

When I talk about a student, is it understood that he could be a girl?

An analysis of on-line processing of generic pronouns

Eleanor Chestnut

Advisor: Deborah Burke

Pomona College

Linguistics and Cognitive Science

Senior Thesis

May 2010

Abstract

This study investigated how male and neutral generic pronouns are processed on-line. Previous research has demonstrated that the male generic pronoun *he* creates a male bias in the interpretation of generic sentences, causing neutral antecedents (e.g. *a writer*) to be interpreted as strictly masculine. The singular pronoun *they*, in contrast, is inclusive of both genders. In this study, 31 male participants and 32 female participants listened to a series of 160 sentences, 40 of which contained generic *he*, singular *they*, sex-specific *he*, or sex-specific *she*. A lexical decision task involving the visual presentation of male or female words (e.g. *brother* or *sister*) immediately after the pronoun was used to determine on-line processing of these pronouns. It was hypothesized that lexical decision latency after generic and sex-specific *he* would be faster for male than for female lexical decision words whereas this difference would not occur after singular *they*. It was found, however, that response times largely depended on the gender of the lexical decision word and the gender of the participant; while male participants recognized male lexical decision words more quickly, female participants recognized female lexical decision words more quickly. Nevertheless, the hypothesis that *he* is interpreted as masculine regardless of context received small support from female participants' response times; no significant differences were found between response times for male and female lexical decision words in either the generic or sex-specific *he* conditions, suggesting that *he* in each case was interpreted in the same way.

Language and Thought

In his essay outlining the importance of linguistics as a social science related to other scientific disciplines such as anthropology, sociology, and psychology, Edward Sapir (1929) writes:

“Language is a guide to ‘social reality’. Though language is not ordinarily thought of as of essential interest to the students of social science, it powerfully conditions all our thinking about social problems and processes. Human beings do not live in the objective world alone, nor alone in the world of social activity as ordinarily understood, but are very much at the mercy of the particular language which has become the medium of expression for their society. [...] We see and hear and otherwise experience very largely as we do because the language habits of our community predispose certain choices of interpretation.” (Sapir, 1929, p. 209)

Although most researchers have since rejected the notion that people are “at the mercy” of the language(s) they speak, an idea commonly referred to as “linguistic determinism” and promoted by Edward Sapir and his student, Benjamin Whorf, many have asserted that language, thought, and interpretations of reality are indeed intimately related. This “weaker” form of linguistic determinism, known as the linguistic relativity hypothesis, recognizes that while it is not the case that language strictly determines or constrains one’s thoughts, language does have the power to at least influence thought in some ways (Lucy, 1997; Boroditsky, 2003).

Much of the support for this claim comes from several studies conducted during the past thirty years that have investigated the cognitive effects of cross-linguistic differences in the representation of concepts such as number, space, time, color, and material. It has been found, for example, that prepositional differences among languages, such as the distinction between “tight fit” (e.g. putting a letter in an envelope) and “loose fit” (e.g. putting an apple in a bowl) in Korean that does not exist in English, may be reflected in the way speakers of different languages organize the world spatially; in the case of “tight” and “loose” fit, Korean speakers have demonstrated a tendency to recognize this distinction more easily than English speakers

(Boroditsky, 2003). The results of these studies have generally suggested that the way in which information is encoded in a language may influence the salience of particular features or a speaker's general conception of reality (Lucy, 1997; Boroditsky, 2003). It is important to note, however, that many of these studies are considered controversial for methodological reasons, and that the amount of empirical research that has addressed these particular issues has been scant. This can be attributed in part to a general fear of the powerful implications that an acceptance of linguistic relativity would have for the way people think, but it can also be attributed to "the interdisciplinary nature of the problem itself," which requires an understanding and assessment of both linguistic structure and cognitive processes and therefore makes research in this area particularly difficult (Lucy, 1997, p. 294). Nevertheless, enough reliable empirical research has been conducted to promote the conception of thought as "a complex set of collaborations between linguistic and non-linguistic representations and processes" (Boroditsky, 2003, p. 920).

An important area to which the linguistic relativity hypothesis has recently been extended—and which is relevant to the current study—is the representation of grammatical and natural gender in language. Can gender, like other features encoded in language, influence a person's thoughts by making certain interpretations of reality more salient than others? Will gendered words cause people to interpret and remember concepts in a particular way according to those genders? A few studies have addressed this issue, focusing primarily on differences among grammatically gendered languages, such as Spanish, French, Italian, and German (Pintado et al., 1994; Flaherty, 2001; Sera et al., 2002; Bassetti, 2007; Boroditsky et al., 2002). The results of these studies have suggested that languages with grammatical gender and only two gender classes (e.g. Spanish, French, and Italian) tend to cause speakers to conceptualize nouns and assign natural gender to them according to the nouns' grammatical gender. Speakers of

languages with either no or little grammatical gender (e.g. English) or more than two gender classes (e.g. German) do not demonstrate the same tendencies, but rather appear to associate gender with nouns based on other conceptual factors and attributes (e.g. whether an object is natural or man-made) (Pintado et al., 1994; Flaherty, 2001; Sera et al., 2002; Bassetti, 2007).

Very little empirical research, however, has been devoted to determining how natural gender is assigned to human nouns and pronouns, such as words meaning *doctor* or *they*. Can the grammatical gender of a noun (in a language with grammatical gender) influence a noun's interpretation if it is different from the noun's natural gender? In Spanish, for example, there are some words that refer to professions, such as the term *el abogado* meaning *lawyer*, that only exist in the masculine but are used to refer to either a man or a woman. Does the grammatical masculinity of this noun influence its interpretation? And in languages lacking extensive grammatical gender, are there certain factors, such as semantic associations with other concepts, that can promote or prevent the interpretation of a noun as male or female? These are important questions to consider, since it could very well be the case—as some studies that will be described in the next section have indeed shown—that language use plays a significant role in shaping the current unequal status of men and women in society.

English, Gender, and Thought

The present study explores the relation between gender in language and thought within the context of English. It is useful, therefore, to first characterize the English gender system. As previously stated, English is a language that for the most part does not utilize grammatical gender; instead, a natural gender system is used in which nouns and some pronouns (e.g. *I, me, you, they*) are typically classified as masculine, feminine, or neuter according to “the real-world [semantic] distinctions of male animate (or male human), female animate (or female human), and inanimate

(non-human)” (Curzan, 2003, p. 17). If the referent of a noun is male (e.g. *man*), in short, then the noun should be interpreted as male; if the referent is female (e.g. *woman*), then the noun should be interpreted as female; and if the sex of the referent is not specified (e.g. *student*), then the noun should be interpreted as referring to either a man or a woman, inclusively.¹

There are two main factors, however, that complicate the natural gender system in English. The first is the use of suffixes, such as *-ess*, *-ette*, and *-ine*, which grammatically identify human nouns as referring specifically to one gender in particular. Since these morphological markings in general tend to encode feminine rather than masculine gender, it has been argued that English unnecessarily “singles women out” and represents men as the “unmarked” category (Baron, 1986, p. 111).

The second is the use of the “male generic”, which was officially established by an Act of Parliament in 1850. This Act stated that masculine nouns and the singular masculine pronoun *he* should be considered to have more than one meaning; they would be used not only to refer to men, but also to refer to both men and women together (e.g. *mankind* instead of *humankind* and *any person knows what he says* instead of *any person knows what he or she says*). The rationale behind this rule was that the male gender was the “worthier” gender, and phrases such as *men and women* and the singular generic pronoun *they* were considered “clumsy” or grammatically inappropriate with respect to number, respectively (Bodine, 1975). The problem with the male generic, however, is that it incorporates a disagreement between grammatical and natural gender that exists nowhere else in the English language; the nouns are intended to represent both men

¹ As will be discussed, however, in the case of sex-indefinite nouns, there may still be a bias towards masculine interpretations even when the gender of a noun is never specified within a context. This may result from a discrepancy between the number of men and women with a given title (e.g. if there are more male lawyers than female lawyers in the world, then the male interpretation of “lawyer” would likely be most salient), general sexist beliefs, or other grammatical constructions in English that portray women as a “marked” category.

and women, but they also agree grammatically with masculine pronouns such as *he*. It would be ungrammatical to say in English, for example, **Any man_i knows what she_i says*, or, **Any girl_i knows what he_i says*. In these cases, the pronoun and antecedent do not agree in terms of grammatical gender, even though *man* and *he* should, according to the Act of Parliament, technically be able to include the female gender. Many have therefore argued that when male generics are used, it is easy to mistakenly interpret them as referring to men only because of this inconsistency and their strong association with the male gender. When this happens, of course, women are excluded from sentences when they should not be.

