

Gender stereotypes as inferences: Why surgeons are all male

Autor: Val Mejuto, Janire (Licenciada en Filología Inglesa y Máster en Psicolingüística, Profesora de Inglés en Educación Secundaria).

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Abstract

This article explores to what extent gender stereotype inferences influence discourse comprehension. It is assumed that the reader resorts to their world knowledge to create a coherent mental representation of a text when the information provided is insufficient or is not readily available. In fact, these inferences are so strong that they even mislead readers. When they encounter a gender neutral occupational noun (e.g., surgeon), they tend to assign a stereotyped male gender even if this contradicts the information in the text. Research suggest that these nouns are processed differently.

Keywords: gender stereotype inferences, minimalist view, constructionist view, mental model, definitional gender nouns

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Resumen

This article explores to what extent gender stereotype inferences influence discourse comprehension. It is assumed that the reader resorts to their world knowledge to create a coherent mental representation of a text when the information provided is insufficient or is not readily available. In fact, these inferences are so strong that they even mislead readers. When they encounter a gender neutral occupational noun (e.g., surgeon), they tend to assign a stereotyped male gender even if this contradicts the information in the text. Research suggest that these nouns are processed differently.

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When readers are engaged in comprehension of a text, they accomplish an interpretation that is not solely restricted to the information provided by the discourse. In fact, readers tend to instinctively resort to their personal world knowledge to construct a coherent mental representation from the recognition of a string of words (e. g. Carreiras, Garnham, Oakhill & Cain, 1996). Therefore, the ability to make inferences seems to be an essential strategy for successful reading comprehension (e. g. Van den Broek, Lorch, Linderholm & Gustafson, 2001). Hence, this essay will be centred on analysing the role of gender stereotype inferences in discourse comprehension. Thus, first I will provide a brief and simplified description of the far more complex processing activities in which readers are engaged in comprehending a text. Secondly, I will address the implications and assumptions of the main theories regarding this particular type of inferences. Thirdly, I will argue that not only does stereotypical gender differ in character from their definitional gender counterpart, but also they follow qualitatively distinct processing. Therefore, I will discuss recent research conducted on stereotypical gender inferences to support my claims.

GENERAL OVERVIEW OF DISCOURSE COMPREHENSION

It is widely assumed that information explicitly provided by the discourse is usually not sufficient to achieve a complete understanding of the text, that is to say, readers do not automatically construct the interpretation described by the text (e. g., McKoon & Ratcliff, 1992). Thus, the comprehender is often required to *read between the lines*, in other words the reader needs to involve in different levels of textual representation consisting of the surface form of the discourse, the textbase and the events that the text describes (e. g. Garrod & Terras, 2000, Halldorson & Singer, 2002). Hence, the degree of understanding of a discourse depends to a great extent on how successful is the comprehender in establishing coherent connections between these levels.

Moreover, whether readers achieve a coherent representation of the discourse is intimately connected to their ability to establish connections between the propositions, effective reference resolution and successful inference construction (e.

g., Halldorson & Singer, 2002). Thus, the reader may initially resort to the explicit available syntactic information to establish connections between the different otherwise incoherent propositions of a text (e. g. van Gompel & Liversedge 2003). For example this strategy has been proved to be effective in reference resolution since an anaphoric expression (e. g. pronoun) can only refer to an antecedent which agrees in gender and number (e. g. Kanzamina, Lau, Lieberman, Yoshida & Philips, 2007, Sturt, 2003). Nevertheless, sometimes these syntactic constraints result to be insufficient to coherently connect these propositions and thus, the reader is instinctively engaged in different inference activities to fill these information gaps (e. g. Kreiner, Sturt & Garrod, 2008).

In addition, when comprehending a text, the reader is actively engaged in the construction of a mental representation of the discourse in which information explicitly stated in the text interacts with the inferences made by the readers based on world knowledge gained by their personal experience about the world (e. g., Carreiras et al., 1996, Halldorson & Singer, 2002, McKoon & Ratcliff, 1992). Since this process is done incrementally, subsequent information appears to confirm or suppress these assumptions *unconsciously* made by the reader (e. g. Cacciari, Carreiras & Cionni, 1997, Carreiras et al., 1996).

