

The Relationship Between Working Memory Capacity and Implicit Gender Stereotypes

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Abstract

It is no secret that attitudes are complex psychological constructs, and thus individual differences arise in attitudes towards people, things, or ideas. Two cognitive processes have an influence on one's attitudes: explicit (i.e., deliberate and conscious awareness or belief) and implicit (i.e., unconscious control or belief). Stereotypes develop when generalizations are formed about a specific group, and these generalizations guide implicit attitudes. People are able to make quicker associations when ideas are consistent with a stereotype (e.g., in gender stereotypes, people can recognize the association between "male" and "office" quicker than "female" and "office"). Working memory capacity (WMC) has been described as the ability to hold information in the immediate consciousness to be used following the storage of that information. Individual differences in WMC influence cognitive tasks. Previous research focuses on self-regulatory behavior, suggesting that individuals with lower WMC are less capable of inhibiting implicit processes over explicit; therefore, implicit processes have stronger influences. The purpose of this study was to determine if these effects of WMC on implicit behavior could be generalized to the gender stereotype of females providing for the family and males remaining in the workplace, using the Implicit Association Test.

Introduction

There are a multitude of mental processes that individuals experience on a daily basis that play a role in cognitive functioning. One of the most important concepts that provide people with the tools necessary to proceed with their day-to-day tasks is that of memory. Over the years, the way in which psychologists have explained human thought has developed immensely. Today, the most common explanation is the Modal Model that was proposed by Atkinson and Shiffrin in 1968. This model incorporates three main types of memory: sensory memory, short-term memory, and long-term memory. Healy and McNamara (1996) explain the modal model by starting with sensory memory that is the visual, auditory, and haptic information, that possesses a relatively large capacity but only a short duration, allowing for little information to be accessed by conscious awareness (i.e., it may seem as though an individual did not see a particular image and can only recall a part of it, but the sensory information is actually being retrieved beyond our awareness). Short-term memory (i.e., primary memory) is capable of storing information for a longer period of time, but there is a limitation to how much information can truly be held, which has long been debated and determined with the magic number of 7 plus or minus 2 items for around 30 seconds in duration (Healy, & McNamara, 1996). Long-term memory (i.e., secondary memory), on the other hand, has a relatively unlimited capacity and is relatively permanent, assuming that there is no significant brain damage that occurs.

As a part of short-term memory, Baddeley, Hitch, and Allen (2018) discussed a more elaborate system called working memory that can be derived from the original model. Working memory is a component of primary memory that must incorporate the use of storage and processing to encode information (Baddeley, Hitch, & Allen, 2018). Long-term memory can also

be broken down into separate parts; two processes that are part of the longer, more permanent storage are known as explicit (i.e., conscious) memory and implicit (i.e., unconscious) memory. According to research conducted on memory components, explicit memories are those that can be categorized as episodic memory (e.g., remembering a specific event and its context), as well as semantic memory (e.g., understanding the general knowledge about a specific concept) (Baddeley, Hitch, & Allen, 2018).

The focus of this study addresses the components that are related to implicit memory. Broadly, implicit memory is the information that may be encoded or retrieved that goes beyond human awareness or consciousness (e.g., a participant could be probed with a stem of a few letters such as ORA___ and must say the first word that comes to mind). Schacter (1987) describes how memories of forgotten experiences are expressed without awareness, and therefore on the personal consciousness. It is important to address what components of memory fall into place when studying the implicit memories, especially since it is such a complex process. Its complexity arises from the fact that it is unconscious, therefore it is more difficult to truly discover how it functions.

Hine and Tsushima (2018) briefly describe the three processes that are involved in memory: encoding (i.e., the input processing of the information), storage (i.e., how information is kept over time), and retrieval (i.e., the ability to regain access to that information from storage). Another key term that is relevant in the study of implicit memory is association. Associations are described as pairs of two different concepts or ideas that share a familiar node or concept and are linked (Greenwald, Rudman, Nosek, Banaji, Farnham, & Mellott, 2002). Greenwald and colleagues (2002) also describe the strength of associations as the potential for

one concept to activate another, and it has been shown to be bidirectional between the two, facilitatory, as well as variable in strength. Associations between concepts that are both activated, as described prominently in Hebb's theory, is a concept that is studied within the neural network of connectivity and plays an important role in implicit memory, as it is important not to leave out the biological processes that are activated (Greenwald et al., 2002).

