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An Examination of the Implicit Comprehension of Gender-Biased Language

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ABSTRACT

An Examination of the Implicit Comprehension of Gender-Biased Language

By

Mary E. Godfrey

This research investigated individual’s comprehension of gender-biased language by examining implicit (i.e., automatic) associations of generic masculine (GM) terms (e.g., *chairman*) and their neutral counterparts (e.g., *chairperson*). Individuals have been taught that GM terms imply inclusion of males and females, yet past research has shown that we do not comprehend these terms as truly inclusive. An implicit priming procedure assessed the activation of masculine and feminine interpretations of GM terms. Female participants listened to sentences containing “prime” terms with a neutral suffix (e.g., –*person*) or a GM suffix (e.g., –*man*) that were spoken by either a male or female voice. Following presentation of the prime, participants made a lexical decision response to a male, female, or place target name by pressing the “Yes” key if the target is a real name by pressing the “No” key if the target is not a real name. Target names were presented immediately after the prime (Experiment 1) or 500 ms after (Experiment 2). When the male spoke GM terms, a trend suggested the immediate activation of male associations compared to the presentation of the neutral terms which activated female associations. In contrast, the female speaker neutralized the associations, resulting in immediate male and female activations for the GM and neutral terms. However, 500 ms after the prime, the speaker’s gender became less influential, as seen through the activation of both male and female associations to GM and neutral terms. This research reveals how subtle linguistic markers, such as suffixes, can create implicit gender associations.
An Examination of the Implicit Comprehension of Gender-Biased Language

Language is filled with various references and innuendos that range from subtle to blatant, and at times are prejudiced in nature (MacKay, 1983). People often repeat words or phrases without a second thought, naïve to the implications that may arise from such language. A hypothesis known as the Sapir-Whorf hypothesis maintains that our language actually influences our thinking (Whorf, 1956). Although the hypothesis remains controversial, a significant body of research suggests that language does influence several aspects of our cognition including reasoning (Bloom & Keil, 2001), categorization (Boroditsky, 2003), and memory (Snyder & Uranowitz, 1978). Further complicating the relationship between language and cognition is that language is filled with ambiguity: Individual words (e.g., ball) and phrases (e.g., tell her baby stories) can have more than one meaning. One example of this ambiguity that has implications for the Sapir-Whorf hypothesis is generic masculine terminology. Because these terms have two meanings (i.e., exclusive of one gender, inclusive of both genders), the meaning that we activate can have serious implications for our understanding of gender roles. The present research investigated how we comprehend generic masculine (GM) language, specifically examining our implicit (i.e., automatic) associations to these terms.

The majority of research on the comprehension of gender bias in the English language focuses on our comprehension of the generic masculine (GM) he. Although he is most often used to refer to a male, the term has multiple meanings as it can also be used generically, when intended to refer to both males and females. Indeed, it was once the pronoun of choice for gender inclusive language (MacKay, 1983). However, many have argued that this pronoun is not generic since the primary (masculine) meaning of he conflicts with its secondary, prescribed meaning, referring to both genders (MacKay,
Indeed, the Sapir-Whorf hypothesis predicts that GM words result in thoughts of males but not females. Consistent with this hypothesis, previous research investigating comprehension of GM terms has shown that people do not comprehend these terms as truly generic (i.e., inclusive of men and women) (e.g., MacKay & Fulkerson, 1979; Miller & James 2009). Nonetheless, GM terms are still used today, even in formal writing (Meyers, 1990). For example, Meyers (1990) found that 34% of students used GM terms when writing a response to the question, “Who is an educated person?”, as opposed to 32% who used the singular form of *they*, and 22% who used *he/she*. Giving that over one-third of students still used the GM, it is still imperative to examine the cognitive responses to such terms.

Research on Generic Masculine in the English Language

One of the first studies to investigate English GM terminology was MacKay and Fulkerson (1979)’s study of the comprehension of the GM *he*. Male and female undergraduates were presented with sentences containing the pronoun *he* (e.g., *A bicyclist can bet he is not safe from dogs*) and were asked to determine whether or not the sentence could apply to females. The antecedents used in the sentences were pilot tested to ensure they were stereotypically-gendered (e.g., *botanist, secretary*) or gender-neutral (e.g., *bicyclist, student*). The results showed an extremely high error rate: Participants actually indicated that 87% of the sentences including the pronoun *he* did not apply to females, regardless of the gender stereotype of the antecedent. These results contrast with a control experiment where sentences were changed to omit the pronoun *he* (e.g., *A bicyclist is not safe from dogs*). Responses that these sentences could not apply to women (i.e., error responses) dropped to 43%. Although this study is over 30 years old, recent research has
replicated and extended these findings (Miller & James, 2009). Miller and James used the same paradigm as MacKay and Fulkerson and also found significantly more errors for experimental sentences than control sentences. Additionally, error rates (i.e., responding that a sentence could not apply to females) were greatest (81%) for sentences where he referred to stereotypically male antecedents (e.g., mechanic) while the error rates (76%) when antecedents were neutral (e.g., bicyclist) were greater than error rates (68%) when antecedents were stereotypically female (e.g., manicurist). Although it may be argued that participants make these errors because they no longer believe he is generic or are not familiar with GM pronouns, Miller and James accounted for this confound by asking participants if they had been taught to use the pronoun he as generic. Over one-third of their participants (37%) indicated that they were specifically taught to use he generically in speech or writing. When including only these participants in their analyses, Miller and James found a similar error rate (74%) as that found in the entire sample (75%). Taken together, these results suggest that the pronoun he is not often interpreted as inclusive of women, and that “the sex associated with the pronoun is likely to dominate over the sex associated with the antecedent” (Miller & James, 2009, p. 489).

Extending research beyond the GM he to words that are also lexically defined by masculinity, Wilson (1979) examined comprehension of terms containing the suffix – men. She presented participants with two types of statements, one of which contained GM plural nouns such as cavemen or repairmen, and one that contained the neutral parallel form of the GM nouns, such as cavepeople or repairpeople. Participants then selected the correct pictorial depiction of the statement from six options, three of which were foils, while one depicted two males, another depicted a male and female, and one
depicted two females. The results revealed that the –men words created a male bias because sentences containing GM plural nouns led to fewer people choosing a picture containing one or more females than the sentences containing a neutral noun.

A more recent study conducted by McConnell and Fazio (1996) similarly examined the use of terms containing the suffix –man (e.g., chairman), -person (e.g., chairperson), or no suffix (e.g., chair) in three vignettes in which the context was manipulated as neutral, feminine, or masculine. After reading each vignette, participants answered a series of questions about the character’s personality. The results revealed that, regardless of the context, participants attributed masculine personality traits significantly more so to –man suffix terms than terms with a –person suffix or no suffix. Consistent with Wilson’s (1979) findings, McConnell and Fazio (1996) concluded that GM terms prime masculine mental constructs, and thus inhibit the understanding of the GM as truly generic.