For these reasons and more, a number of researchers have considered English to be an “androcentric” and sexist language that either categorizes women as “marked”—as deviations from the (masculine) norm—or makes women “invisible”. Why is this important? There are several researchers, in fact, who have argued that this should not be a matter of concern. The linguistics faculty at Harvard in 1971, for example, argued that “the fact that the masculine is the unmarked gender in English ... is simply a feature of grammar. It is unlikely to be an impediment to change in the patterns of the sexual division of labor towards which our society may wish to evolve” (Harvard Crimson, 1971, as cited by Martyna, 1980, p. 483). Similarly, others have generally maintained that sexist linguistic patterns “are manifestations, rather than causes, of underlying attitudes,” and so proposing linguistic reform is pointless because “changing biases in linguistic patterns will not automatically change social biases” (Schneider & Foss, 1976, p. 6). And with respect to male generics, even Robin Lakoff wrote, “While this lexical and grammatical neutralization is related to the fact that men have been the writers and the doers, I don’t think it by itself specifies a particular and demeaning role for women... My feeling is that this area of

pronominal neutralization is both less in need of changing, and less open to change, than many of the other disparities that have been discussed earlier...” (Lakoff, 1973, p. 75).

Recent empirical findings involving male generics support the linguistic relativity hypothesis and suggest that they affect thought and sexism. While it is undeniable that much more than linguistic reform will be required to change social biases and ultimately eliminate sexism, it is likely that the encoding of gender in English both “reflects and reproduces sexist social structures and attitudes” (Ehrlich & King, 1994, p. 60). Several studies conducted during the past few decades, in fact, have suggested that the use and representation of gender in English—namely, the use of male generics—do indeed exclude women from English speakers’ thoughts, fostering an androcentric view of reality and likely contributing to gender inequality in society.

The element of English grammar that has arguably received the most attention and that has been most clearly demonstrated as androcentric is the third person male generic pronoun *he*. Martyna (1978), one of the first to address whether *he* serves as an adequate generic pronoun, investigated its ability to refer to both men and women unambiguously through an experiment based on production. Participants were required to complete sentences (e.g. *When a teenager finishes high school...*), and she proposed that if *he* is “an adequate generic term”, it should be used “whenever a pronoun must be chosen without knowing the sex of the referent” (Martyna, 1978, p. 132). It was found, however, that participants frequently used *he* to complete sentences with “masculine” antecedents (e.g. *police officer*), “she” to complete sentences with “feminine” antecedents (e.g. *babysitter*), and *they* or *he or she* to complete sentences with “neutral” antecedents (e.g. *person*). This suggests that the *he* and *she* produced for predominantly male and female antecedents serve more as sex-specific pronouns than as generic pronouns, and that *he* is

not considered an adequate generic pronoun since alternatives such as *he or she* and *they* were often produced instead for the more neutral antecedents. Furthermore, the male participants who did use *he* to complete sentences with neutral antecedents tended to associate male imagery with those sentences.² For this reason, Martyna (1978) proposes that generic *he* is “neither clear nor equitable” (137). And even though many of her female participants produced generic *he* without reporting male imagery, the tendency of her male participants to associate *he* with male imagery suggests that the usage of generic *he* does not necessarily entail a generic comprehension.

Although Martyna (1978) briefly touched upon the comprehension of generic *he* in her study, her focus was on production. A study that provided a more thorough analysis of the comprehension of generic *he* was conducted by MacKay and Fulkerson (1979). These researchers investigated whether male generic pronouns “simply stand for their referents” or bias speakers toward male interpretations without respect to the participants’ own production of generic *he* (661). In their study participants were presented with sentences that contained sex-specific nouns (e.g. *The front door was quickly answered by his aunt*), sex-specific pronouns (e.g. *The old housekeeper cleaned her carpet before sunrise*), or the male generic pronoun (e.g. *A bicyclist can bet that he is not safe from dogs*), and were asked to state whether the sentence could or could not refer to one or more females. It was found that participants overwhelmingly interpreted sentences with generic *he* as not referring to females, but rather to males only. This interpretation occurred regardless of how “masculine” or “feminine” the antecedents were perceived to be by the participants when the nouns were presented in isolation; even such antecedents as *nurse* and *secretary*, which were rated as predominantly feminine, were interpreted as excluding women in sentences with generic *he*. This indicates that “generic *he* is not neutral

² Possible reasons for differences between male and female participants will be discussed later.

but perceptually polarizes an otherwise neutral antecedent”, making male interpretations “more readily available” (MacKay and Fulkerson, 1979, p. 669).

Importantly, MacKay and Fulkerson (1979) note that their results do not suggest that “generic *he* distorts our cognitive map of the world”, since participants only tended to interpret nouns as strictly male when they were associated with generic *he*. When they were presented with nouns in isolation—without any potentially biasing pronouns—they appeared to base their interpretations of the nouns on “real-world experience”, reflecting the actual gender distribution of certain professions (669-670). MacKay and Fulkerson (1979) do acknowledge, however, that generic *he* has the power to distort the “cognitive maps” of those who are in the “formative” stages (e.g. children) and who do not yet have enough real-world experience to know, for example, whether both men and women are scientists. In these cases, the usage of generic *he* may bias speakers toward believing that only men hold those positions, which in turn can contribute to and reinforce sexist attitudes and behavior.

Studies conducted by MacKay (1980), Gastil (1990), Hamilton (1988), and Khosroshahi (1989) confirmed the results of the Martyna (1978) and MacKay and Fulkerson (1979) experiments and further demonstrate that the production and comprehension of generic *he* tend to contribute to a male bias. MacKay (1980) investigated the interpretations of generic *he* in comparison to neologisms (*E*, *e*, or *tey*) when they referred to neutral antecedents within the context of paragraphs. Participants were asked to read paragraphs that contained one of the four pronouns and were then required to answer three multiple-choice questions, one of which targeted the gender of the pronoun’s antecedent. While only 20% of the participants who read *E*, *e*, or *tey* incorrectly identified a neutral antecedent as male instead of as male or female, 80% of the

participants who read generic *he* incorrectly identified a neutral antecedent as male.³ MacKay (1980) accounts for this difference by explaining that the male meaning of *he*, which is used “about 10 to 20 times as often as the supposedly generic use”, is “so strongly engraved in semantic memory that no special-purpose or context-restricted meaning can displace [it]” (447-448). Even when the context favors a “male or female” interpretation, the pronoun *he* may still cause antecedents to be interpreted as male because its male meaning is so salient. The neologisms, which did not have any previous meaning attached to them, therefore did not have the same effect and were interpreted generically.

Gastil (1990) provides further evidence that reading or hearing generic *he* can bias speakers toward male interpretations. In his study, participants read aloud twelve sentences, half of which contained one particular type of third person generic pronoun: *he*, *he/she*, or *they*. After reading each sentence, participants verbally described any images that came to mind, and after reading all twelve sentences, the participants were asked to review the sentences and recall the gender (male, female, male or female, or neither) of any people they visualized. The images recalled after reviewing the sentences were in general only used to confirm or determine the gender of the original image; if the original image was clear, then the second image was not considered. Gastil (1990) found that *he* generally evoked more male images than either *he/she* or *they*, although the difference between the images evoked for *he* and *he/she* was not significant for male participants. These results suggest that *he* does not serve effectively as a generic pronoun because it “biases the listener toward predominantly male images” (Gastil, 1990, p. 640). They also touch upon another important concept mentioned earlier: that men and women may interpret pronouns and male generics very differently.

³ Interestingly, the neologisms were never incorrectly interpreted as referring only to females.

Unlike MacKay and Fulkerson (1979), MacKay (1980), and Gastil (1990), Hamilton (1988) was concerned again with the production of generic *he*. Her study was designed to determine whether the male imagery reported in Martyna (1978) could have been caused by the pronoun chosen to complete the sentence: “If we use masculine generics, even when we ‘know’ we mean both sexes, are we likely to be thinking more about males than females?” (786). To answer this question Hamilton (1988) induced participants to use either sexist (e.g. *he*) or unbiased (e.g. *he or she* or *they*) generics by asking them to complete sentences in either a “traditional, formal, academic” way or a “modern, relaxed, casual” way, respectively (787). After completing each sentence, participants were asked to describe any image they had of the person in the sentence. The results of the study indicated that participants in the male generic condition produced significantly more male imagery than did the participants in the unbiased condition, supporting the idea that one’s own use of male generics can bias one’s thoughts to exclude women and the more general linguistic relativity hypothesis that “languages are not simply a reflection of culture, or of the behaviors, cognitions, or attitudes of their speakers, but instead actually help shape them, by allowing or encouraging certain thoughts and discouraging others” (Hamilton, 1988, p. 795).

Khosroshahi (1989) also investigated the effect of one’s own production of generic pronouns on the comprehension of generic sentences. Instead of determining whether producing generic *he* immediately influences the comprehension of the particular sentence in which it appears, however, she addressed whether everyday language use—that is, choosing either to use or not to use male generics—influences the comprehension of generic sentences in general. It was hypothesized that those who have made a conscious effort to reform their own language and produce *he or she* instead of *he* as a generic pronoun would be “more egalitarian in their thought”,

interpreting generics as including women more often than those who regularly use male generics (Khosroshahi, 1989, p. 509).