Activation may only be present for a couple of hours (Graf, Squire, & Mandler, 1984), but this activation may sometimes lead to errors in cognitive abilities. An implicit effect that can also be called a priming effect occurs when information is given prior to testing that activates a specific concept, whether explicitly or implicitly, so that it can be easily accessed later (Hupbach, Melzer, & Hardt, 2006). Priming refers to a long-term change in a behavioral response to an item, such as a word, as a result of having the prior exposure to that item (Berry, Shanks, Li, Rains, & Henson, 2010). Greenwald, Banaji, and Nosek (2003) utilize the term negative transfer to describe the idea that practice at one task interferes with the performance at a second task, leading to different responses to the stimuli from the first task. It could also be the case that activation occurs in a concept that does not actually align with the targeted response, which creates a false memory (e.g., a subject recalls seeing the word "sleep" when in reality they were only primed with related words such as "tired" or "bed") (McBride, Coane, & Raulerson III, 2005). A similar concept that must be distinguished is recognition because according to Berry and colleagues (2010), recognition allows for the ability to judge whether or not a particular item has been presented already before. Thus, recognition is more closely associated with explicit memory.

There have been multiple studies conducted to address implicit memory, and there are multiple tests that have been shown to examine its unconscious nature. These tests can be separated into two main categories; one group is the perceptual tasks, which are characterized by the reliance on perceptual processing of stimuli (e.g., a lexical decision task), and the other group is conceptual tasks, which are characterized by operating on semantic aspects of the stimuli (e.g., a word association task) (Hupbach, Melzer, & Hardt, 2006). Some of the most common implicit tasks that have been used are the lexical decision, the word identification, and the word stem or fragment completion (Schacter, 1987). One of the most influential psychologists in cognitive studies, Ebbinghaus, took note of what he called “savings” and developed the savings paradigm that examines how memory is tested by relearning lists that have already been previously studied (i.e., savings are observed over a retention interval for items that are not consciously remembered as being studied before) (Schacter, 1987). This led multiple researchers to start collecting data to determine what is affected by implicit memory.

A study conducted by Berry and colleagues (2010) implemented a picture fragment identification task to measure implicit memory effects, and they found that there was a priming effect for ignored items but not in the absence of recognition. However, in the same study, they also implemented a word outline stimuli and found that there was an association between priming and recognition (Berry et al., 2010). This research falls in line with the majority of implicit memory research in which it is often times contradictory and convoluted. Other studies have implemented the Implicit Association Test (IAT) that measures the strengths of associations between different concepts, has a test-retest reliability of approximately $r = 0.6$, and is a measure of internal consistency (Greenwald et al., 2002; Greenwald, Banaji, & Nosek, 2003). A website

was created that allows people to experience the IAT method that indicates that associations have a greater strength when they are tested in the first combined task (Greenwald, Banaji, & Nosek, 2003). Evidence of implicit memory is examined as subjects were presented with letter strings that were organized according to rules of synthetic grammar; results concluded that subjects were able to learn to identify the grammatically correct strings even though they were not consciously or explicitly aware of the rules (Schacter, 1987).

The issue of awareness arises when implicit tasks are not followed up by checks to ensure that the results were specifically related to the implicit behavior and not explicit (i.e., there needs to be a check to see if participants were aware of what they were responding with). According to McBride, Coane, and Raulerson III (2005), the proportion of related or studied items included in an implicit test can have an impact on the subjects' ability to engage in intentional retrieval strategies. They suggested that there were many different checks that could be implemented in order to ensure that the implicit task is measuring implicit memory. These checks include a level of processing manipulation, a time limit per trial that is used to discourage the use of an explicit strategy of deliberate thought, a large number of the unstudied words in the task to hide the true nature of the study, and to implement a posttest questionnaire to determine if participants used explicit retrieval or if they were ever aware of the connections they were making to the study items (McBride, Coane, & Raulerson III, 2005). The reason this may arise is because implicit memory can be tested without a retrieval cue, so the check is necessary to be more careful in collecting data on implicit memory (Perfect, Moulin, Conway, & Perry, 2002).

Though these checks may be useful in ensuring that implicit memory is measured, some research has been skeptical of the reliability of these techniques. According to Bernhardt and

Geraci (2008), there is nothing to inhibit subjects from developing an awareness that they are utilizing information that they have previously been exposed to, which is known as involuntary explicit memory. Research has shown that when the implicit memory is tested using perceptual identification, explicit contamination is less likely to occur (Perfect, Moulin, Conway, & Perry, 2002). Participants may also engage in specific behavior that constitutes a shift away from actually saying the first word that comes to their mind and intentionally responding with studied words; this is when explicit contamination of implicit memory could lead researchers to falsely conclude results about implicit memory that are actually measuring explicit memory (Bernhardt, & Geraci, 2008). The researchers also suggest that the posttest questionnaire may be phrased in terms of leading questions and may actually guide more individuals into a state of awareness (Bernhardt, & Geraci, 2008). McBride, Coane, and Raulerson III (2005) suggest that some aware participants may take the posttest questionnaire and not mark that they were aware on the questionnaire. However, it has been shown to result in a valid assessment of test awareness for both perceptual implicit tests and conceptual implicit tests; it also tends to have a liberal bias and classifies more unaware subjects as aware, which may be safer in the long run (Bernhardt, & Geraci, 2008).