Although the aforementioned studies have used explicit assessments to assess comprehension of GM terminology, a recent investigation has extended this research to how implicit reading comprehension is affected by use of GM terms. Khan and Daneman (2011) used an eye-tracking device to examine reading times when there was gender incongruency between GM terms and pronouns. Participants read sentences containing a GM term (e.g., chairman) or the equivalent gender-neutral term (e.g., chairperson) followed by a masculine (e.g., himself) or feminine (e.g., herself) pronoun. The findings showed that individuals spent more time processing herself when it followed a GM term than when it followed a neutral term, and also regressed back to the GM term, suggesting the need for further processing of the GM term itself. These findings suggest that GM terms “evoked the expectation of a male referent” (p. 361). However, by using the eye-
tracking device, Khan and Daneman were mainly investigating a disruption in reading as a result of encountering GM terms. In contrast, the current study’s methodology provides the ability to distinguish the timeline of gender association activation by examining the associations activated during immediate comprehension of GM terms.

While research has revealed that gender-associated terms are similar to GM terms in their exclusive nature, GM occupational terms (e.g., policeman) have also been directly compared to gender-associated occupational terms (e.g., mechanic). For example, Liben, Bigler, and Krogh (2002) presented participants with images of individuals working and asked whether an unmarked gender-associated term (masculine, feminine or neutral associations) or a GM term (containing suffixes of –man, -master, -er, -or) could be used to describe the picture. Additionally, participants decided whether occupational terms included males, females, or both. Unfortunately, this blatant and explicit questioning of the participants could have led to self-presentation issues, in which participants may have altered their responses due to concern about how they were perceived. The results revealed that marked terms were considered gender-inclusive significantly less than gender-associated terms. However, masculine associated terms were less likely to be applied to males and females compared to neutral terms. These findings regarding occupations are consistent with the past research analyzing generic-masculine language, as it revealed the biased nature of marked terms and the gender-exclusive nature of the GM and masculine associated terms. From this research investigating the gender-biased language of occupational terms, the researchers concluded that, “although the work place is becoming more balanced with respect to distributions of men and women, the psychological world of work remains strongly
gendered” (Liben et al., 2002, p. 825).

**Implications of Using Gender-Biased Language**

There are several implications for comprehending GM language as exclusive of women. For example, research has shown that the generic *he* is perceived as sexist, meaning that these terms “reinforce negative and discriminatory attitudes toward women” (Murdock & Forsyth, p. 40). Murdock and Forsyth (1980) examined attitudes towards the usage of the generic *he* by asking participants to read essays that were written in one of three styles: a gender-neutral style using the phrase “he or she”, a *he* style, or stereotypical style, where the essay contained sentences including the generic *he* and sentences that emphasized gender-stereotypes (e.g. *Businesses are always on the lookout for ambitious men and aggressive women*). Although the majority of the participants were women, results revealed that participants rated the stereotypical essay to be the most sexist, yet still rated the essay written with the generic *he* as more sexist than the neutral style. These findings indicate that, despite its intended generic use, GM language can convey a sexist connotation and may thus perpetuate the social inequalities between men and women (Miller & James, 2009).

As a result of the perceived sexism of gender-biased language, research has shown this biased language has the potential to ostracize individuals. Past research has shown that when women feel ostracized due to their gender, a permanent group membership, they may lose motivation and struggle to recover from such ostracism significantly more so than those ostracized for temporary group membership (Wirth & Williams, 2009; Stout & Dasgupta, 2011). Stout and Dasgupta (2011) found that women who read job descriptions that used gender-exclusive language reported the description as
significantly more sexist and isolating compared to the women who read the gender-inclusive description. Furthermore, the gender-exclusive group reported higher expectations of ostracism in the work environment, and significantly less motivation to pursue the job than those in the gender-inclusive group. Men, however, reported feeling significantly more motivated in the gender-exclusive group compared to those in the gender-inclusive group. Therefore, in addition to demonstrating that biased language ostracizes women, this research also demonstrates that biased language results in unearned advantages for men. Specifically, women lose the motivation to apply for jobs which use GM terms, which consequently gives men greater motivation and greater opportunity to acquire a job. Thus, gender-biased language has been shown to potentially contribute to gender-based ostracism, with the power to critically influence both males’ and females’ motivation to pursue certain careers.

*Implicit Association Test*

The present study examined the presence of automatic gender associations through an implicit priming procedure. Automatic, or implicit, associations are influenced by past experiences that are not available for explicit recall, and thus cannot be shown in self-report or during introspection (Greenwald & Banaji, 1995). While explicit associations are created with purpose, and are controllable, implicit associations differ in that they have reduced controllability and lack of intention (Nosek, 2007). These automatic associations have been shown to elicit beliefs, or stereotypes, about particular categories (Banaji & Hardin, 1996). Past research demonstrates that implicit stereotypes reflect cultural knowledge, such as culturally-shared stereotypes, that are separate from one’s own stereotypes (Devine, 1989). However, more recent studies dispute that
although implicit stereotypes are a representation of numerous experiences and influences that an individual may not endorse or may not have awareness of, these stereotypes are still personal due to their power to influence an individual’s actions, judgments and perceptions (Nosek, 2007; Nosek, Greenwald, & Banaji, 2005). Therefore, using an implicit measurement to examine associations to GM terms may potentially provide further understanding of individual’s implicit comprehension of gendered language.

The present research assessed implicit comprehension of gender-biased language by adapting a priming technique that is commonly used to investigate the representation of words and their associations in memory. This testing method shares some similarities with the traditionally used Implicit Association Test (IAT, Greenwald, 1998). Both the IAT and the current testing method measure implicit knowledge by examining automatic associations. For example, IATs have revealed an association between males and achievement significantly more so than between females and achievement, yet other studies have found greater positivity towards females in regards to gender-neutral traits (e.g., pleasant, nice, valuable) compared to males (Eagly, Mladainic, Otto, 1991). Subsequently, these complex, implicit gender perspectives suggest the IAT associations reveal individuals’ stereotypes rather than generally consistent positive or negative attitudes. Although this experiment’s cognitive priming procedure has not previously been used to assess implicit gender associations, the IAT will serve as a basis of comparison due to its similarities with the current method.