Khosroshahi (1989) divided participants into four groups: men who use traditional language, men who use reformed language, women who use traditional language, and women who use reformed language. The procedure consisted of presenting the participants with paragraphs that used either *his*, *his or her*, or *their* as a possessive third person generic pronoun. After reading each paragraph, the participants were required to draw an image that the paragraph evoked. Khosroshahi (1989) found that regardless of the pronoun used, more male than female images were produced overall. Additionally, as expected, *he* was interpreted as masculine 67% of the time and evoked the lowest number of female images, whereas *he or she* evoked the highest number of female images.

When language use and gender are considered, however, the results become more interesting. First, both groups of men produced more male images (an average of 1.578 out of a maximum score of 2) and fewer female images (an average of .206) than both groups of women. Second, whereas the men with traditional and reformed language did not differ significantly in the number of male, female, and generic images that they produced in response to each pronoun, the women with reformed language produced significantly more female images and fewer male images than the women with traditional language. While the women with reformed language produced an average of .718 male images and 1 female image, the women with traditional language produced an average of 1.022 male images and .689 female images. The women with reformed language, in fact, were the only participants to produce more female images than male images.

From these results, Khosroshahi (1989) draws three main conclusions: 1) the pronoun used can influence the number of female referents evoked, but since more male images were produced than female images, the “typical person seems to be male by default”; 2) although all the men and the traditional women interpreted generic sentences primarily as having male referents, the men were much more “androcentric” than the women; 3) since the women with reformed language displayed the opposite behavior, “who [the] reader is is also very important” (517).

Although previous research reported that only men tend to associate generic pronouns other than *he* with male images significantly more often than with female images, Merritt and Kok (1995) demonstrated that people typically attribute male gender to gender-unspecified individuals regardless of their own gender or their schematic status according to the Bem Sex Role Inventory. In their study participants were presented with one of three scripts that lacked descriptive pronouns and had been rated before testing as mostly gender neutral: a “business” script, an “interpersonal” script, and an “education” script. After reading the script, subjects were given three distraction tasks and then asked to assign a gender to the main character of the script (*Chris*). It was found that the main character was assigned the male gender significantly more often than the female gender; 88% of the subjects who read the business script attributed male gender to the character, 70% of the subjects who read the interpersonal script attributed male gender to the character, and 71% of the subjects who read the educational script attributed male gender to the character. Importantly, as previously stated, neither the subjects’ gender nor their BSRI classification was significantly related to the attribution of gender, and a majority of both the male and female participants identified Chris as “male” in each condition.

With respect to the English language, it cannot be definitively stated whether the encoding of gender contributes to this “people = male” bias, but considering the stark “markedness” of femininity in English and children’s early exposure to male generics, it is entirely possible. As Merritt and Kok (1995) state,

“Children are exposed to generic masculine pronouns without the grammatical knowledge of the rule, and, as a result, they may conclude that ‘the typical person is a male’ [(Hyde, 1984, p. 704)]. This early learning may continue to affect people’s imagery and thoughts even when they acquire knowledge of the grammatical rule for generic terms and result in male gender being viewed as most prototypic of the person category” (155).

Thus, it is possible that male generics are part of a “complex circular causal chain” in which societal prejudices and language use both influence and mirror one another (Merritt and Kok, 1995, p. 155). To reduce the people = male bias, then, Merritt and Kok (1995) propose that male generics be eliminated.

The finding that male and female participants interpret pronouns differently—more specifically, that male participants demonstrate a stronger male bias than female participants in contexts that use both male and neutral generics—also receives support from other studies (Martyna, 1978; Hamilton, 1988; Gastil, 1990). A number of interesting explanations have been proposed in the literature to account for this phenomenon. With respect to generic *he*, Martyna (1978) presents the idea originally proposed by Nilsen (1977) that “girls and boys may learn about the generic masculine in very different ways” (137). For boys, according to this hypothesis, learning to use generic *he* is simply learning to extend terms that they would normally use to refer to themselves to include generic people. This would arguably make it easy for them to imagine a generic person as male and therefore to interpret generic sentences as referring to males only. For girls, however, the situation is more complicated, since they must become accustomed to hearing

themselves and other females referred to with a pronoun that they would not normally use to refer to themselves; and if they do not interpret *he* as a generic pronoun when it is presented in a generic context, they would be preventing the possibility of including themselves as potential referents. This might therefore cause females to attribute a more strictly grammatical function to the term and to interpret it as including both men and women more often.

Hamilton (1988) offers similar explanations for this gender difference in interpretations, but her reasoning could also be used to account for men's male bias when interpreting neutral generics. Referencing the "people = self" bias proposed by Silveira (1980), he first suggests that interpretations of generic sentences may be shaped by a "projection of 'self' into the sentences" (Hamilton, 1988, p. 797). According to this bias, men would demonstrate a male bias for neutral generic sentences, while women would demonstrate a female bias. Considering that the male bias in men has been found to be the strongest bias, however, it is likely, as Hamilton (1988) goes on to suggest, that constant exposure to male generics strengthens the people = self bias for men and weakens the bias for women by associating maleness with typicality. This, of course, is very similar to what Merritt and Kok (1995) propose.

The third conclusion that Khosroshahi (1989) draws from her results—that an individual's beliefs and characteristics are important determinants of how he or she will interpret a sentence—has important implications for how language reform should be approached. As previously stated, the women with reformed language in Khosroshahi's (1989) study were the only participants not to demonstrate a male bias when interpreting generic sentences with either male or neutral generics. To account for this, Khosroshahi (1989) writes:

"It seems that whether new behavior is associated with new thought depends in part on the depth of the underlying change of attitude. The men who have adopted new linguistic behavior seem to have undergone a relatively superficial change of attitude, a change induced by situational

demands, interpersonal pressures, or other extraneous influences, rather than by inner convictions. [...] The women who have altered their pronoun usage seem to have changed attitude at this level, that is, not just in what they regard as interactionally appropriate, but in their actual conception of who the generic person is.” (521)

Here, Khosroshahi (1989) argues that the men who used reformed language, unlike the women who used reformed language, did not actually undergo “an authentic change of heart”; instead, they continued to hold a male bias, and therefore frequently did not interpret generics as including women (522). The women with reformed language, on the other hand, are claimed to have developed “top-down, controlled processes to inhibit the automatically evoked masculine associates of *he*” (517). Whether a person has actually adopted feminist ideology, then, is crucial for determining how a generic sentence will be interpreted, and language reform (e.g. promotion of the use of *he or she* instead of *he*) that is unaccompanied by such “mental” reform will be unsuccessful.

It is important to note that this study does not necessarily provide support for the linguistic relativity hypothesis. It is not clear, in other words, whether the women’s reformed language preceded or shaped their conceptions of generic people. It could very well be the case, for example, that both their pronoun comprehension and their use of more inclusive generic pronouns were simply influenced by changes in their beliefs and attitudes. Khosroshahi (1989) recognizes this herself, explaining that at best the study may suggest that “people who *initiate* linguistic reform are likely to experience correlated reform of thought” (522). Different methodology—similar to that used by Hamilton (1988)—would have to be used to determine the effect and power of language use itself.

The studies briefly mentioned here all generally point toward the idea that male generics, both produced and comprehended, contribute to a male bias that is stronger in men than it is in

women. However, despite this body of research, the exact manner in which both male and neutral generics are processed by men and women remains unclear. Khosroshahi (1989) argues that the women with reformed language in her study were able to inhibit the “automatically evoked masculine associates of *he*” with top-down processes (517). The problem with this claim is that it makes two unsupported assumptions: first, that masculine associates of *he* are automatically evoked by the word and overpower its generic meaning; and second, that it is possible to inhibit these automatic processes. Her methodology, unfortunately—and the methodology used in the aforementioned studies—do not permit such inferences. This is because each of these studies involved strictly off-line processing. As will be discussed, there are significant differences between off-line and on-line processing and the types of information their measures reveal.

On-line Processing

On-line processing is defined as the comprehension of written or spoken language in real time. As Marslen-Wilson and Tyler (1981) explain, this type of processing is automatic, effortless, and unavailable to conscious awareness, and it is typically measured through priming paradigms, eye-tracking, and self-paced reading tasks. Although the extent to which syntax and semantics interact to produce meaning during the processing of language is not yet clear, several studies that have measured on-line processing with these techniques do generally suggest that language processing “is not some distant goal, only reached after large chunks of the utterance have been heard” (Marslen-Wilson and Tyler, 1981, p. 318). Instead, meaning appears to be constructed “as rapidly and as early as possible” during sentence parsing, and context—at least for syntactically unambiguous sentences—can influence how a word will be interpreted (Marslen-Wilson and Tyler, 1981, p. 322). Measures of on-line processing, therefore, may shed light on the organization of the mental lexicon, how certain words are immediately interpreted within

sentences—which of their semantic features, for example, have been activated—and how these interpretations may be shaped by other contextual information.

Off-line processing, in contrast, refers to the comprehension of written or spoken language after it has already been read or heard, respectively. In this case, comprehension is not limited to automatic, unconscious processes, but rather may include a number of other processes and cognitive functions that are available to conscious awareness, such as metalinguistic decisions or explicit memory. For this reason, Marslen-Wilson and Tyler (1981) characterize off-line processing as “idiosyncratic and variable” and not “central to the normal process of speech understanding” (322). This is not to say, however, that off-line processing is not worthwhile or useful; indeed, measures of off-line processing may demonstrate how people consciously think about and interpret language, which is equally important and necessary for understanding how language works as a whole. The issue is simply that off-line processing, despite the claims that Khosroshahi (1989) and others make, cannot expose the processes involved in the immediate and subconscious interpretation of language.