It is important to address the individual differences associated with executive functioning because those differences may account for the differences in susceptibility to be influenced by implicit processes. Working memory can be explained as the simultaneous storage and manipulation of information that coincides with short-term memory (Cowan, 2008). Multiple studies have explained that individual differences in working memory capacities (i.e., WMC) are presented across populations (Gonzalez, 2005; Kyllonen & Christal, 1990). Current research

has expressed the influence of working memory on implicit associations and the behaviors consequential of those implicit processes. Finn and Hall (2004) suggest that individuals with a lower WMC are less capable to shift their attention away from the stimuli that is highly activated, and positive associations are more highly activated. Implicit memory has been addressed in studies, mainly focusing on alcohol use (Thush, Wiers, Ames, Grenard, Sussman, & Stacy, 2008; Finn, & Hall, 2004), political attitudes (Schmitz, Teige-Mocigemba, Voss, & Klauer, 2013), dangerous driving stereotypes (Lambert, Seegmiller, Stefanucci, & Watson, 2013), self-regulatory behavior (Hofmann, Friese, Gschwendner, Wiers, & Schmitt, 2008), and fear and avoidance behavior (Effting, Salemink, Verschuere, & Beckers, 2016). Redman, Greenwald, and McGhee (2001) utilized an IAT in order to examine the differences between implicit and explicit gender stereotypes. The focal stereotypes that the IAT accounted for were gender potency (i.e., powerful vs. weak) and gender-warmth (i.e., warm vs. cold). The results of this study determined that although females reported less sex-stereotyping than men on explicit measures of gender beliefs and attitudes, both genders scored similarly on implicit measures (Redman, Greenwald, & McGhee, 2001). From this research, it is evident that women still hold gender stereotypes at the unconscious level, even if not explicitly aware. There has been less research conducted in order to address the influence WMC has on implicit attitudes towards gender stereotypes specifically.

The purpose of this study was to investigate the gaps within previous research that is limited in addressing both implicit gender stereotypes between males and females and the relationship between WMC and implicit gender stereotyping. This study consisted of an examination of the relationship between WMC and the implicit gender stereotypes that females

are associated with family and males are associated with the workplace. Because of the link between lower working memory capacity and the capability, or rather incapability, to shift attention away from stimuli that is highly activated, it was hypothesized that individuals who have a lower working memory capacity would display stronger implicit gender stereotypes (i.e., there would be a larger difference in reaction time between stereotype consistent and inconsistent trials of the study) (Finn, & Hall, 2004). Due to the recent shift in societal norms, it was also hypothesized that within the explicit measures, females would exhibit less gender-stereotyping compared to males. There is some research that suggests that men are more likely to perform better in working memory tasks, so there may have been a relationship between working memory capacity and the explicit measure of gender stereotyping, but due to the lack of previous research, this was merely speculation.

Method

Participants

A total of 41 undergraduates from a small, liberal college in the southeastern United States participated in this study. The participants were sampled from a psychology research participation pool and served as participants in exchange for course credit or extra credit, as was determined by their instructor. Participants listed both their sex (assigned at birth) and their gender identity (how they choose to identify). The participant pool was 80% female and 20% male, and the ethnic make-up of the participant pool was 78% Caucasian, 7% African American, 7% Hispanic, 2% Asian, 2% North African and 4% a combination of two ethnicities. Participants ranged in age from 18-29 years, with an average of 20.5 years ($SD=1.66$).

Design

The experiment formed a 2 x 2 x 2 mixed subjects factorial design, with the WMC (lower, higher) and participant gender (male, female) as the grouping variables, and the IAT components (stereotype consistent trials, stereotype inconsistent trials) as the within subjects factor. The dependent variables were the implicit and explicit gender stereotypes exhibited, as measured by a series of surveys and performance on an implicit association test. The experimenter collected data from a total of 41 participants.

Materials

Working Memory Capacity. Participants used the automated version of the OSPAN task via the Operation Span ZAPS lab (<https://www.digital.wnnorton.com/cognition7>) as a measure of working memory capacity. The task utilized both a processing component of verifying the accuracy of an equation (e.g., verifying if the equation “ $(17 + 11) / 7 = 4$ ” is “correct” or “incorrect”), and a storage component of remembering a list of words in order (e.g., motor, route, marine, curtain, woman). This task has been shown to be internally consistent ($\alpha = 0.80$). The stimuli consist of 40 mathematical questions and 40 one-to-two syllable, English words. The task is scored out of 40, and a higher score indicates a higher working memory capacity. The participant must score at least 85% on the arithmetic portion of the task in order for their score to be considered valid.

