get upset easily.</td>
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<td>Have difficulty understanding abstract ideas.</td>
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<td>Keep in the background.</td>
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<td>Am not really interested in others.</td>
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<td>Make a mess of things.</td>
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<td>Seldom feel blue.</td>
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<td>Do not have a good imagination.</td>
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Appendix E
Liberal-Conservative Self-Identification Scale (from ANES)

Where would you place yourself on this scale, or have you not thought much about this?

- Extremely Liberal
- Liberal
- Slightly Liberal
- Moderate, middle of the road
- Slightly Conservative
- Conservative
- Extremely Conservative
- Don't know, haven't thought about it
Appendix F

Marlowe-Crowne Social Desirability Scale, Short Version (Form C) (Reynolds, 1982)

Items 3, 6, 10, 12, 13, 15, 16, 19, 21, 26, 28, 30, 33 from the original scale

3. It is sometimes hard for me to go on with my work if I am not encouraged.

6. I sometimes feel resentful when I don't get my way.

10. On a few occasions, I have given up doing something because I thought too little of my ability.

12. There have been times when I felt like rebelling against people in authority even though I knew they were right.

13. No matter who I'm talking to, I'm always a good listener.

15. There have been occasions when I took advantage of someone.

16. I'm always willing to admit it when I make a mistake.

19. I sometimes try to get even rather than forgive and forget.

21. I am always courteous, even to people who are disagreeable.

26. I have never been irked when people expressed ideas very different than my own.

28. There have been times when I was quite jealous of the good fortune of others.

30. I am sometimes irritated by people who ask favors of me.

33. I have never deliberately said something that hurt someone’s feelings.

* All items are in a true-false response format. *