Understanding how language is automatically interpreted is essential for determining how language is comprehended in general because that is how language is interpreted in everyday life. There is not often an opportunity to pause and reflect on what a particular utterance might have meant; instead, language comprehension occurs rapidly and automatically, and utterances are attributed meaning based largely on the subconscious activation of features. It is therefore not sufficient to determine how male and neutral generics are interpreted and reflected upon after language is heard or read. To determine how they are initially processed—and to provide insight into how they may be processed and interpreted in rapid, everyday conversation—it is necessary to use an on-line processing technique.

The Present Study

The present study was designed to assess how English sex-specific (*he* and *she*) and generic (*he* and *they*) pronouns are processed on-line by college undergraduate students using a cross-modal priming paradigm. Participants were required to complete lexical decision tasks while listening to sentences. The target sentences contained either a neutral antecedent (e.g. *a writer*) followed by generic *he*, a neutral antecedent followed by singular *they*, a male antecedent (e.g. *John*) followed by sex-specific *he*, and a female antecedent (e.g. *Mary*) followed by sex-specific *she*. The words used for the lexical decision tasks during each of these sentences were either male or female semantically (e.g. *brother* or *sister*) and were presented visually immediately after the pronoun in the sentence. Considering previous research, it was hypothesized that response times for male lexical decision words would be faster than response times for female lexical decision words for both generic *he* and sex-specific *he*, that response times for female lexical decision words would be faster than response times for male lexical decision words for *she*, and that there would be no significant difference between response times for male and female lexical decision words for singular *they*. Since it has been shown that men demonstrate a greater male bias than women, it was also hypothesized that this difference between response times for male and female lexical decision words for generic *he* would be greater for the male participants and that they would respond more quickly to male lexical decision words for the pronoun *they*, as well.

Method

Participants

Participants included 63 undergraduate students at the Claremont Colleges, 31 of whom were male and 32 of whom were female.

Apparatus and Materials

This experiment was created with PsyScope. Materials included 160 sentences that were recorded using Audacity, 120 of which were fillers and 40 of which were target sentences. Each of the 40 target sentences were structured similarly as conditional sentences and were part of one of four conditions so that each condition contained ten target sentences (see Appendix A). The four conditions were the generic *he* condition, the generic *they* condition, the sex-specific *he* condition, and the sex-specific *she* condition. Generic *he* sentences contained a neutral antecedent (e.g. *a writer*) and the pronoun *he*, generic *they* sentences contained a neutral antecedent and the pronoun *they*, sex-specific *he* sentences contained a male antecedent (e.g. *John*) and the pronoun *he*, and sex-specific *she* sentences contained a female antecedent (e.g. *Mary*) and the pronoun *she*. The antecedents of the generic sentences were selected based on previous experiments that utilized “gender neutral” nouns, and antecedents that are considered to be predominantly male or predominantly female were avoided.

Each of the target sentences was paired with either a male or female lexical decision word (e.g. *brother* or *sister*), and these words were matched for length and syllable structure (see Appendix B). The 20 words used for the lexical decision task were also selected in pairs (e.g. *mother* and *father*, *uncle* and *aunt*), and so word frequencies for each member of each “pair” were similar. Half of the sentences in each condition were paired with a male lexical decision word, and half of the sentences were paired with a female lexical decision word (see Tables 1 and 2). The conditions and pairings were counterbalanced over sentences through the use of eight different groups of participants (see Appendix A, Tables 1 and 2). Every group but one consisted of four male participants and four female participants. The one group—Group 6—that

did not consist of eight participants consisted of seven, instead. In this group there were three male participants instead of four.

Half of the filler sentences had the same general structure as the target sentences, and half of the filler sentences were structured differently. The lexical decision words for the filler sentences were words that were matched with the target lexical decision words for length, number of syllables, and frequency using the MRC Psycholinguistic Database. The lexical decision non-words, which were paired with 80 of the filler sentences, were constructed by switching the position of two adjacent letters in words that were also matched with the target lexical decision words for length, number of syllables, and frequency (see Appendix B).

Other materials included four lists of eight sentences, four of which were filler sentences used in the study and four of which were similar to filler sentences used in the study.

Procedure

Each participant read and signed a consent form before participating in the study. Participants were taken into a quiet, private room with the experimenter where the experiment was programmed on a computer using PsyScope. Instructions explaining the lexical decision task and the memory task were then given to the participant. The participant was told that he or she would listen to a series of sentences, and that during each sentence a word would appear on the screen. The participant was instructed to indicate as quickly and as accurately as possible whether what he or she saw was a word or a non-word by pressing either the *j* or *f* button on the keyboard. It was also emphasized that the participant should listen carefully to each sentence, because the participant would be required during breaks to identify those sentences that he or she had heard. Breaks occurred after every forty trials, resulting in four short breaks throughout the 25-minute study. During each break the participant was handed a sheet with eight sentences and

asked to circle those sentences that he or she recognized. This task was used simply to ensure that the participants would listen carefully to the sentences. The sentences that the participant heard were presented in random order, and while the sentences were presented orally, the lexical decision words were presented visually on the screen. For the target sentences, the lexical decision words always appeared 0 ms after the pronoun. For the filler sentences that were structured similarly, the lexical decision word or non-word appeared 0 ms after the first word of the second clause. For the filler sentences that were not structured similarly, the lexical decision word or non-word appeared approximately halfway through the sentence. The participant also controlled the pace of the experiment by pressing the space bar to hear each new sentence. The key that the participant pressed, the word used for the lexical decision task, and the sentence that was heard were all recorded for each trial in addition to response time.

Results

Of the response times collected, 71 were eliminated: 32 of the eliminated response times were incorrect responses, and 39 of the eliminated response times were greater than three standard deviations away from the participant's mean response time for the target sentences. On average, 1.11 response times were eliminated for each participant. All response times for *niece* and *nephew* were also eliminated because mean response times for these words were greater than three standard deviations away from the mean of the response times for the other 18 gendered lexical decision words combined, suggesting that response times for these words were from a different distribution than that of the other lexical decision words.

The response times were subjected to a mixed design repeated-measures analysis of variance. The interaction of lexical decision word and participant gender was large and statistically reliable, $F(1, 61) = 9.934, p = .003$. While male participants tended to respond more

quickly to male lexical decision words, female participants tended to respond more quickly to female lexical decision words (see Figure 1). The average response times for male participants to male and female lexical decision words was 572 ms and 585 ms, respectively, and the average response times for female participants to male and female lexical decision words was 605 and 590 ms, respectively. No other significant main effects were found.

Follow-up t-tests showed that for female participants, there was a significant effect for gender of the lexical decision word for *she*, $t(31) = 1.866$, $p = .036$, with female lexical decision words receiving faster response times than male lexical decision words. There was a marginally significant effect for gender for the lexical decision word for singular *they*, $t(31) = 1.490$, $p = .073$, as well, with female lexical decision words once again receiving faster response times than male lexical decision words (see Table 3, Figure 2). For generic and sex-specific *he*, differences between response times for male and female lexical decision words were not significant. For male participants, there was a significant effect for gender of the lexical decision word for generic *he*, $t(30) = 3.112$, $p = .004$, with male lexical decision words receiving faster response times than female lexical decision words, but no significant differences were found between response times for male and female lexical decision words for any of the other conditions (see Table 3, Figure 3).

Discussion

The results of this study suggest that there exists a male bias in men and a female bias in women, such that men are faster to recognize male words and women are faster to recognize female words, regardless of sentences and pronouns that they may hear. Since only this interaction between the gender of the lexical decision word and the gender of the participant was found to be statistically significant, the original hypotheses that average response times would be faster for female lexical decision words for sex-specific *she* and that average response times for

male and female lexical decision words would not be significantly different for singular *they* are not supported. The response times for the female participants in the generic and sex-specific *he* conditions, however, do provide small support for the hypothesis that *he* is always interpreted as predominantly masculine, since response times in these two conditions were similar.

There are several ways to account for these results. Methodologically, it is possible that the present study did not sufficiently measure the automatic processing of pronouns, and as a result response times reflect some other process. It could be the case, for example, that perhaps the lexical decision task was too easy for the participants. Since non-words were constructed by switching two adjacent letters in a word (e.g. *later* → *latre*), the non-words were often non-permissible strings of phonemes in English or very clearly “odd”. This might have allowed the participants to identify actual words in English more quickly and easily than they might have otherwise.