Implicit Association Test. Participants used the automated version of the IAT task via the Implicit-Association Test ZAPS lab (<https://www.digital.wnnorton.com/cognition7>) as a measure of implicit gender stereotyping. The task consists of 7 different series, 100 items total. Series 1 and 5 prompted participants with a name to categorize as either “man” or “woman”

(e.g., the stimulus word is “Daniel”, so the participant must click the word “man”). Series 2 prompted participants with a word to categorize as either “career” or “family” (e.g., the stimulus word is “salary”, so the participant must click the word “career”). Series 3 and 4 prompted participants with a mixture of words or names and must categorize them as either “man-career” or “woman-family” (e.g., the stimulus word is “corporation”, so the participant must click the button that reads “man-career”). Series 6 and 7 prompted participants with a mixture of words or names and must categorize them as either “woman-career” or “man-family” (e.g., the stimulus word is “home”, so the participant must click the button that reads “man-family”). This test measures implicit attitudes by calculating the differences in reaction time between inconsistent stereotype and consistent stereotype conditions (i.e., the inconsistent stereotype occurs when participants are asked to pair a word that is associated with the workplace and must categorize it as “woman-career”, or vice versa). The task has been shown to be internally consistent ($\alpha = 0.70$ to 0.90).

Bem Sex Role Inventory. Participants’ masculinity and/or femininity in terms of their own self-report was assessed using the 20-item short-form of the Bem Sex Role Inventory (Campbell, Gillaspy, & Thompson, 1997) (*see* Appendix B). This short-form version of the BSRI is composed of 10 items to determine a masculinity score (e.g., forceful) and 10 items to determine a femininity score (e.g., affectionate). Participants used a 7-point scale to rate themselves in terms of the extent to which the characteristic is true to them. The experimenters assessed these scores by noting whether participants are androgynous, male sex-typed, female sex-typed, or undifferentiated depending on the masculinity and femininity scores. The scale has been shown to be internally consistent ($\alpha = 0.82$ to 0.89).

Attitudes Toward Women Scale. Participants' opinions about the rights and roles of women were assessed using the shorter 15-item version of the Attitudes Toward Women Scale (Spence, & Hahn, 1973) (*see* Appendix C). This scale is composed of attitudes toward the role of women in society that different people have (e.g., "women should worry less about their rights and more about becoming good wives and mothers"). Participants used a 5-point scale to indicate the extent to which they agree with each statement. A low score suggests that the participant has a pro-feminist, egalitarian attitude, whereas a high score suggests that the participant has a traditional, conservative attitude. The scale has been shown to be internally consistent ($\alpha = 0.80$ or higher).

Sex-Role Egalitarianism Scale. Participants' attitudes towards the equality of men and women were assessed using a modified version of the Sex-Role Egalitarianism Scale (SRES) - Alternate Abbreviated Form (King & King, 1997) (*see* Appendix D). This scale is composed of gender-role attitudes across different content domains (e.g., "it is wrong for a man to enter a traditionally female career"). Participants used a 5-point scale indicating the extent to which they agree with each statement. A higher score indicates the most egalitarian responses. The scale has been shown to be internally consistent ($\alpha =$ between 0.83 and 0.90).

Procedure

The experiment will take place in a lab or classroom setting. All participants were first asked to give informed consent (Appendix A). Participants began the experimental portion of the study by completing the automated Operation Span task. In order to categorize the participants into higher or lower WMC, those who score above the median score will be considered to have a higher WMC and those who score below the median score will be considered to have a lower

WMC. Then, participants completed the automated Implicit-Association Test. It is imperative that the implicit measure be carried out prior to the explicit measures of attitudes toward gender stereotypes in order to avoid the concept of explicit contamination (i.e., the participants suffer from involuntary explicit memory from exposure to the explicit measures, even in the implicit task). After completion of both tasks on the ZAPS site, the participants completed the remaining explicit-measure scales, as well as demographic information (Appendix B - E). Participants were then debriefed (Appendix F).

Results

It was expected that regardless of the gender of the participant, participants who have a lower WMC would display stronger implicit gender stereotypes, compared to participants who have a higher WMC (i.e., there will be a larger difference in the reaction time between the inconsistent and consistent stereotype trials of the IAT for participants with a lower WMC). A multivariate factorial ANOVA was conducted with gender (male, female) and working memory capacity (high, low) as the grouping variables, and the average difference in reaction time between stereotype-consistent and stereotype-inconsistent trials of the IAT as the dependent measure, as well as the scores on the Attitudes Towards Women Scale (i.e., ATWS) and the Sex-Role Egalitarianism Scale (i.e., SRES). There was insufficient evidence to conclude that gender had an effect on the combination of all three dependent measures, $F(3, 35) = 1.75, p = 0.175$. As shown in Table 1, univariate ANOVAs revealed that there was not a significant effect of gender across all dependent measures. Female participants failed to show significantly weaker implicit biases ($M = 0.09, SD = 0.04$) compared to male participants ($M = 0.23, SD = 0.07$), $F(1, 37) = 3.21, p = 0.081$). Female participants also failed to show more pro-feminist, egalitarian

attitudes toward women ($M = 21.81$, $SD = 1.19$) compared to male participants ($M = 27.13$, $SD = 2.38$), $F(1, 37) = 4.00$, $p = 0.053$. In addition, female participants failed to show higher, more egalitarian attitudes of sex-role ($M = 46.56$, $SD = 0.77$) compared to male participants ($M = 44.50$, $SD = 1.54$), $F(1, 37) = 1.42$, $p = 0.241$.