During an IAT, participants are asked to categorize four types of items using two responses in a computer program (Rudman, Greenwald, & McGhee, 2001). The test assesses the strength of the associations between the categories by measuring response
latencies to target words. Therefore, participants do not make deliberate decisions, but instead categorize items as quickly as possible based on their automatic, implicit knowledge. For example, Banaji and Hardin (1996) tested whether gender stereotypes of occupational titles were implicitly used when making judgments about the gender of the individuals performing the occupation. The study presented participants with an occupational prime that is primarily associated with one gender (e.g., doctor, nurse) followed by a target pronoun which participants had to decide was male or female (e.g., he, she). As predicted, the results revealed a faster response to matching-gender prime and target words (e.g., doctor-he, nurse-she) compared to mismatched pairs (e.g., doctor-she, nurse-he). The primes were either gender-associated by definition (e.g., mother, father, king, queen) or by normative base rates (e.g., doctor, nurse, mechanic, secretary). The faster response to the matching-gender prime and target words (compared to the mismatched pairs), known as automatic gender priming effect, supports the automaticity of gender stereotyping (Banaji & Hardin, 1996). The automaticity of gender stereotyping suggests that individuals’ stored knowledge of occupational gender implicitly influences the comprehension of that role. Furthermore, Banaji and Hardin (1996) replicated these findings in the second study where the judgment task was unrelated to the concept being measured. In contrast to the first study in which participants had to determine whether the pronoun was male or female, the second study asked participants to determine whether or not the term was a pronoun. Therefore, these results suggest that the automatic gender stereotyping effect may still be observed when the judgment task (e.g., whether or not it is a pronoun) is unrelated to the concept of the prime-target relationship (e.g., gender association) (Banaji & Hardin, 1996; Bargh, Chaiken, Raymond, & Hymes, 1996).
Due to the drastic difference in methodology compared to explicit self-report measures, a body of research has been conducted examining the validity of IATs. For example, the IAT has been shown to accurately measure associations for compatible pair items (i.e., instrument-pleasant/flower-pleasant, weapon-unpleasant/insect-unpleasant) that do not have stereotypes associated with them. As predicted, compatible pairs were responded to equally as fast, and faster than incompatible pairs, providing support for the IAT’s accurate measurement of implicit associations (Greenwald, McGhee, & Schwartz, 1998). Additional studies assessing the stability and convergent validity of the IAT have found that participants’ scores were consistent (i.e., highly correlated) across time and across various IAT measures (Cunningham, Preacher, & Banaji, 2001). As supported by previous meta-analyses, IATs are considered to be reliable and valid measurements of implicit stereotypes (Greenwald et al., 1998; Cunningham et al., 2001; Hofmann, Gawronski, Gschwender, Le, Schmitt, 2005).

In addition to the validity and stability of implicit measurements, research has shown that the IAT has high predictive validity, as the measurements have provided reliable predictions for individuals’ behavior (Hofmann et al., 2005). One study investigated males’ and females’ responses to a self-report along with the responses in IATs regarding academic stereotypes (e.g., males associated with science, and females associated with humanities) and gender identity (e.g., associations of the self and one’s own gender, compared to others and the other gender) (Lane, Goh, & Driver-Linn, 2012). When examined along with reported plans of academic pursuit, implicit stereotypes significantly predicted academic behavior for participants, while explicit self-reported responses were less consistently related to participant’s academic plans. For example,
implicit measurements revealed an association between males and science, such that males were more likely to pursue science during college than females. Therefore, while still lacking a strong correlation with explicit measurements, implicit tests are able to provide results predictive of future behavior, suggesting implicit tests may provide more accurate measurements of an individual’s stereotypes compared to explicit measurements.

Despite support for the validity and predictability of IATs, they lack strong correlations with explicit measurements of stereotypes (e.g., a correlation of .24 found in one meta-analysis by Hofmann et al. 2005), findings that some argue is a weakness of the IAT (Nosek et. al, 2007; Cunningham et al., 2001; Hofmann et al., 2005). In Nosek and colleague’s (2007) investigation, which examined the completion of more than 2.5 million IATs and explicit self-report measurements, results showed that while there was generally a positive relationship between the explicit and implicit tests, the relationship was inconsistent and variable across different topics and tests. From these results, the researchers concluded that while implicit and explicit measurements are related, they are distinct measurements (Nosek et. al, 2007). Past studies examining the numerous factors contributing to the variance have provided some explanation for the inconsistencies. Hofmann and colleagues (2005) discovered that the correlation between the IAT and explicit self-report measures increased as a result of “spontaneity”, or gut reactions, in making explicit judgments in self-reports and the increase of the corresponding concepts being tested. Additionally, factors hindering implicit memory retrieval (e.g., lack of motivation, lack of cognitive capacity), differing constructs, and motivational self-presentation biases also contributed to low correlations between the two types of tests.
For example, past studies have found that self-image biases (i.e., biases created through individuals’ concern for how others may perceive them based on their responses) contribute to the discrepancy between the two tests’ results (Nosek, et. al, 2007; Greenwald, Poehlman, Uhlmann, & Banaji, 2009). Comparing IAT measures to self-report tests, Nosek et al., (2007) found that participants tended to display stronger implicit preferences for the stereotypically higher-status groups (e.g., male versus female, heterosexual versus homosexual), yet did not show this preference on explicit measures. Additionally, Greenwald et al.’s (2009) meta-analysis of IAT and explicit measures showed that the social sensitivity of the topic explained 24.4% of the variation in explicit tests, but only 3% of the variation in implicit measurements. Because implicit measures avoid approaching taboo or sensitive subjects in a blatantly explicit manner, the results obtained from implicit tests are not as significantly influenced by the self-presentation biases that affect explicit measurements. Subsequently, past research has suggested that implicit measures will provide more accurate predictions of behavior when social desirability and self-image is a concern (Greenwald, et al., 2009; Messner & Vosgerau, 2010). Therefore, implicit measurements have the power to unveil automatic stereotypes, which individuals may filter in explicit measurements.

Nevertheless, researchers argue that the presentation method of the stimuli used in the IATs creates a bias in the data. Specifically, by first presenting compatible pairing, followed by incompatible pairing, cognitive inertia occurs (Messner & Vosgerau, 2010). Cognitive inertia is the difficulty of switching from one rule of categorizing (e.g., Male/Pleasant, Female/ Unpleasant) to another rule of categorizing (e.g., Female/Pleasant, Male/Unpleasant). Subsequently, the latency in response in the second
pairing, which researchers typically attribute to implicit stereotypes or beliefs, may actually be the difficulty in responding to the new rule. When examining this issue through IAT testing, Messner and Vosgerau (2010) found that by first presenting the incompatible pairing before the compatible pairing, the automatic stereotyping effect decreases. Additionally, the researchers discovered that by counterbalancing the order of presentation across subjects, the effect of cognitive inertia decreased (Messner & Vosgerau, 2010). The current study avoids the issues of cognitive inertia and the order effects by using a counterbalanced cognitive priming task, rather than using the traditional IAT testing the association of paired terms.

Research on Ambiguous Language

Just as ambiguous words (e.g., ball) have multiple meanings, masculine referents consist of multiple meanings (e.g., exclusively male, generic masculine). Many ambiguous words have a dominant (i.e., primary) meaning (e.g., the masculine meaning of a GM word) and a subordinate (i.e., secondary) meaning (e.g., the gender-inclusive interpretation of a GM word). The experiments presented here examined whether GM referents are perceived as ambiguous by using an established experimental technique to examine the comprehension of ambiguous words (e.g., Swinney, 1979). This technique provides a way to determine whether both meanings of an ambiguous word are unconsciously and automatically activated. In Swinney’s (1979) seminal research, participants listened to sentences containing ambiguous prime words (e.g., The man was not surprised when he found several bugs in the corner of his room) that have two or more meanings (e.g., insect, listening device). Immediately following presentation of the ambiguous word, participants made a lexical decision (i.e., decided whether a visually-
presented letter string is a real word) to a target. The target was associated with either the dominant (e.g., ant) or subordinate (e.g., spy) meaning of the ambiguous prime, or was unrelated (e.g., sew) to the ambiguous prime. Swinney found that response times to both targets (ant, spy) were similar and were faster than response times to unrelated targets. These findings suggest that both meanings of an ambiguous word are at least initially activated during sentence comprehension. More recent studies have also found that both dominant and subordinate meanings of ambiguous words are initially activated by using eye-tracking devices to measure eye-fixations on ambiguous words (e.g., Swaab, Brown & Hagoort, 2003; Chen & Boland, 2008).