A second possible methodological problem concerns the prosody of the sentences that the participants heard. Since the word for the lexical decision task always needed to appear on the computer screen immediately after the utterance of the pronoun, the first and second halves of each sentence had to be recorded separately. This resulted in somewhat unnatural prosody for the sentences—especially the first halves of the sentences—and some participants mentioned after completing the task that they were able to anticipate at times the presentation of the word on the screen. If a participant ever anticipated the presentation of the word for some sentences but not for others, this certainly could have skewed response times. At the same time, however, this effect should have been the same across all conditions and groups, since the sentences were counterbalanced with both male and female lexical decision words. The four sentence halves that corresponded to the same sentence in each condition (e.g. *If a writer wants to be published, he; If*

a writer wants to be published, they; If John wants to be published, he; If Mary wants to be published, she) were also matched for length and intonation.

Considering other studies that have demonstrated that words are processed on-line differently at different points throughout the sentence—namely, 0 ms after the presentation of the word and approximately 200 ms later—it could be argued that the timing of the presentation of the lexical decision word was too early for response times to have reflected how the word was actually interpreted once the sentence was finished. Seidenberg et al. (1982), for example, demonstrate that both meanings of ambiguous words are initially accessed regardless of whether they are syntactically or pragmatically primed by previous contextual information.⁴

They also show, however, that semantic priming can influence the initial interpretation of ambiguous words; when the prior context contains a word that is semantically related to one of the meanings of the ambiguous word (e.g. *Although the farmer bought the straw*), only the related meaning is initially facilitated. With this in mind, then, it is likely that presenting the lexical decision word 0 ms after the pronoun did indeed reflect how the pronoun was ultimately interpreted by each participant, since the subject of each sentence (e.g. *John, Mary, a student*) provided semantically-biasing information. Additionally, even if it were the case that every possible meaning of the pronouns was facilitated 0 ms after the pronouns were heard, then the response times for male and female participants should have been similar and should have reflected this activation (i.e. response times for singular *they* should have reflected the equal availability of masculine, feminine, and generic interpretations; response times for *she* should have reflected the availability of only a feminine interpretation; and response times for *he* should

⁴ This analysis, of course, assumes that *he* is indeed an ambiguous pronoun that is stored as having both generic and sex-specific meanings. Future research that varies the timing of the lexical decision task must be conducted to determine whether this is actually the case; if it is found that *he* is interpreted in the same way at various points throughout the sentence, then it is arguable that it is not an ambiguous pronoun.

have reflected the equal availability of generic and masculine interpretations for both the generic and sex-specific contexts). These results, of course, were not obtained. But once again, other problems within the study might have contributed to this.

Another way to account for the results of the present study is through word frequencies. Lexical decision tasks are extremely sensitive to word frequencies; the more frequently a word is heard or seen, the more easily it will be recognized. It is possible, then, that men and women perhaps encounter the words that were used for the lexical decision task at different rates. While men might hear or read *boy*, *man*, and *male* more often than *girl*, *woman*, and *female*, women might hear or read feminine words most frequently. If this effect is strong enough, then it could cause women to recognize feminine words more quickly and men to recognize masculine words more quickly regardless of any other stimuli that might also prime gendered words. A study involving only a lexical decision task with gendered words, or another task that measures on-line processing, could easily address this.

Lastly, it is possible that the nouns selected to serve as the antecedents for the pronouns biased the participants toward certain interpretations. Although nouns that were considered to be stereotypically masculine (e.g. *plumber*) or stereotypically feminine (e.g. *secretary*) were avoided for the present study, no formal system of measurement was used before conducting the study to determine whether some of the nouns might nevertheless be associated more with one gender for the participants. This could have influenced response times for certain sentences in each condition, although it still would not explain why the male and female participants tended to demonstrate opposite biases.

As previously mentioned, despite these potential problems, there are some patterns in the significant effects that are consistent with the hypotheses. It is important to consider what they

suggest in terms of pronoun comprehension. Although a significant difference was found only between the response times for male and female lexical decision words in the generic *he* condition for male participants, significant differences were found in both the singular *they* and sex-specific *she* conditions for female participants. For the female participants, response times for female lexical decision words in both of these conditions were significantly faster than response times for male lexical decision words. This suggests that *they* and *she* are more inclusive of women than are generic and sex-specific *he*, at least for female undergraduate students. In addition, since response times for male and female lexical decision words for both generic and sex-specific *he* were not significantly different, it can be argued that *he* in each of these contexts is interpreted in the same way by female undergraduate students. And if it is assumed that *he* was interpreted as masculine for the sentences in the sex-specific *he* condition, then it can be concluded that *he* was in fact interpreted as masculine for both conditions.

With respect to the male participants' response times, it is not clear how the significant difference found for generic *he* should be interpreted. Male participants' response times were significantly faster for male lexical decision words in the generic *he* condition, but they were not significantly faster for male lexical decision words in the sex-specific *he* condition. If the response times for the generic *he* condition reflect a predominantly masculine interpretation of the pronoun, then it would not make sense for the same bias not to appear in the sex-specific *he* condition, since that condition contains overtly masculine information. Again, it is likely that problems with the design of the study prevented response times from accurately reflecting the on-line processing of each pronoun.

Nevertheless, combined with previous research on the off-line processing of generic *he* (Martyana, 1978; MacKay & Fulkerson, 1979; MacKay, 1980; Hamilton, 1988; Khosroshahi,

1989; Gastil, 1990), these results begin to point toward the idea that *he* should not be used as a generic pronoun. Even if it is only the case that women interpret *he* in the same sex-specific way regardless of the context, this is reason enough not to use *he* as a generic pronoun, since half the time the pronoun is used it will not be interpreted as the writer or speaker intended. From both linguistic and social perspectives, then, the pronoun appears to be problematic; it might not always be interpreted as generic, and it can exclude women from thought when they should not be.

References

- Baron, D. Grammar and Gender. New Haven: Yale University Press, 1986.
- Bassetti, B. (2007). Bilingualism and thought: Grammatical gender and concepts of objects in Italian-German bilingual children. *International Journal of Bilingualism*, 11, 251-273.
- Bodine, A. (1975). Androcentrism in prescriptive grammar: singular 'they', sex-indefinite 'he', and 'he or she'. *Language in Society*, 4, 129-146.
- Boroditsky, L. (2003). "Linguistic Relativity". Encyclopedia of Cognitive Science. Ed. L. Nadel. London: Macmillan, 2005.
- Curzan, A. Gender Shifts in the History of English. Cambridge: Cambridge University Press, 2003.
- Ehrlich, S. & King, R. (1994). Feminist Meanings and the (De)Politicization of the Lexicon. *Language in Society*, 23, 59-76.
- Flaherty, M. (2001). How a Language Gender System Creeps into Perception. *Journal of Cross-Cultural Psychology*, 32, 18-31.
- Gastil, J. (1990). Generic pronouns and sexist language: The oxymoronic character of masculine

pronouns. *Sex Roles*, 23, 629-643.

Hamilton, M. C. (1988). Using masculine generics: Does generic 'he' increase male bias in the User's imagery? *Sex Roles*, 19, 785-799.

Khosroshahi, F. (1989). Penguins Don't Care, but Women Do: A Social Identity Analysis of a Whorfian Problem. *Language in Society*, 18, 505-525.

Lakoff, R. (1973). Language and Woman's Place. *Language in Society*, 2, 45-80.

Lucy, J. A. (1997). Linguistic Relativity. *Annual Review of Anthropology*, 26, 291-312.

MacKay, D. G. & Fulkerson, D. C. (1979). On the Comprehension and Production of Pronouns. *Journal of Verbal Learning and Verbal Behavior*, 18, 661-673.

Mackay, D. G. (1980). Psychology, Prescriptive Grammar, and the Pronoun Problem. *American Psychologist*, 5, 444-449.

Marslen-Wilson, W.D. & Tyler, L. K. (1981). Central processes in speech understanding. *Philosophical Transactions of the Royal Society of London*, 295, 317-332.

Martyna, W. (1978). What Does 'He' Mean? *Journal of Communication*, 28, 131-138.

Martyna, W. (1980). Beyond the "He/Man" Approach: The Case for Nonsexist Language. *Signs*, 5, 482-493.

Merritt, R. D. & Kok, C. J. (1995). Attribution of gender to a gender-unspecified individual: An Evaluation of the people = male hypothesis. *Sex Roles*, 33, 145-157.

Pintado, J., Sera, M., & Berge, C. (1994). Grammatical and conceptual forces in the attribution of gender by English and Spanish speakers. *Cognitive Development*, 9, 261-292.

Sapir, E. (1929). The Status of Linguistics as a Science. *Language*, 5, 207-214.

Schneider, M. J. & Foss, K. A. (1977). Thought, Sex, and Language: The Sapir-Whorf Hypothesis in the American Women's Movement. *Women's Studies in Communication*, 1, 1-7.

Seidenberg, M. S., Tanenhaus, M. K., Leiman, J. M., & Bienkowski, M. (1982). Automatic access of the meanings of ambiguous words in context: Some limitations of knowledge-based processing. *Cognitive Psychology*, 14, 489-537.

Sera, M., Burch, M., Forbes, J., & Rodriguez, W. (2002). When Language Affects Cognition and When It Does Not: An Analysis of Grammatical Gender and Classification. *Journal of Experimental Psychology*, 131, 377-397.

Table 1

The condition and the gender of the lexical decision (LD) word for each target sentence in Groups 1, 3, 5, and 7.