Table 1. Average (SD) difference in reaction time on IAT, score on ATWS, and score on SRES as a function of gender.

Gender Condition	DV1: Difference in Reaction Time on IAT (higher scores = stronger implicit bias)	DV2: Score on ATWS (higher scores = more traditional, conservative attitude)	DV3: Score on SRES (higher scores = more egalitarian)
Female	0.09 (0.04)	21.81 (1.19)	46.56 (0.77)
Male	0.23 (0.07)	27.13 (2.38)	44.50 (1.54)

There was also insufficient evidence to conclude that working memory capacity had an effect on the combination of all three dependent measures, $F(3, 35) = 0.754$, $p = 0.527$. As shown in Table 2, univariate ANOVAs also revealed that there was not a significant effect of working memory capacity across all dependent measures. Participants with a high WMC failed to show significantly weaker implicit biases ($M = 0.09$, $SD = 0.04$) compared to participants with a low WMC ($M = 0.23$, $SD = 0.07$), $F(1, 37) = 4.00$, $p = 0.531$. Participants with a high WMC also failed to show more pro-feminist, egalitarian attitudes towards women ($M = 21.81$, $SD = 1.19$) compared to participants with a low WMC ($M = 27.13$, $SD = 2.38$), $F(1, 37) = 1.07$, $p = 0.308$. In addition, participants with a high WMC failed to show higher, more egalitarian

attitudes of sex-role ($M = 46.56$, $SD = 0.77$) compared to participants with a low WMC ($M = 44.50$, $SD = 1.54$), $F(1, 37) < 1$, $p = 0.845$.

Table 2. Average (SD) difference in reaction time on IAT, score on ATWS, and score on SRES as a function of working memory capacity.

Working Memory Capacity Condition	DV1: Difference in Reaction Time on IAT (higher scores = stronger implicit bias)	DV2: Score on ATWS (higher scores = more traditional, conservative attitude)	DV3: Score on SRES (higher scores = more egalitarian)
High WMC	0.18 (0.06)	23.09 (1.85)	45.70 (1.20)
Low WMC	0.13 (0.06)	25.84 (1.91)	45.36 (1.24)

In addition, there was insufficient evidence to conclude that there was an interaction between gender and working memory capacity on all dependent measures. As shown in Figure 1, there was insufficient evidence to conclude that there was an interaction between gender and working memory capacity on the difference in reaction time between the stereotype-consistent and stereotype-inconsistent trials of the IAT, $F < 1$, $p = 0.370$. As shown in Figure 2, there was also insufficient evidence to conclude that there was an interaction between gender and working memory capacity on the attitudes towards women, $F < 1$, $p = 0.577$. In addition, as shown in Figure 3, there was insufficient evidence to conclude that there was an interaction between gender and working memory capacity on the attitudes of sex-role, $F(1, 37) = 1.85$, $p = 0.183$.

Figure 1. Average Difference in Reaction Time Between Inconsistent and Consistent Stereotype Trials of the IAT as a Function of Gender and Working Memory Capacity.