In general terms, inferences are considered to be pieces of information generated by the reader, but not explicitly described in the text (McKoon & Ratcliff, 1992). There seems to be two main types of inferences: inferences based on explicit textual information, those that are required to establish local coherence of a text; and automatic inferences, those that are based on information quickly available in the text or general knowledge of the reader (e. g. McKoon & Ratcliff 1992). Nevertheless, the character of these inferences may considerably vary across readers and reading situations or reading goal (Van den Broek et al., 2001).

Thus, in the absence of sufficient discourse context the reader tends to supply this lack of information with their inferences. Nevertheless, this world knowledge results unnecessary, when consistent discourse context information is provided (Duffy & Keir 2004).

The following lines of this essay will be centred on analysing the character of a construction that invites the reader to instinctively evoke their world knowledge: gender neutral role nouns. Therefore, first a brief description of the main theories regarding the nature of these inferential activities will be provided and in the subsequent parts of the essay, recent research done on the field will be discussed.

ROLE NOUNS ELICIT STEREOTYPICAL GENDER INFERENCES

There seems to be two main theories which pose different suggestions regarding the evocation of this world knowledge while reading. According to the minimalist view readers will resort to inferences only to establish local coherence or if the necessary information is easily available (e. g. McKoon & Ratcliff 1992). Therefore, inferences are believed to be made in a backward direction in order to integrate information from different parts of the text (e. g. Garnham, Oakhill & Reynolds, 2002, Reynolds, Garnham & Oakhill, 2002).

Conversely, the constructionist view claims that inferences will be made in order to construct a lively description of the events described in the text (McKoon & Ratcliff 1992). Therefore, according to this view inferences are done elaboratively, in a forward direction even when they are not necessary for the local coherence of the discourse.

Growing evidence from recent studies centred on analysing the character of gender inferences seem to provide evidence claiming that the reader is engaged in inferential activities that are not required to establish local coherence of the discourse (e. g., Carreiras et al., 1996, Garnham et al., 2002, Oakhill et al.,).

Gender neutral role names seem to invite the reader to unavoidably evoke their world knowledge and tend to make gender stereotypical inferences. Thus, when encountering a role name, readers, as a cognitive economy strategy tend to assign the most probable gender based on their world knowledge (e. g., Cook & Myers 2004, Oakhill, Garnham & Reynolds, 2005). In fact, this default gender is encoded into the mental representation of the text and it is assumed until proved wrong by subsequent information in the text (e. g. Cacciari et al., 1997, Carreiras et al., 1996). Therefore comprehension involves the interaction between both the semantic memory which assigns the meaning and the stereotyped information about the role noun and discourse context which explicitly provides the reader with unambiguous information about the character (e. g., Duffy & Keir 2004).

Sanford (1985) conducted one of the first studies examining the character of the presuppositions that readers make when encountering a role name that is underspecified for gender. He presented students with the famous riddle which states as follows:

A man and his son were away for a trip. They were driving along the highway when they had a terrible accident. The man was killed outright but the son was alive, although badly injured. The son was rushed to the hospital and was to have an emergency operation. On entering the operating theatre, the surgeon looked at the boy, and said, "I can't do this operation. This boy is my son." How can this be? (Sanford, 1985, p.311)

Sanford (1985) interpreted the resulting confusion presented by students as evidence supporting the immediate presupposition of the surgeon being male as soon as encountering the role noun. Thus, comprehenders instinctively assign male gender to the surgeon, even when previous discourse explicitly states that is dead. In fact, in doing so, they are being misled to the construction of an incoherent mental representation of the excerpt. Nevertheless, the strong textual constraint that the boy's father is dead should be enough to override the weak inference of attributing a male gender to the surgeon and conclude that the surgeon is in fact the boy's mother and thus female (Kreiner et al., 2008).