Target Sentences	Condition				Gender of LD word
	Group 1	Group 3	Group 5	Group 7	
1 - 5	Gen. <i>he</i>	Sing. <i>they</i>	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	male
6 - 10	Gen. <i>he</i>	Sing. <i>they</i>	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	female
11 - 15	Sing. <i>they</i>	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	Gen. <i>he</i>	male
16 - 20	Sing. <i>they</i>	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	Gen. <i>he</i>	female
21 - 25	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	Gen. <i>he</i>	Sing. <i>they</i>	male
26 - 30	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	Gen. <i>he</i>	Sing. <i>they</i>	female
31 - 35	Sex-sp. <i>she</i>	Gen. <i>he</i>	Sing. <i>they</i>	Sex-sp. <i>he</i>	male
36 - 40	Sex-sp. <i>she</i>	Gen. <i>he</i>	Sing. <i>they</i>	Sex-sp. <i>he</i>	female

Table 2

The condition and the gender of the lexical decision word for each target sentence in Groups 2, 4, 6, and 8.

Target Sentences	Condition				Gender of LD word
	Group 2	Group 4	Group 6	Group 8	
1 - 5	Gen. <i>he</i>	Sing. <i>they</i>	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	female
6 - 10	Gen. <i>he</i>	Sing. <i>they</i>	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	male
11 - 15	Sing. <i>they</i>	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	Gen. <i>he</i>	female
16 - 20	Sing. <i>they</i>	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	Gen. <i>he</i>	male
21 - 25	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	Gen. <i>he</i>	Sing. <i>they</i>	female
26 - 30	Sex-sp. <i>he</i>	Sex-sp. <i>she</i>	Gen. <i>he</i>	Sing. <i>they</i>	male
31 - 35	Sex-sp. <i>she</i>	Gen. <i>he</i>	Sing. <i>they</i>	Sex-sp. <i>he</i>	female
36 - 40	Sex-sp. <i>she</i>	Gen. <i>he</i>	Sing. <i>they</i>	Sex-sp. <i>he</i>	male

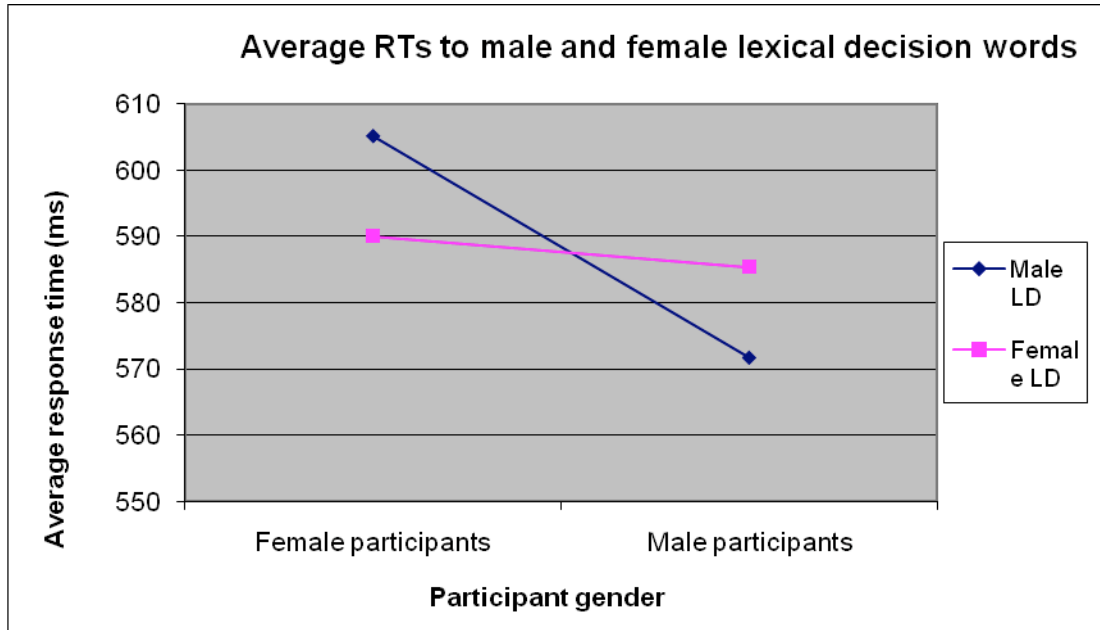
Table 3

Average response times for male participants, female participants, and male and female participants combined for male and female lexical decision words in each condition.

Participants	Generic <i>he</i>		Singular <i>they</i>		Sex-specific <i>he</i>		Sex-specific <i>she</i>	
	male LD	fem. LD	male LD	fem. LD	male LD	fem. LD	male LD	fem. LD
Male	559	590	580	583	571	585	577	584
Female	608	594	618	588	590	599	604	578
All	584	592	599	585	581	592	591	581

Figure 1

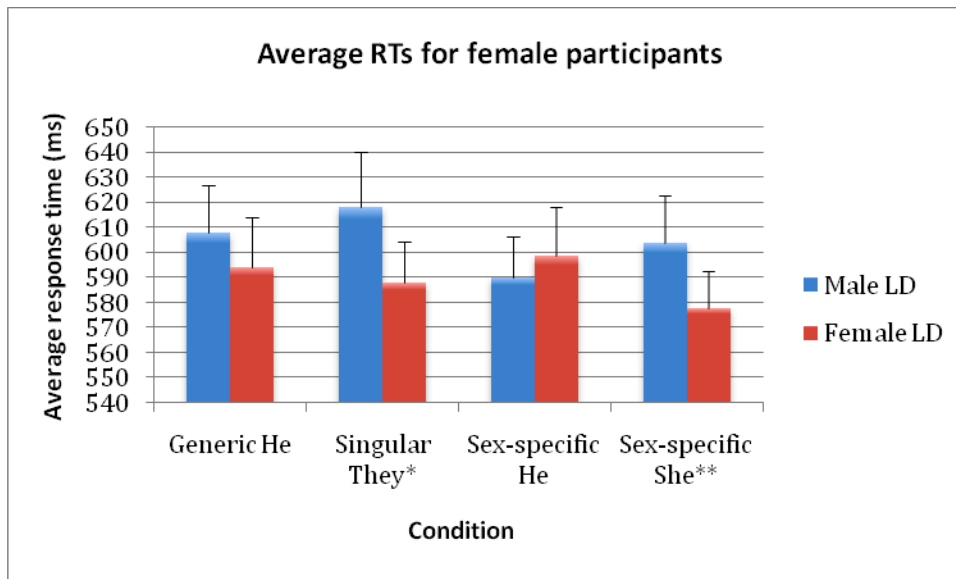
Male and female participants' average response times to all male and female lexical decision words.



$p = .003$

Figure 2

Female participants' average response times to male and female lexical decision words in each condition.

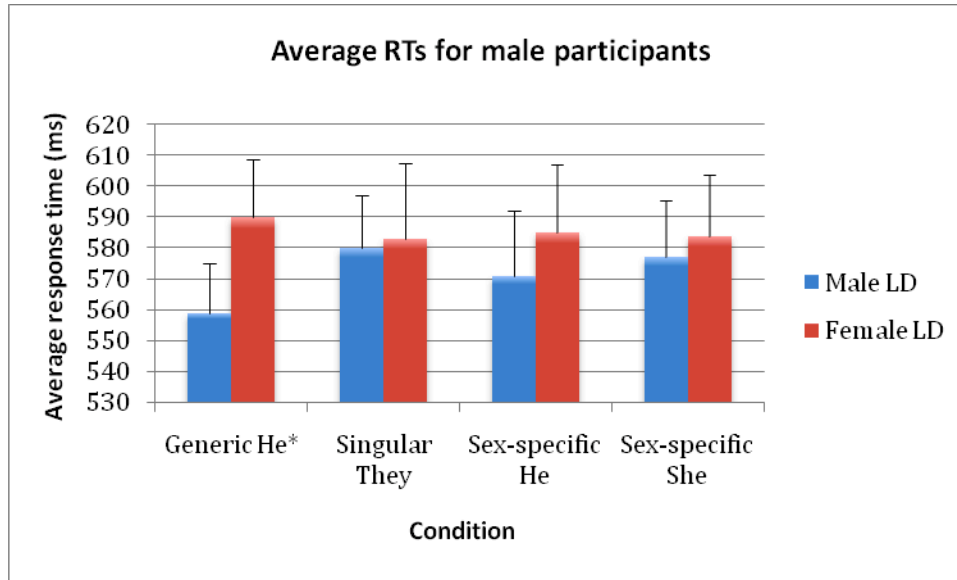


* $p = .036$

** $p = .073$

Figure 3

Male participants' average response times to male and female lexical decision words in each condition.



* $p = .004$

Appendix A

Target sentences used for Groups 1 and 2 of this study

Generic *he*

- 1 As soon as a musician becomes famous, he buys some new instruments.
- 2 After a dancer auditions for a company, he stretches and tries to relax.
- 3 When a student studies hard for a test, he usually does well.
- 4 Before an artist begins to paint, he gets a palette and brushes ready.
- 5 If a writer wants to be published, he should write interesting work.
- 6 A singer moves with the music while he is performing.
- 7 A cook goes to culinary school before he opens a restaurant.
- 8 If a person wants to be safe, he should look both ways before crossing the street.
- 9 A runner drinks a lot of water after he competes in a meet.
- 10 A teacher makes sure that the students are ready before he schedules an exam.