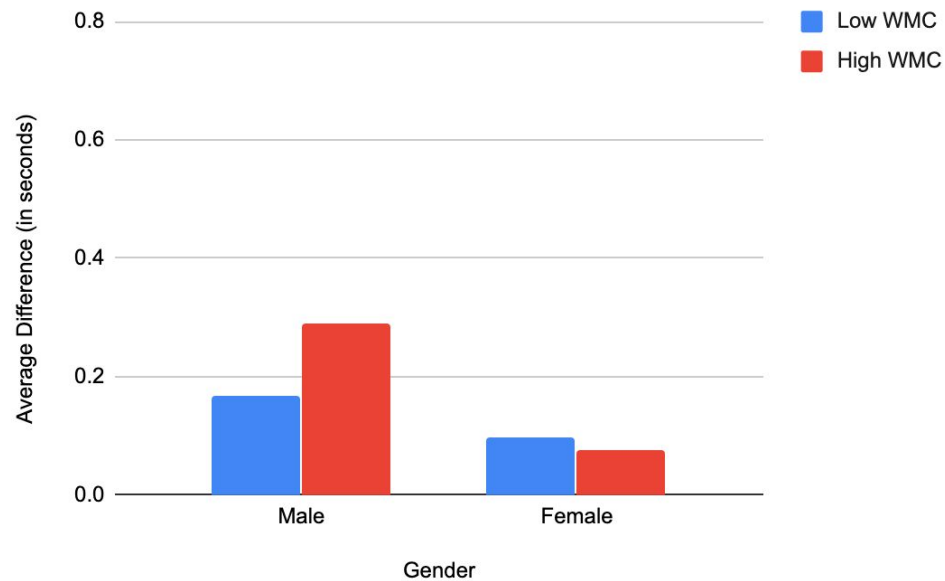


Figure 2. Average Score on the Attitudes Towards Women Scale as a Function of Gender and Working Memory Capacity

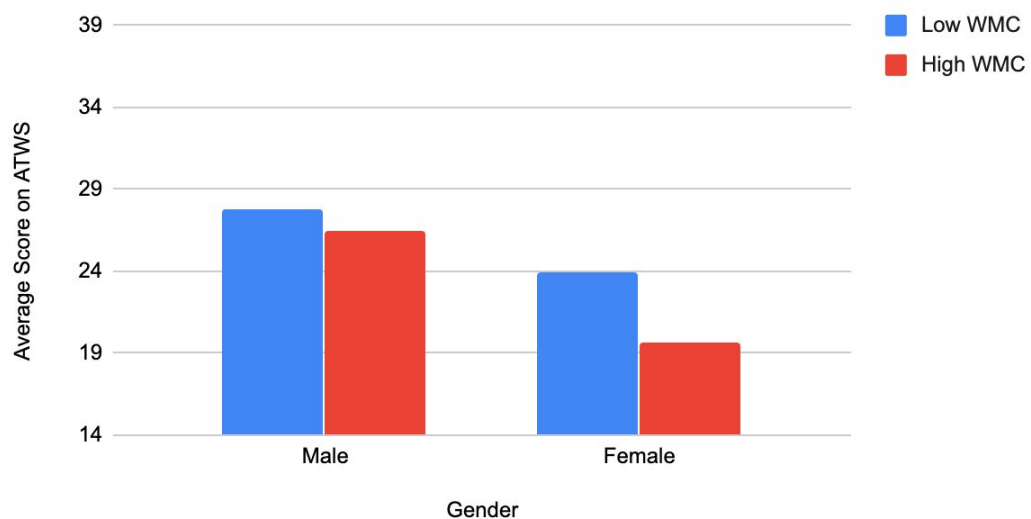
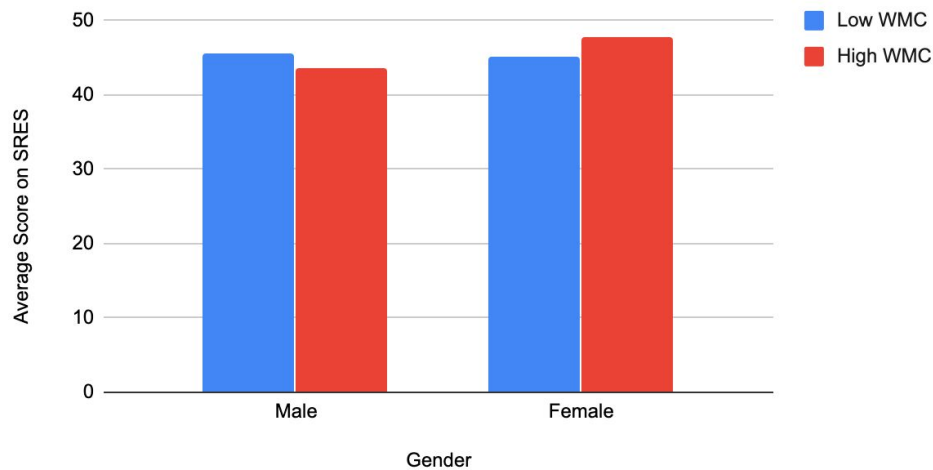


Figure 3. Average Score on the Sex-Role Egalitarianism Scale as a Function of Gender and Working Memory Capacity



Discussion

The purpose of this experiment was to determine the relationship between working memory capacity and the implicit gender stereotype that females are associated with family and males belong in the workplace, as well as the relationship between males and females of this implicit gender stereotype. Based on the results of this study, it cannot be concluded that there is not a significant relationship between working memory capacity and the implicit gender stereotype (i.e., WMC is not an individual difference factor with regard to implicit gender stereotypes). Participants with lower working memory capacities failed to express stronger implicit gender stereotypes as measured by the difference in reaction time between stereotype-consistent and stereotype-inconsistent trials of the IAT. There is also no relationship between WMC and the explicit measures (i.e., WMC does not influence one's attitudes towards women or their attitudes on sex roles). There is also no influence of gender on measures of gender stereotypes. Females did not have significantly weaker implicit biases of the gender stereotype, as compared to males. Also, compared to males, females failed to explicitly express

stronger, more pro-feminist attitudes towards women, and they failed to explicitly express more egalitarian attitudes on sex-roles.