The experiments reported here investigated the comprehension of GM terms by examining whether both masculine and feminine meanings are activated when GM referents (i.e., –man suffixes) are encountered. Targets were male, female, or place names that were presented immediately after prime GM referents (Experiment 1) or 500 ms after the presentation of the prime (Experiment 2).

Main Goals of the Present Study

The current study had three main goals. First, this study was designed to extend previous research on the GM he by examining more subtle linguistic components, specifically words with the suffix –man. Previous studies have mostly focused on comprehension of GM he, thus maintaining a narrow concept of what constitutes GM language. The GM he is no longer accepted as generic due to the vast amount of findings supporting its exclusive nature. The infrequency of the generic he in formal writing has been maintained through many academic as well as commercial publishers policies that discourage the use of GM terms and instead encourage use of gender-inclusive (e.g.,
they) and gender-neutral (e.g., person) terms (APA Publication Manual Task Force, 1977; Harper & Row Publishers Inc., 1976; McGraw-Hill Book Company, 1972; Random House, 1975). Consequently, more recent studies have focused on words that provoke gender stereotypes or male connotations (e.g., doctor, engineer, lawyer; White & White, 2006; Gabriel & Gygax, 2008). The current study, however, examines gender-inclusive words containing the suffix –man. By examining a suffix, rather than an entire GM word, we will gain further understanding of the extent to which specific linguistic markers (e.g., suffixes) can affect comprehension.

The second goal of this research is to determine if GM language is comprehended in a similar manner as other ambiguous words by examining the activation of GM terms. If GM words are truly ambiguous, both the subordinate and the dominant meanings should initially become activated. In other words, individuals would, at least initially, comprehend these words as truly inclusive of women. Therefore, this would indicate that GM language is stored in our lexicon similar to other ambiguous words with multiple meanings. Finally, the study examined whether the current methodology would offer an alternative assessment of implicit biases measured by the IAT and explicit measures. Past studies using explicit (i.e., conscious) assessment have used self-reports in order to examine participants’ understanding of GM language (e.g., by asking participants whether words such as he or surgeon include the female sex; MacKay & Fulkerson, 1979; Miller & James 2009). This methodology may lead to demand characteristics, where participants become aware of the experiments’ purpose and adjust their responses. The current research used an implicit assessment to study the comprehension of masculine references thus concealing the intended purpose. Furthermore, as discussed
above, research has shown that implicit attitudes can be a more accurate predictor of behavior than explicit attitudes, thus indicating that relying solely on explicit assessments may not fully capture people’s inherent gender biases (Lane, Goh, & Driver-Linn, 2012).

Two experiments investigated these three goals. Both experiments use a methodology similar to that used by Swinney (1979) and several subsequent studies on ambiguity comprehension (Vu, Kellas, & Paul, 1998; Vu, Kellas, Peterson & Metcalf, 2003). Comprehension of terms with GM –man suffixes and terms with corresponding neutral suffixes (e.g., -person) were assessed through a listening comprehension task. Participants listened to a recording of sentences containing prime terms (e.g., chairman, chairperson). While hearing the prime term, participants simultaneously performed a lexical decision task (administered via a computer) where they indicated whether or not a visually-presented target was a real name. The lexical decision task was presented either immediately after the offset of the prime (Experiment 1) or 500 ms after the offset of the prime (Experiment 2). The target was either a male name, a female name, or a place name (e.g., city names).

**Experiment 1**

Supported by previous studies, we predicted that there would be no differences in response times to both male and female names when these target names are presented immediately following the prime term (Swinney, 1979; Tanenhaus et al., 1979). As Swinney’s (1979) first study showed, both meanings of an ambiguous word are immediately activated, i.e., target words associated with both meanings of the ambiguous word were responded to equally fast and faster than an unrelated word. If GM terms are organized in our lexicon as ambiguous words with multiple meanings, then male and
female meanings should both show activation when presented 0 ms after the prime (Swinney, 1979). For gender-neutral suffixes, past research supports that response times to male and female names will not significantly differ due to the inclusive nature of gender-neutral terms.

Method

Participants

Participants in the main experiment included 61 female students attending Rhodes College who were recruited from introductory psychology courses. Technical errors with the computer program resulted in a loss of seven participants’ data, and one participant was not included in analyses due to having an inadequate number of years speaking English. Thus, a total of 53 females were used for evaluation. Participants received either research or extra credit for their participation. All of the participants were 18 years of age.

Materials

Prime Words and Sentences. Forty-eight “suffix” primes were selected and embedded into sentence frames. Half of the suffix primes contained the suffix –man (e.g., chairman, fireman) while the other half of the primes corresponded to the gender-neutral counterpart (e.g., chairperson, firefighter). Unfortunately, many words that have both a GM and a gender-neutral suffix do not also have a corresponding –woman suffix (e.g., a female firefighter is not typically referred to as a firewoman) and therefore these suffixes were not used in this experiment. Sentences were constructed to have a gender-neutral context and each maintained the same structure, consisting of a clause, the prime (either GM or neutral), and a verb and direct object clause (e.g., Despite the tension in the room,
the chairman/chairperson maintained order over the meeting). The suffix primes were counterbalanced so that each participant heard either the –man or the neutral form of each prime, but never both forms. Counterbalancing therefore resulted in each participant encountering 12 of each prime type (GM or neutral).

An additional 96 “filler” sentences were constructed in order to disguise the true purpose of the study. These sentences included occupational terms (e.g., accountant). Thirty-six of these sentences had the same structure as the experimental sentences, which began with a dependent clause, whereas 60 of these fillers had a different structure beginning with the occupational term (e.g., The zookeeper fed the bear fish for lunch.). Each of the sentences was pre-recorded by the NaturalSoft computer software, which transferred the sentences from text to speech, and each sentence was spoken at the medium level 3 speed (www.naturalreaders.com). Additionally, the sentences were counterbalanced so that half of the participants heard the sentences spoken by a male voice, and half of the participants heard the sentences spoken by a female voice.

**Target Names.** A total of 180 target names were selected for use with the suffix and filler sentences. Each suffix and 36 filler sentences were assigned a male name (e.g., Michael), female name (e.g., Kristin), or place name (e.g., Denmark). Place names served as the control condition. Presentation of these names were counterbalanced so each participant saw either the male, female, or place name for each sentence. The male and female names were selected from the 1990 U.S. census data’s lists of the 200 most frequent male and female names. Male and female names were matched for proportional frequency ($M_{male} = 0.35$, $M_{female} = 0.35$), word length ($M_{male} = 5.7$ letters, $M_{female} = 6.0$), and number of syllables (exact match). Place names were matched to their corresponding male and
female names in number of syllables, and as closely as possible in word length ($M = 5.99$ letters).