Singular *they*

- 11 As soon as a child learns how to read, they can begin to learn other important material.
- 12 When a teenager does not get enough sleep, they are usually very cranky.
- 13 A journalist should obtain a visa if they need to travel to another country.
- 14 While an architect is building a model, they never let anyone near it.
- 15 A director consults the producer before they make a decision.
- 16 An author throws a party after they complete a novel.
- 17 When an editor receives a manuscript, they sit down and begin to read.
- 18 If a researcher wishes to prove a hypothesis, they must design a suitable experiment.
- 19 If a tenant does not pay the rent, they might get evicted.
- 20 A tutor buys new supplies as soon as they receive a paycheck.

Sex-specific *he*

- 21 John returns to the cabin to clean after he eats breakfast.
- 22 Mark demonstrates how to hold a bow when he teaches archery.
- 23 Edward will fill out a series of forms while he waits to give blood.
- 24 Teddy should file a complaint if he is not satisfied with the service.
- 25 After Daniel receives a promotion, he shares the good news with family members.
- 26 Asher turns on a recording machine when he conducts an interview.
- 27 Henry begins to cry as soon as he becomes hungry.
- 28 Matthew studies previous research before he constructs a proposal.
- 29 Brian sometimes punches a wall when he gets angry.
- 30 Andrew investigates a site thoroughly before he chooses to work there.

Sex-specific *she*

- 31 After Jane has recorded plant data, she analyzes the findings.
- 32 As soon as Mary finishes writing, she takes a long break.
- 33 While Rebecca collects information for a book, she conducts interviews with other scholars.
- 34 Before Sophia begins to sketch, she thinks about the target age group.
- 35 If Julia is thirsty during a talk, she takes a sip of water.
- 36 When Lauren prescribes a diet, she makes sure it is appropriate.
- 37 After Barbara completes a poem, she puts it away for a few days.
- 38 Celia starts to get irritated if she has been waiting for a long time.
- 39 Suzanne distributes programs as soon as she receives them.
- 40 Molly cheers loudly while she is watching a game

Target sentences used for Groups 3 and 4

Singular *they*

- 1 As soon as a musician becomes famous, they buy some new instruments.
- 2 After a dancer auditions for a company, they stretch and try to relax.
- 3 When a student studies hard for a test, they usually do well.
- 4 Before an artist begins to paint, they get a palette and brushes ready.
- 5 If a writer wants to be published, they should write interesting work.
- 6 A singer moves with the music while they are performing.
- 7 A cook goes to culinary school before they open a restaurant.
- 8 If a person wants to be safe, they should look both ways before crossing the street.
- 9 A runner drinks a lot of water after they compete in a meet.
- 10 A teacher makes sure that the students are ready before they schedule an exam.

Sex-specific *he*

- 11 As soon as John learns how to read, he can begin to learn other important material.
- 12 When Mark does not get enough sleep, he is usually very cranky.
- 13 Edward should obtain a visa if he needs to travel to another country.
- 14 While Teddy is building a model, he never lets anyone near it.
- 15 Daniel consults the producer before he makes a decision.
- 16 Asher throws a party after he completes a novel.
- 17 Henry John receives a manuscript, he sits down and begins to read.
- 18 If Matthew wishes to prove a hypothesis, he must design a suitable experiment.
- 19 If Brian does not pay the rent, he might get evicted.
- 20 Andrew buys new supplies as soon as he receives a paycheck.

Sex-specific *she*

- 21 Jane returns to the cabin to clean after she eats breakfast.
- 22 Mary demonstrates how to hold a bow when she teaches archery.
- 23 Rebecca will fill out a series of forms while she waits to give blood.
- 24 Sophia should file a complaint if she is not satisfied with the service.

- 25 After Julia receives a promotion, she shares the good news with family members.
- 26 Lauren turns on a recording machine when she conducts an interview.
- 27 Barbara begins to cry as soon as she becomes hungry.
- 28 Celia studies previous research before she constructs a proposal.
- 29 Suzanne sometimes punches a wall when she gets angry.
- 30 Molly investigates a site thoroughly before she chooses to work there.

Generic *he*

- 31 After a botanist has recorded plant data, he analyzes the findings.
- 32 As soon as a columnist finishes writing, he takes a long break.
- 33 While a historian collects information for a book, he conducts interviews with other scholars.
- 34 Before an illustrator begins to sketch, he thinks about the target age group.
- 35 If a lecturer is thirsty during a talk, he takes a sip of water.
- 36 When a nutritionist prescribes a diet, he makes sure it is appropriate.
- 37 After a poet completes a poem, he puts it away for a few days.
- 38 A patient starts to get irritated if he has been waiting for a long time.
- 39 An usher distributes programs as soon as he receives them.
- 40 A spectator cheers loudly while he is watching a game.

Target sentences used for Groups 5 and 6

Sex-specific *he*

- 1 As soon as John becomes famous, he buys some new instruments
- 2 After Mark auditions for a company, he stretches and tries to relax.
- 3 When Edward studies hard for a test, he usually does well.
- 4 Before Teddy begins to paint, he gets a palette and brushes ready.
- 5 If Daniel wants to be published, he should write interesting work.
- 6 Asher moves with the music while he is performing.
- 7 Henry goes to culinary school before he opens a restaurant.
- 8 If Matthew wants to be safe, he should look both ways before crossing the street.
- 9 Brian drinks a lot of water after he competes in a meet.
- 10 Andrew makes sure that the students are ready before he schedules an exam.

Sex-specific *she*

- 11 As soon as Jane learns how to read, she can begin to learn other important material.
- 12 When Mary does not get enough sleep, she is usually very cranky.
- 13 Rebecca should obtain a visa if she needs to travel to another country.
- 14 While Sophia is building a model, she never lets anyone near it.
- 15 Julia consults the producer before she makes a decision.
- 16 Lauren throws a party after she completes a novel.
- 17 When Barbara receives a manuscript, she sits down and begins to read.
- 18 If Celia wishes to prove a hypothesis, she must design a suitable experiment.

- 19 If Suzanne does not pay the rent, she might get evicted.
- 20 Molly buys new supplies as soon as she receives a paycheck.

Generic *he*

- 21 A camper returns to the cabin to clean after he eats breakfast.
- 22 A counselor demonstrates how to hold a bow when he teaches archery.
- 23 An adult will fill out a series of forms while he waits to give blood.
- 24 A customer should file a complaint if he is not satisfied with the service.
- 25 After an employee receives a promotion, he shares the good news with family members.
- 26 A reporter turns on a recording machine when he conducts an interview.
- 27 An infant begins to cry as soon as he becomes hungry.
- 28 A linguist studies previous research before he constructs a proposal.
- 29 A coach sometimes punches a wall when he gets angry.
- 30 An archeologist investigates a site thoroughly before he chooses to work there.

Singular *they*

- 31 After a botanist has recorded plant data, they analyze the findings.
- 32 As soon as a columnist finishes writing, they take a long break.
- 33 While a historian collects information for a book, they conduct interviews with other scholars.
- 34 Before an illustrator begins to sketch, they think about the target age group.
- 35 If a lecturer is thirsty during a talk, they take a sip of water.
- 36 When a nutritionist prescribes a diet, they make sure it is appropriate.
- 37 After a poet completes a poem, they put it away for a few days.
- 38 A patient starts to get irritated if they have been waiting for a long time.
- 39 An usher distributes programs as soon as they receive them.
- 40 A spectator cheers loudly while they are watching a game.

Target sentences used for Groups 7 and 8

Sex-specific *she*

- 1 As soon as Jane becomes famous, she buys some new instruments
- 2 After Mary auditions for a company, she stretches and tries to relax.
- 3 When Rebecca studies hard for a test, she usually does well.
- 4 Before Sophia begins to paint, she gets a palette and brushes ready.
- 5 If Julia wants to be published, she should write interesting work.
- 6 Lauren moves with the music while she is performing.
- 7 Barbara goes to culinary school before she opens a restaurant.
- 8 If Celia wants to be safe, she should look both ways before crossing the street.
- 9 Suzanne drinks a lot of water after she competes in a meet.
- 10 Molly makes sure that the students are ready before she schedules an exam.

Generic *he*

- 11 As soon as a child learns how to read, he can begin to learn other important material.
- 12 When a teenager does not get enough sleep, he is usually very cranky.
- 13 A journalist should obtain a visa if he needs to travel to another country.
- 14 While an architect is building a model, he never lets anyone near it.
- 15 A director consults the producer before he makes a decision.
- 16 An author throws a party after he completes a novel.
- 17 When an editor receives a manuscript, he sits down and begins to read.
- 18 If a researcher wishes to prove a hypothesis, he must design a suitable experiment.
- 19 If a tenant does not pay the rent, he might get evicted.
- 20 A tutor buys new supplies as soon as he receives a paycheck.