The researchers' hypotheses were not supported. However, this may have implications on the general change in societal attitudes of gender stereotyping. There could have potentially been no significant difference because both males and females have shifted attitudes towards more egalitarian across both genders. In this case, both genders have developed more egalitarian attitudes overall, and this could be a reason for no significant difference between genders. Another reason that could be cause for failure to support the hypotheses is that the study consisted of only 41 participants. If more participants were sampled, the results may have changed drastically. The institution in which participants were sampled from contains a majority of female students, therefore the participant pool of this study consisted of a majority female (i.e., female participants consisted of 80% of the participants).

Further research must be conducted in order to further determine the relationship between working memory capacity and implicit gender stereotypes. It is recommended that a much higher participant count would benefit a study like this one, and it may also be beneficial to collect more explicit measures of the participants' attitudes of gender stereotypes.

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Appendix A
Informed Consent to Participate in Research

PROJECT TITLE: The Relationship Between Working Memory Capacity and Implicit Gender Stereotypes

PRINCIPAL INVESTIGATOR(S): Jordan Martin and Dr. Leilani Goodmon

PURPOSE OF THE STUDY: The purpose of this study is to assess how working memory capacity relates to gender. You are being asked to participate in this research study because this information will help increase our understanding of what characteristics people may have and how they make associations in modern society. If you take part in this study, first you will participate in an automated test of working memory. Then you will be asked to answer some questions about what you perceive about gender. The study should take no more than 60 minutes.

STUDY PROCEDURES: If you take part in this study, first you will participate in an automated test of working memory. Then you will be asked to answer some questions about what you perceive about gender. The study should take no more than 60 minutes.

RISKS AND DISCOMFORTS: There are no more risks than those involved in everyday activities.

POTENTIAL BENEFITS: You will receive course credit or extra credit towards your grade for a course as determined by your course instructor. You will not directly benefit from participating in this study, however the results may help researchers better understand our cognitive abilities.

CONSENT: By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research.

CONFIDENTIALITY: We must keep your study records confidential. Your privacy will be protected because you will not be identified by name as a participant in this project. Your data will be assigned a number code and will be kept in a locked cabinet. No records will be kept with your name on them. The obtained information will be kept for 5 years and will be shredded at that time. However, certain people may need to see your study records (including IRB officials). By law, anyone who looks at your records must keep them completely confidential.

VOLUNTARY PARTICIPATION / WITHDRAWAL: Your participation is completely voluntary and you are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice.

QUESTIONS, CONCERNS, OR COMPLAINTS: If you have any questions, concerns or complaints about this study, contact Dr. Leilani Goodmon at lgoodmonriley@flsouthern.edu, the Chair of the IRB at fscirb@flsouthern.edu, or the Provost at 863-680-4124.

Consent to Take Part in this Research Study

It is up to you to decide whether you want to take part in this study. If you want to take part, please sign the form, if the following statements are true. **I freely give my consent to take part in this study.** I understand that by signing this form I am agreeing to take part in research.

Signature of Person Taking Part in Study

Date

Printed Name of Person Taking Part in Study

Appendix B

The Bem Sex Role Inventory

Instructions

Please rate yourself on the following items on the 1 - 7 scale

1	to	7
(never or almost never true)		(always or almost always true)

1. Defend my beliefs

1	2	3	4	5	6	7
---	---	---	---	---	---	---

2. Independent

1	2	3	4	5	6	7
---	---	---	---	---	---	---

3. Assertive

1	2	3	4	5	6	7
---	---	---	---	---	---	---

4. Strong personality

1	2	3	4	5	6	7
---	---	---	---	---	---	---

5. Forceful

1	2	3	4	5	6	7
---	---	---	---	---	---	---

6. Has leadership abilities

1	2	3	4	5	6	7
---	---	---	---	---	---	---

7. Willing to take risks

1	2	3	4	5	6	7
---	---	---	---	---	---	---

8. Dominant

1	2	3	4	5	6	7
---	---	---	---	---	---	---

9. Willing to take a stand

1	2	3	4	5	6	7
---	---	---	---	---	---	---

10. Aggressive

1	2	3	4	5	6	7
---	---	---	---	---	---	---

11. Affectionate

1	2	3	4	5	6	7
---	---	---	---	---	---	---

12. Sympathetic

1	2	3	4	5	6	7
---	---	---	---	---	---	---

13. Sensitive to the needs of others

1	2	3	4	5	6	7
---	---	---	---	---	---	---

14. Understanding

1	2	3	4	5	6	7
---	---	---	---	---	---	---

15. Compassionate

1	2	3	4	5	6	7
---	---	---	---	---	---	---

16. Eager to soothe hurt feelings

1	2	3	4	5	6	7
---	---	---	---	---	---	---

17. Warm

1	2	3	4	5	6	7
---	---	---	---	---	---	---

18. Tender

1	2	3	4	5	6	7
---	---	---	---	---	---	---

19. Loves children

1	2	3	4	5	6	7
---	---	---	---	---	---	---

20. Gentle

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Appendix C

Attitudes Toward Women Scale

Instructions

Please express your feeling about each statement by indicating on the 1 - 5 scale