A set of 60 non-names were assigned to the remaining 60 filler sentences. Non-names (e.g., Jeasher) were created so that participants were not always responding “yes” to the lexical decision task (which asks participants to indicate whether a target name is real or not). These non-names were composed of a pronounceable string of letters, which were selected from a larger group of non-names that were rated by ten volunteers on a scale from 1 (sounding like a male name) to 5 (sounding like a female name). Only the terms that had a neutral rating (ranging from 2 to 4) were selected to be used as the non-names. Additionally, volunteers also rated the ease of pronunciation, indicated on a scale of 1 (not pronounceable) to 5 (pronounceable). The non-names with a score below a 3 were altered to a more pronounceable spelling.

**Comprehension Questions.** For each of the sentences, one question was created to assess comprehension of the sentence. Comprehension questions were intended to ensure that participants were listening to the sentences (and not simply making a lexical decision to target names). Each of the 24 suffix and 36 of the filler sentences had a question that asked about the sentence’s prime (i.e., who performed the actions described in the sentence, such as, *Who gave the speech?*). So that participants’ attention was not always drawn to the agent primes themselves, the 60 filler sentences were assigned questions that asked about the agent’s actions (e.g., *Where did the trainer run?*).

**Demographic Questionnaire:** A questionnaire was designed to gather information about participants’ age, education, gender, English language skills, learning disabilities, and handedness.
Post-Experiment Questionnaire. A questionnaire was designed to assess participants’ knowledge of the study’s purpose. Participants were asked what they thought the intended purpose of the study was, whether they noticed a relationship between the sentences and the target words, and whether they noticed anything unusual about the sentences. For each question participants answered with a “Yes”, they were asked to provide specific examples pertaining to their comment. These answers revealed whether or not participants had discovered the true purpose of the study. Participants were also asked if they had any difficulties with the task (e.g., pressing the wrong key, not listening to the sentences) in order to help explain any possible discrepancies in their data.

Design and Procedure

The experiment used a 2 (Suffix Prime: GM, Gender Neutral) × 3 (Target Name: Male, Female, Place Name) within-participants design. Because male and female voices were used to speak the sentences, speaker gender was also included as a between-participants factor in the analyses. The dependent variable was the response time (RT) to target names that were presented immediately (0 ms) after the prime.

Participants were asked to perform a listening comprehension task while simultaneously performing a lexical decision task. Before beginning the listening comprehension task, participants completed the demographic questionnaire. Participant handedness was taken into account for the listening comprehension task so that the participant’s dominant hand was used to press the “Yes” key during the task.

In the listening comprehension task, participants listened to pre-recorded sentences over headphones and made a lexical decision to a target (male name, female name, place name, or non-name) presented 0 ms after the prime. The target was
displayed on the computer screen and participants were instructed to press the Z key on
the keyboard if the word was a real name, and to press the forward slash (/) key if the
word was not a real name (these keys were reversed for left-handers so that each
participant was pressing the “Yes, real name” key with their dominant hand, and the “No,
not real name” key with their non-dominant hand). Participants first heard five practice
sentences (e.g., At the circus, the clown juggled ten bowling pins). Then participants
listened to 24 “suffix” sentences, 36 filler sentences that matched the sentence structure
of the suffix sentences, and 60 filler sentences that had a different sentence structure.
Sentences were randomly selected so that for every 10 trials, two suffix sentences, three
similar structure filler sentences, and five different structure filler sentences would be
presented. Following each sentence, participants typed a one-word answer to a
comprehension question that was presented on the computer screen. After entering in the
one-word response, participants heard a tone over the headphones, indicating the next
sentence would follow (see Figure 1).
Participants listen to sentences spoken over the headphones by a male or female speaker.

*Despite the tension in the room, the chairman/chairperson maintained order over the room.*

*The cashier accidentally returned incorrect change to the customer after receiving a twenty dollar bill.*

Target name presented (0 ms after prime in Experiment 1, 500 ms after prime in Experiment 2) and participants made a lexical decision response: *Ryan OR Marie OR Texas*

Target non-name presented (0 ms after prime in Experiment 1, 500 ms after prime in Experiment 2) and participants made a lexical decision response: *Brott*

Comprehension question appears on screen after entire sentence was been played: *Who maintained order over the meeting?*

Comprehension question appears on screen after entire sentence was been played: *How much money did the cashier receive?*

*Figure 1. Procedure for Experiment 1.*

After hearing all 120 sentences, participants completed the post-experiment questionnaire and were debriefed.

**Results**

Three types of responses were excluded from analyses. Responses were excluded if participants incorrectly answered the comprehension question following a sentence. Incorrect answers were given on 11.8% of the sentences including suffix primes. Additionally, only responses with a correct lexical decision response were included in
analyses, resulting in an additional loss of 6.4% of responses to suffix sentences. Finally, response times that were greater than 2.5 SD above the mean were also excluded. This resulted in an additional loss of 0.6% of responses for suffix sentences. Assessment of the post-experiment questionnaire revealed that no participants figured out the purpose of the study, and therefore no additional data was lost due to explicit awareness of the experimental purpose.

Because there were two speaker voices (male, female), we included speaker voice as a between-participants variable in order to determine whether the speaker’s gender had any effect on response times. Twenty-six participants heard the male speaker and 27 heard the female speaker. A 2 (Speaker Voice: Male, Female) x 2 (Suffix Prime: GM, Neutral) x 3 (Target Name Type: Male, Female, Place) repeated measures analysis of variance (ANOVA) was conducted on mean response times to target names (see Table 1).

Table 1

<table>
<thead>
<tr>
<th>Reader Voice</th>
<th>GM Suffix Prime</th>
<th>Gender Neutral Suffix Prime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Speaker</td>
<td>Male Target</td>
<td>693.52 (132.65)</td>
</tr>
<tr>
<td></td>
<td>Female Target</td>
<td>738.03 (147.25)</td>
</tr>
<tr>
<td></td>
<td>Place Target</td>
<td>810.11 (174.85)</td>
</tr>
<tr>
<td>Female Speaker</td>
<td>Male Target</td>
<td>725.31 (166.58)</td>
</tr>
<tr>
<td></td>
<td>Female Target</td>
<td>669.21 (108.74)</td>
</tr>
<tr>
<td></td>
<td>Place Target</td>
<td>800.06 (159.96)</td>
</tr>
</tbody>
</table>

There was no main effect of speaker voice, $F < 1$, or suffix prime, $F < 1$. There was a main effect of target name type, $F_{1}(2,102) = 25.95$, $MSE=11639.56$, $p < .001$, $\eta^{2} = .34$. However, this main effect was moderated by a Speaker Voice x Suffix Prime x Target
Name Type interaction, $F(2,102) = 5.12, MSE = 10407.73, p = .008$. Further inspection of this three-way interaction revealed a Suffix Prime x Target Name Type interaction when the speaker voice was male, $F(2,50) = 4.06, MSE = 9866.30, p = .02$ (see Figure 2).