Singular *they*

- 21 A camper returns to the cabin to clean after they eat breakfast.
- 22 A counselor demonstrates how to hold a bow when they teach archery.
- 23 An adult will fill out a series of forms while they wait to give blood.
- 24 A customer should file a complaint if they are not satisfied with the service.
- 25 After an employee receives a promotion, they share the good news with family members.
- 26 A reporter turns on a recording machine when they conduct an interview.
- 27 An infant begins to cry as soon as they become hungry.
- 28 A linguist studies previous research before they construct a proposal.
- 29 A coach sometimes punches a wall when they get angry.
- 30 An archeologist investigates a site thoroughly before they choose to work there.

Sex-specific *he*

- 31 After John has recorded plant data, he analyzes the findings.
- 32 As soon as Mark finishes writing, he takes a long break.
- 33 While Edward collects information for a book, he conducts interviews with other scholars.
- 34 Before Teddy begins to sketch, he thinks about the target age group.
- 35 If Daniel is thirsty during a talk, he takes a sip of water.
- 36 When Asher prescribes a diet, he makes sure it is appropriate.
- 37 After Henry completes a poem, he puts it away for a few days.
- 38 Matthew starts to get irritated if he has been waiting for a long time.
- 39 Brian distributes programs as soon as he receives them.
- 40 Andrew cheers loudly while he is watching a game.

Filler sentences

- 41 As soon as dinner is ready, the television is turned off.
- 42 It has to get dark out before the stars can be seen clearly.
- 43 After a heavy rainfall, the ground is usually wet.
- 44 The gate is always closed while the cat is outside.
- 45 When there is fog outside, it is difficult to see.

- 46 The wrong time is displayed if the clocks are not turned back.
- 47 As soon as an exam is finished, the class celebrates.
- 48 The air is chilly before the sun rises in the sky.
- 49 After a bulb burns out, a new bulb is put in.
- 50 Playing outside is fun while the weather is warm and breezy.
- 51 When class is canceled, a make-up is typically scheduled.
- 52 A technology service is called if a computer breaks or freezes.
- 53 As soon as cake finishes baking, icing is prepared.
- 54 Before a banana goes bad, its skin turns brown.
- 55 A hockey stick is not useful after it snaps in two.
- 56 Nitrogen fixation occurs while plants grow and develop.
- 57 When autumn begins, trees lose their leaves.
- 58 Winter continues for six weeks if the groundhog sees his shadow.
- 59 As soon as prayers are said, eating and drinking commence.
- 60 Spelling and grammar are checked before a paper is printed out.
- 61 After the holidays, delicious leftovers are in the refrigerator.
- 62 Visibility is improved when the headlights are turned on.
- 63 When socks are dirty, their stench fills the room.
- 64 Fewer flies will be around if a spider is there to catch them.
- 65 As soon as the laundry is folded, the floor is swept and tidied.
- 66 Before a bike ride, the wheels are checked and pumped.
- 67 Sweat cools the body off after a long run outside.
- 68 While the ram's horn sounds, the congregation listens attentively.
- 69 Everyone dances when the music is turned up.
- 70 Breakfast is served if the plates are on the table.
- 71 As soon as the kettle whistles, the water is hot enough.
- 72 Brainstorming is useful before writing an essay.
- 73 After a hard day, going to bed early is a good idea.
- 74 Sunscreen protects the skin even when clouds are in the sky.
- 75 While a meeting is in session, the door is shut.
- 76 If textbooks are in the library, photocopying is an option.
- 77 As soon as the rooster wakes up, the whole farm wakes up.
- 78 The air is crisp before snow falls on a town.
- 79 A dog barks for a while after the doorbell rings once or twice.
- 80 A house smells nice while bread is in the oven.
- 81 As soon as the whistle blows the players all stop.
- 82 Wind blows a sign down if the tape does not stick to the wall.
- 83 Before the flowers bloom the rain falls heavily.
- 84 A lake is calm and peaceful after a storm passes through.
- 85 When a squid is angry ink shoots everywhere.
- 86 A squirrel eats in the clearing while nuts fall from the trees.
- 87 A bunny hops away as soon as danger is detected nearby.
- 88 If the sound is too loud the volume is turned down.
- 89 Water is not taken off the stove before the temperature reaches the boiling point.
- 90 After mitosis occurs, two identical cells are created.

- 91 An egg hatches when a hen sits on it.
- 92 While the fire burns more wood is gathered outside.
- 93 As soon as the rabbits mate, new rabbits are born.
- 94 The stain lasts if detergent is not used immediately.
- 95 Warming up is important before starting a serious game.
- 96 Skiing is difficult after an icy rain shower.
- 97 When pasta is finished cooking, sauce should be heated up.
- 98 While shoelaces are untied tripping is very easy.
- 99 Crickets begin to chirp as soon as silence falls on the town.
- 100 If a cheetah is hungry a gazelle keeps hidden.
- 101 The birds fly together effortlessly in the sky.
- 102 Lavender is a smell that soothes nerves and reduces stress.
- 103 Friendship bracelets can sometimes last for years.
- 104 Writing a ten-paged paper requires a lot of concentration.
- 105 The lamps on the sidewalk are beautiful during the night.
- 106 The skin of a kiwi is both hairy and edible.
- 107 A horse's mane and tail are often braided for a competition.
- 108 Winning a race is a very exhilarating experience.
- 109 Javelins are sharp, long, and dangerous objects.
- 110 Juggling requires a certain amount of mental and physical coordination.
- 111 Some characteristics are passed down to offspring genetically.
- 112 The play was entertaining but not very intellectual.
- 113 The best time for board games is during cold winter days.
- 114 Nothing warms the body like a hot cup of tea.
- 115 Swimming in the ocean is enjoyable as long as there are no jellyfish.
- 116 It is very hard to wash sand out of thick curly hair.
- 117 Softball games usually end after seven innings.
- 118 Hockey is a great sport, even though it does not receive much support.
- 119 Classes do not ever last more than three hours.
- 120 Flossing teeth everyday is just as important as brushing teeth.
- 121 The radio is in the bathroom on the second floor.
- 122 A raccoon is sifting through the trashcans outside in the driveway.
- 123 Thunder and lightning can reveal how far away a storm is.
- 124 This year the last day of school is in May.
- 125 Sweaters are on the right side of the bottom drawer.
- 126 A mouse crawled across the floor and into a hole in the wall.
- 127 The east and west coasts of the United States are very different.
- 128 Surfing can be thrilling, but it is also dangerous.
- 129 A chipped mug is sitting in the middle of the table.
- 130 Textbooks are usually heavy and overpriced.
- 131 The daffodils are beautifully arranged in the vase.
- 132 A vacuum is used to clean the carpet.
- 133 It is irritating when a computer shuts down unexpectedly.
- 134 There are blue and yellow fliers posted all over campus.
- 135 Planetariums are interesting and relaxing for people of all ages.

- 136 The buildings at the college are not close to each other.
- 137 The plants in California are different from the plants in New Jersey.
- 138 Sometimes strangers on a bus are very talkative.
- 139 The coffee at the restaurant was far too bitter.
- 140 Going for a run outside is less boring than using a treadmill.
- 141 Pianos create lovely music that is pleasing to the ears.
- 142 A saxophone has many different parts that must be kept together.
- 143 Hand-written letters are much more personal than e-mails.
- 144 Deadlines ensure that work gets finished during the semester.
- 145 Crossword puzzles are good exercises for the brain.
- 146 An old bicycle is behind the empty boxes in the garage.
- 147 A separate license is required to drive a motorcycle.
- 148 The jacket in the store was comfortable but too expensive.
- 149 Old pants can be cut and turned into new shorts.
- 150 Vermont maple syrup makes pancakes taste much better.
- 151 Climbing to the top of a mountain is extremely rewarding.
- 152 The books are in the room at the end of the hallway.
- 153 Chestnuts are added to the stuffing for Thanksgiving dinner.
- 154 January is one of the coldest months of the year.
- 155 Chips and salsa are already out on the counter.
- 156 Black beans are a good source of protein and fiber.
- 157 Oatmeal and cereal are standard breakfast foods.
- 158 The recycling bin outside is filled with crumpled paper.
- 159 Shady areas today are much colder than sunny areas.
- 160 Regular practice is the only way to improve a skill

Appendix B

Words used for the lexical decision task

Masculine words

boy
man
male
king
lord
brother
father
uncle
nephew
husband

Feminine words

girl
woman
female
queen
lady
sister
mother
aunt
niece
wife

Filler words

rubbish
box
wire
summer
off
magic
fork
juggle
quarter
yard
common
head
yeast
number
today
bell
castle
score
feet
city

Filler non-words

settnig
sta
bluk
letetr
lod
paple
arhc
blalot
commnet
mukc
statsu
flim
toats
secnod
latre
vreb
tongeu
forst
psot
obdy

curiuos
mda
culb
middel
mya
awrad
laek
rubebr
dealnig
girp
smiple
veiw
belss
cuople
eraly
alnd
widnow
nocth
bakn
zeor