1	2	3	4	5
(disagree strongly)		(neither agree nor disagree)		(agree strongly)

1. Swearing and obscenity are more repulsive in the speech of a woman than a man.

1	2	3	4	5
---	---	---	---	---

2. Under modern economic conditions with women being active outside the home, men should share in household tasks such as washing dishes and doing laundry.

1	2	3	4	5
---	---	---	---	---

3. It is insulting to women to have the "obey" clause remain in the marriage service.

1	2	3	4	5
---	---	---	---	---

4. A woman should be free as a man to propose marriage.

1	2	3	4	5
---	---	---	---	---

5. Women should worry less about their rights and more about becoming good wives and mothers.

1	2	3	4	5
---	---	---	---	---

6. Women should assume their rightful place in business and all the professions along with men.

1	2	3	4	5
---	---	---	---	---

7. A woman should not expect to go to exactly the same places or to have quite the same freedom of action as a man.

1	2	3	4	5
---	---	---	---	---

8. It is ridiculous for a woman to run a locomotive and for a man to darn socks.

1	2	3	4	5
---	---	---	---	---

9. The intellectual leadership of a community should be largely in the hands of men.

1	2	3	4	5
---	---	---	---	---

10. Women should be given equal opportunity with men for apprenticeship in the various trades.

1	2	3	4	5
---	---	---	---	---

11. Women earning as much as their dates should bear equally the expense when they go out together.

1 2 3 4 5

12. Sons in a family should be given more encouragement to go to college than daughters.

1 2 3 4 5

13. In general, the father should have greater authority than the mother in the bringing up of the children.

1 2 3 4 5

14. Economic and social freedom is worth far more to women than acceptance of the ideal of femininity which has been set up by men.

1 2 3 4 5

15. There are many jobs in which men should be given preference over women in being hired or promoted.

1 2 3 4 5

Appendix D
Sex-Role Egalitarianism Scale

Instructions

Please express your feeling about each statement by indicating on the 1 - 5 scale

1	2	3	4	5
(disagree strongly)		(neither agree nor disagree)		(agree strongly)

1. The husband should be the head of the family.

1	2	3	4	5
---	---	---	---	---

2. It is more appropriate for a mother, rather than a father, to change their baby's diapers.

1	2	3	4	5
---	---	---	---	---

3. It is wrong for a man to enter a traditionally female career.

1	2	3	4	5
---	---	---	---	---

4. A woman should be careful not to appear smarter than the man she is dating.

1	2	3	4	5
---	---	---	---	---

5. Home economics courses should be as acceptable for male students as for female students.

1	2	3	4	5
---	---	---	---	---

6. Things work out best in a marriage if a husband stays away from the housekeeping tasks.

1	2	3	4	5
---	---	---	---	---

7. Keeping track of a child's activities should be mostly the mother's task.

1	2	3	4	5
---	---	---	---	---

8. Women can handle job pressures as well as men can.

1	2	3	4	5
---	---	---	---	---

9. A person should be more polite to a woman than to a man.

1	2	3	4	5
---	---	---	---	---

10. Choice of college is not as important for women as for men.

1	2	3	4	5
---	---	---	---	---

Appendix E
Demographics Questionnaire

INSTRUCTIONS: Please answer the questions as honestly and as accurately as possible. Your responses will be completely anonymous because your name will not be associated with your data at all.

Age: _____

Grade Level: _____

Major: _____

Sex: _____

Gender Identity: _____

Race/Ethnicity: _____

Student ID#: _____

Appendix F

Debriefing Statement

The purpose of this study was to determine the relationship between working memory capacity and implicit gender stereotypes. The first task of the Operation Span was used to measure working memory capacity. The second task was the Implicit Association Test that was used in order to address the implicit bias towards the stereotype. The following surveys were used to explicitly measure attitudes toward gender stereotypes. This means that even if someone explicitly states that they do not agree with the stereotype, they may still have an implicit bias. Based on previous research, it is expected that those who have a higher working memory capacity will have a greater ability to inhibit the implicit bias from influencing attitudes toward gender stereotypes. Thank you so much for participating. Are there any questions?