![Figure 2](image_url)

**Figure 2.** Mean response times (in ms) to male, female, and place target names for sentences containing generic masculine (GM) and neutral suffix primes spoken by a male voice.

For GM suffix primes spoken by a male voice, responses to male targets were marginally faster than responses to female targets ($p = .098, \eta^2 = .11$), and responses to both male ($p = .002, \eta^2 = .33$) and female ($p = .007, \eta^2 = .25$) targets were significantly faster than responses to place targets. For neutral suffix primes spoken by a male voice, response times to male and female targets did not differ (although there was a trend towards responses to male targets being slower than responses to female targets, $p = .13, \eta^2 = .09$).

Although response times to male targets were not different from response times to place targets, $p = .64, \eta^2 = .01$, responses to female targets were marginally faster than responses to place targets, $p = .08, \eta^2 = .12$. 
In contrast to the findings for sentences spoken by a male voice, when the speaker voice was female, there was no main effect of suffix prime $F < 1$, or Suffix Prime $\times$ Target Name Type interaction, $F(2, 52) = 1.45$, $MSE = 10928.34$, $p = .24$. There was a target name type main effect, $F(2, 52) = 21.14$, $MSE = 12644.64$, $p < .001$, $\eta^2 = .45$, such that response times to male names ($M = 713.32$ ms) and female names ($M = 685.58$ ms) did not differ, $p = .13$, $\eta^2 = .08$, but were both faster than response times to place names ($M = 818.92$ ms), $p < .001$, $\eta^2_{\text{male names}} = .42$, $\eta^2_{\text{female names}} = .58$.

**Discussion**

Experiment 1 demonstrated an unexpected but interesting effect of speaker gender on responses to target names presented immediately after GM and neutral suffix primes. Finding that speaker gender influences activation of suffix terms is a novel finding that has not been reported in previous research where participants typically read sentences containing GM and neutral terms. When a GM term was spoken by a male voice, participants were fastest to respond to male names, followed by female names, and were slowest to respond to place names. These finding suggest that masculine associations are activated more strongly than feminine associations when GM terms are spoken by males. The male speaker could have primed participants to activate the (dominant) masculine meaning of the GM suffix, consequently prompting faster response times to male names. This finding is consistent with the notion that GM terms are biased towards masculine interpretations. However, when the neutral suffix prime was read by the male voice, only female names were responded to faster than place names, and there was a nonsignificant trend towards female names being activated to a greater degree than male names. One explanation for this finding is that the strong association between GM suffixes and the
masculine meaning results in a lack of a strong association between neutral suffixes and masculine meanings. This strong association between GM suffixes and the masculine meaning is supported by the aforementioned results of the McConnell and Fazio’s (1996) research. Consistent with the present results, McConnell and Fazio showed that participants associated masculine traits significantly more so to GM terms than to neutral suffix terms. Therefore, the current results demonstrate that people consequently become accustomed to using neutral suffixes when referring to females (and possibly males and females as a group), and therefore form a stronger association between the neutral suffixes and females.

In contrast to suffixes spoken by a male voice, when the suffixes were spoken by a female voice, response times to female and male names were not significantly different (although there was a nonsignificant trend towards faster responses to female than male names), yet both were faster than responses to place names. The similarity in the response times to male and female names when hearing a female speak GM and neutral suffix primes suggests that a female voice can override the strong association between GM suffixes and males that is seen with a male speaker. Consequently, when the female voice speaks a GM suffix, it is processed similar to a neutral suffix where neither the masculine or feminine meaning is strongly dominant over the other meaning.

**Experiment 2**

Experiment 1 demonstrated immediate activation of the masculine interpretation of GM terms (when spoken by a male), and equal activation of masculine and feminine interpretations of neutral suffixes as well as GM terms when spoken by a female. However, research on processing of ambiguous words has also shown that even when the
subordinate meaning of the prime is activated concurrently with the dominant meaning, the subordinate meaning is typically inhibited after a brief time period. In a second study conducted by Swinney (1979), target words were presented three syllables (approximately 250 ms) after the offset of the ambiguous prime (bug). Responses were faster than unrelated words for only the dominant meaning (ant). Furthering Swinney’s study, Tanenhaus and colleagues (1979) examined time delays in a lexical decision task while noun-verb ambiguous terms were presented in biasing sentences (e.g., I bought the watch or I will watch). Participants were instructed to name target words that were related to the noun or the verb meaning, or were unrelated to either meaning. The targets were presented 0 ms, 200 ms, or 600 ms after the offset of the sentence. The researchers found that both ambiguous meanings were activated 0 ms after the offset of the sentence, but by 200 ms after the offset of the sentence, only the dominant meaning remained activated (Tanenhaus, Leiman, & Seidberg, 1979). From such studies, researchers have concluded that both meanings of ambiguous words are initially activated, yet after a few hundred milliseconds, inhibition of the subordinate meaning occurs and only the dominant meaning remains active (Simpson, 1984). Consequently, we wanted to investigate which meanings of GM and neutral suffix primes would remain active after a brief time interval. Experiment 2 thus presented the lexical decision task 500 ms after the participants heard the prime word. We chose 500 ms instead of Swinney’s 250 ms because our prime words were longer and lower frequency than Swinney’s, and lower frequency words are activated significantly slower than words with a higher frequency (Dahan, Magnuson, Tanenhaus, 2001). In light of the results of Experiment 1, we predicted that when the male voice spoke GM terms, male names (presented 500 ms after
the prime) would continue to elicit faster response times to female and place names.

Furthermore, when the neutral suffix prime was spoken by a male voice, response times to both male and female names would be significantly faster than response times to place names. In contrast, we might expect that when the female voice spoke GM terms, the dominant male meaning would remain activated after 500 ms, in accordance with Swinney (1979). Consequently, GM terms read by the female voice would result in faster response times to male names compared to female and place names. Alternatively, if a female voice does continue to equalize masculine and feminine interpretations of GM terms, both male and female interpretations could remain active at this later time period. Finally, when neutral suffix primes are spoken by a female, response times to both male and female names were expected to be faster than response times to place names.

Method

Participants. As in Experiment 1, participants were recruited from psychology courses at Rhodes College and received either research or extra credit for their participation. A total of 45 female participants ranged in age from 18-21 (\(M = 19.26, SD = .99\)).

Materials, Design, and Procedure. The materials, design, and procedure for Experiment 2 were identical to Experiment 1 with the exception the target presentation timing on the computer screen. In Experiment 2, the target appeared on the screen 500 ms after the participants heard the prime word over the headsets.

Results

As with Experiment 1, we excluded response times that corresponded to incorrectly answered comprehension questions (8.8% of suffix prime sentences), incorrect lexical decision responses (an additional loss of 5.9% of suffix sentences), and
response times that were greater than 2.5 SD above the mean (an additional 2.6% of suffix sentences). Assessment of the post-experiment questionnaire revealed that no participants figured out the purpose of the study, and therefore no additional data was lost due to explicit awareness of the experimental purpose.

As in Experiment 1, speaker voice was included as a between-participants variable (26 participants heard the female voice and 19 participants heard the male voice). A 2 (Speaker Voice: Male, Female) x 2 (Suffix Prime: GM, Neutral) x 3 (Target Name Type: Male, Female, Place) ANOVA was conducted on mean response times to target names (see Table 2).

Table 2

*In Experiment 2, Mean Time to Respond (and Standard Deviations), in ms, to Target Names When Sentences with GM and Neutral Suffix Primes are Spoken by Male or Female Voices.*

<table>
<thead>
<tr>
<th>Reader Voice</th>
<th>GM Suffix Prime</th>
<th>Gender Neutral Suffix Prime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Voice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Target</td>
<td>861.32 (225.78)</td>
<td>797.62 (251.11)</td>
</tr>
<tr>
<td>Female Target</td>
<td>789.80 (216.63)</td>
<td>782.17 (207.08)</td>
</tr>
<tr>
<td>Place Target</td>
<td>869.56 (238.62)</td>
<td>934.19 (275.86)</td>
</tr>
<tr>
<td>Female Voice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Target</td>
<td>768.03 (239.52)</td>
<td>731.50 (195.91)</td>
</tr>
<tr>
<td>Female Target</td>
<td>736.24 (198.94)</td>
<td>754.51 (231.45)</td>
</tr>
<tr>
<td>Place Target</td>
<td>845.16 (221.94)</td>
<td>824.82 (225.64)</td>
</tr>
</tbody>
</table>

There was no main effect of speaker voice, $F < 1$, or suffix prime, $F < 1$. There was a main effect of target name type, $F (2, 86) = 20.89, MSE = 12150.69, p < .001, \eta^2 = .37$. The only interaction that approached significance was the Suffix Prime x Target Name Type, $F(2, 86) = 2.58, MSE = 12171.34, p = .08$ (see Figure 3).
Investigation of this interaction revealed that for GM suffix primes, responses to male target names were marginally slower than responses to female target names, $p = .06, \eta^2 = .08$, but faster than place target names, $p < .001, \eta^2 = .08$. Female target names were also responded to more quickly than place target names, $p = .06, \eta^2 = .39$. For neutral suffix primes, both male and female target names were responded to faster than place target names, $ps < .001, \eta^2_{\text{male}} = .33, \eta^2_{\text{female}} = .33$, but responses to male and female target names were equally fast, $p = .78, \eta^2 = .02$. No other two-way interactions were significant, $F < 1$, and the three-way interaction was also not significant, $F (2, 86) = 1.87, MSE = 12171.34, p = .16$.

**Discussion**

Unlike Experiment 1, the gender of the speaker did not influence the activation of either the male or female meanings of the GM and neutral suffix primes. Therefore, the speaker’s gender no longer influences which meanings are activated 500 ms after hearing
the suffix. This suggests lexical access (i.e., retrieval of the word and its semantic meaning) may be complete by 500 ms, and these results may not reflect comprehension of the GM and gender neutral terms. Alternatively, individuals could implicitly filter out the influence of the gender of the speaker’s voice by 500 ms, resulting in the speaker’s gender no longer influencing comprehension. Although speaker gender no longer influenced responses, responses were affected by the type of suffix. When hearing the GM term, response times were equally fast to both male and female names. Although somewhat surprising, support for this finding comes from previous studies that have also found equal activation of male and female associations to male-stereotyped terms. Kreiner, Sturt, and Garrod (2008) point out that when Banaji and Hardin (1996) presented an IAT using a lexical decision (compared to gender decision) in their second experiment, they did not find significant activation of male associations to the male-stereotyped terms. Consequently, the current results support Banaji and Hardin’s (1996) findings. However, the present results showed marginally faster responses to female names than to male names, both of which were faster than responses to place names. Finding that responses were fastest to female names is similar to that found with neutral suffixes read by males in Experiment 1, as well as both GM and neutral suffix primes read by females. These results suggest that 500 ms after hearing a GM suffix, the female interpretation is more active than the male interpretation. One explanation for this finding is that the increased time allows for the gender inclusive meaning of GM suffixes to be realized, and thus the masculine interpretation is suppressed. In contrast, when the neutral suffix prime was presented, response times were equally fast to male and female names, both of which were significantly faster than response times to place names. Therefore,
500 ms after the presentation of the neutral suffix primes, associations to both males and females are active (regardless of speaker voice), suggesting that even with increased time to process, neutral terms are interpreted as intended: inclusive of both genders.

**General Discussion**

The purpose of the two experiments reported here was to provide further understanding of how individuals comprehend generic masculine terms compared to gender-neutral terms. Specifically, we investigated the timing of the activation of dominant male associations and the subordinate gender-inclusive associations when listening to someone speak these terms, rather than when reading them. Using this method, this research provided insight into which meanings were initially activated and which meanings remained activated after the auditory presentation of GM terms and their neutral counterparts.

As seen from the results, the gender associations activated when hearing a GM term are influenced by the amount of time elapsed after the auditory presentation, as well as by the gender of the speaker. When the GM terms were spoken by a male, both the male and female associations were immediately activated, with a marginally significant trend towards a faster activation of the male association. The trend towards faster activation of the male association suggests that upon hearing a GM term spoken by a male, male associations are activated more strongly than female associations. This finding further emphasizes the dominant masculine meaning of GM terms. However, when a female speaks a GM term, both female and male associations are initially equally activated. In other words, neither association is dominant over the other when the female voice presents the GM term. The equally fast response times to male and female names
when spoken by a female voice suggests that the terms are immediately neutralized by the female voice compared to when they are spoken by the male voice. These findings suggest that a speaker’s gender plays an important role in *activating* lexical meanings during listening comprehension.

However, the influence of the speaker’s gender appears to become less influential over time, as seen by the similarity in gender association activation after 500 ms when GM terms are spoken by male and female voices. Regardless of the speaker’s gender, both male and female associations were activated after 500 ms, with a trend towards faster activation of the female association. This faster activation of female associations could be due to delayed activation of the gender-inclusive meaning. Possibly by activating the gender inclusive meaning, and thus activating female associations, the male associations are consequently suppressed. Alternatively, the faster activation of female associations could be the result of the completion of lexical access (i.e., retrieval of the word and its semantic meaning). The previously mentioned study conducted by Tanenhaus and colleagues (1979) showed that the significantly faster activation towards the dominant meaning compared to the subordinate meaning began to decrease after 200 ms. By 600 ms this difference in activation was no longer significant, since all three conditions (dominant, subordinate and unrelated) had equal response times (Tanenhaus, 1979). Consequently, these results suggest that lexical access is completed by 200 ms. Therefore, faster responses to female names than place names at 500 ms could be the simple result of faster activation of female names following lexical access (i.e., a female bias) by these female participants.
As predicted, the findings also demonstrated that when individuals hear gender-neutral terms, both male and female associations are activated. In Experiment 1, when the female voice spoke the neutral suffix, response times to male and female names were equally fast (and faster than responses to place names). While the male voice also elicited the activation of both male and female associations, the results revealed marginally faster response times to female names, suggesting the activation of female associations. Because GM terms are so strongly associated with the masculine meaning when spoken by a male voice, the presentation of a neutral suffix by a male voice could actually be more strongly associated with the female meaning. In other words, because the –man suffix is more frequently used in reference to males than females, we consequently exclude males from neutral suffix terms. Furthermore, the pattern of activation created 0 ms after the male speaks the neutral term mirrors the pattern of activation occurring 500 ms after the GM term is presented (regardless of speaker gender). This suggests that individuals comprehend GM terms 500 ms after hearing the term from either a male or female speaker in the same way that they comprehend neutral suffixes 0 ms after hearing the term spoken by a male speaker. Finally, both male and female associations remain activated at 500 ms after the neutral term is spoken. Once again, these results demonstrate that the speaker’s gender is not influential 500 ms after hearing the term, after lexical access has been completed. These findings show that the initially weak male association to neutral terms spoken by a male voice, compared to female associations, has diminished. After 500 ms, individuals appear to realize the masculine association with gender-neutral terms, resulting in equal response times.
The current study offers unique results that reveal the gender associations automatically activated when comprehending GM terms. The majority of previous research regarding GM terms provided an understanding of what associations individuals explicitly activate when presented with GM language (Liben, Bigler, & Krogh, 2002; Gabriel & Gygax, 20008; Miller & James, 2009). Unlike previous studies, the current experiments examined individuals’ automatic associations through the use of implicit cognitive priming procedure, and thus provided findings regarding the activation of associations during and immediately after lexical access. As previously mentioned, implicit associations have been shown to correlate more strongly with individual’s actions compared to the associations revealed through explicit measurements (Hofman et al., 2005). Additionally, the current research examines the direct association between male and female meanings and the GM and neutral terms. Past studies, such as Khan and Daneman (2011), examined pairs of both gender-matched or mismatched GM terms and anaphors, and inferred gender associations based on the comprehension of these pairs. The two current experiments used a more direct measurement by examining the associations activated at specific times in response to encountering a GM or neutral term. Furthermore, while past research has examined GM terms through the IAT, the current results extend studies using the IAT by providing precise timing of which associations are active at specific time intervals. The current methodology has also avoided many of the issues the IAT faces. For example, researchers argued that cognitive inertia, or the difficulty of switching from one categorization rule to the next, created the significant results found by the IAT (Messner & Vosgereau, 2010). The current methodology requires only one, consistent response (i.e., lexical decision), thus avoiding the issue.
A final unique aspect of this research was the examination of the comprehension of GM terms through auditory presentation. Previous research has only investigated individuals’ reading comprehension of GM terms (Banaji & Hardin, 1996; McConell & Fazio, 1996; Khan & Daneman, 2011). These experiments have revealed the importance of the gender of the speaker in how GM terms are comprehended initially. These findings are pertinent to the modern audience since individuals today are probably more likely to speak informally (and thus use GM terms) than to write informally. Due to reforms regarding GM language, the use of GM terms in writing has most likely become less prevalent (Khan and Daneman, 2011). However, it is likely that individuals continue to use GM terms when speaking informally. Therefore, the unique analysis of the speaker’s gender in the current study reveals new information pertinent to the modern audience.

Although the current study has provided unique findings, there are some limitations that should be considered. First, some of the results were only marginally significant and should therefore be investigated with additional participants. No more than 27 participants in Experiment 1 heard the male or female voice and only 19 participants heard the male voice in Experiment 2. It is expected that increasing the sample size will result in the additional power needed to reveal significant results. Second, the participants of the studies were limited to female college students, ranging between 18 to 22 years of age. These individuals could have comprehended GM terms differently than those who are not college-educated, as their additional years of formal education may have encouraged them to more readily apply these terms to incorporate males and females. Their age could have also influenced the results, in that these young adults may automatically comprehend an occupation as gender-inclusive, whereas older
adults may not immediately apply certain occupations to females due to their era in which they were raised. Additionally, there were not enough male participants in order to test participant gender effects, an issue that should be explored in future research. Although previous research suggests that males and females would not differ in their response times to target names, male participants should be tested in order to verify these claims (Rudman, Greenwald, & McGhee, 2001). Given that the current results reveal the influence of the voice’s gender, male participants, compared to female participants, may comprehend the male voice as more strongly associated with the male meaning of terms. Male participants may also perceive the neutral suffix as more strongly associated to males when spoken by a male, compared to the females’ immediately faster activation of the female meaning of the neutral suffix spoken by a male. Consequently, males could comprehend the female voice as gender-exclusive. Finally, the NaturalSoft speaker voice was noted by some participants (in the post-experiment questionnaire) as being more difficult to understand than a human speaker. This could explain the relatively high rate of incorrect comprehension question answers, therefore contributing to a loss of data. Nevertheless, using a “real” voice would have presented alternative concerns. In particular, the NaturalSoft program ensured the speaker’s speed was at a steady rate and that the prime terms were presented at the same point in time by the male and female speakers. These advantages would not have been possible had we used a real voice.

Despite the limitations of the study, the current research has provided further understanding of language’s influence on cognition. Specifically, the study revealed the potential for terms containing both GM and neutral suffixes to be comprehended initially as gender-exclusive. When spoken by a male, the GM term immediately activates the
male association. The activation of this gender-exclusive association can result in stronger associations between the occupational titles and specific genders. Subsequently, our results support the Sapir-Whorf hypothesis, illustrating that GM terms can influence individuals’ understanding of gender associations and gender roles.

In conclusion, the two experiments presented here have revealed unique findings regarding the implicit comprehension of GM terms. In contrast to findings that ambiguous words initially activate both meanings and yet only the dominant meaning remains active across time (e.g., Swinney, 1979), GM terms appear to have the reverse effect in that they have the potential to initially activate only the dominant meaning, yet eventually activate both meanings. This illustrates the inherent gender-bias of GM terms, yet individuals’ ability to overcome this bias. Additionally, we found the current methodology to provide an alternative assessment of implicit biases compared to the results of the IAT and explicit tests. Using this methodology, the results demonstrated new findings and presented a more precise timeline of gender association activation. Furthermore, the study unexpectedly offered further understanding of the influence of speaker’s gender revealing that females comprehend the female voice as neutral while they also comprehend the neutral suffix as inclusive of women, both immediately and after a delay. Subsequently, efforts should be made to use gender-neutral terms rather than GM terms which could initially be perceived as gender-exclusive when spoken by a male voice. By shifting the language we use from potentially exclusive GM terms to gender-neutral terminology (even when speaking about men), stronger associations between particular terms and both genders can be formed. Subsequently, strong gender-exclusive associations with occupations would weaken. Therefore, the use of gender-
neutral terms could reduce gender associations that lead to gender stereotypes and sexism. Through this reduction of gender stereotypes, individuals may no longer feel ostracized or excluded in the work place. Accordingly, this change in word choice could have greater implications for gender relations in our society. The use of gender-inclusive occupational terms could lead to greater acceptance of females in any occupational role.
References