In addition, evidence against the minimalist view has also obtained from the studies addressing the generic use of masculine plural nouns in gender marked languages. Gygax, Gabriel, Sarrasin, Oakhill and Garnham (2008) investigated the generic use of the plural masculine occupation nouns in English, French and German. In the last two languages the masculine plural form can be used either to refer to plural masculine nouns, or a group in which males and females are included. Therefore, participants were involved in a judgement task and they concluded that the generic use of the masculine tends to be interpreted as a male biased to the disadvantage of women. Similar results were obtained by Gabriel and Mellenberg (2004) and Gabriel, Gygax, Sarrasin, Garnham and Oakhill (2008). In addition, they found that the generic use of the masculine plural form is interpreted to be slightly more female biased by women than men. Moreover, Kennison and Trofe (2003) reported that male participants assigned more often the masculine gender to neutral role nouns than did females. Therefore, it is worth mentioning that future research on the field should include the gender of the participants as the results may be conditioned by this characteristic.

Hence, this study seems to be consistent with the constructionist view since readers seem to resort to the general assumption that surgeons are usually male to integrate into their mental model the representation of the surgeon. Conversely, these findings poses serious difficulties for the minimalist view, as stereotypical gender inferences appear to occur when gender information is not readily available and even if gender is unnecessary for the overall understanding of the riddle.

ARE STEREOTYPICAL GENDER NOUNS PROCESSED DIFFERENTLY FROM DEFINITIONAL GENDER NOUNS?

Gender inferences involves various levels of language processing since it can be morphologically marked (e. g. stewardess), lexically encoded in definitional nouns (e. g. prince) or those that although gender neutral they are commonly assumed to be either male or female (e. g. surgeon) (Kreiner et al., 2008). Therefore, this type of inference provides a target of study to examine the character of processes in which the reader is involved in comprehension.

There seems to be two main views regarding the character of these stereotypical gender inferences. The mental models theory argues that when comprehending a discourse, readers are involved in a construction of a mental representation of the text in which world knowledge is integrated with the information provided by the text (e. g. Carreiras et al., 1996, Garnham, 2001). Therefore, this theory states that when encountering a role name, readers resort to their world knowledge and assign a probable gender which may be entrenched or disconfirmed by subsequent input (Reynolds et al., 2002). In the contrary, the lexical reinterpretation model claims that the stereotypical gender is lexically encoded as part of the lexical representation of the role name, similar to definitional gender (e. g. Hess, Foss & Carrol, 1995). Therefore, the lexical reinterpretation model predicts that stereotypical information as being part of the lexical representation of the word is invoked when the role noun is first encountered and only after the activation occurs can a reinterpretation proceed to integrate subsequent input (Kreiner et al., 2008).

Evidence supporting the mental models theory was obtained by Carreiras et al. (1996). They investigated the nature of these stereotypical inferences in English and in Spanish by presenting participants with sets of sentences in which the first contained a stereotypical role noun (e. g. footballer, la/el futbolista) followed by pronoun whose gender matched (e. g. he, él) or mismatched (e. g. she, ella) the antecedent. The authors reported slower reading times for the incongruent condition that is to say, when the stereotypical gender did not agree with the gender of the pronoun, compared to the

congruent condition. In the case of Spanish, similar slower reading times were reported for the mismatching noun phrases, containing a definite article whose gender agreed with the stereotypical gender of the noun following it, compared to the congruent condition. Interestingly, this effect disappeared when encountering the mismatching pronoun noun in the second sentence. Carreiras et al. (1996) concluded that gender inferences are made elaboratively, as readers resort to world knowledge to assign a stereotypical gender to the role noun as soon as encountering it. In addition, it is worth mentioning that Carreiras et al. (1996) as well as Duffy and Keir (2004) do not include nouns bearing definitional gender, and those that they include either interpret the results as evidence supporting similar processing for definitional and stereotypical gender only differing in the probabilistic character of the former (Osterhout et al., 1997) or leave the debate as being inconclusive (Reynolds et al. 2006).

Moreover, evidence supporting the lexical reinterpretation model appears to be obtained from both reaction-time methods and online-methods. Banaji and Hardin (1996) involved participants into a lexical decision task in which they judged the gender of the pronoun after being presented a stereotypical (e. g. nurse-she or nurse-he) or if the word that followed the role noun was actually a pronoun. They reported similar slower responses for the mismatching conditions which were interpreted as supporting evidence for the automatic activation of stereotypical gender when encountering the role noun. Nevertheless, as Kreiner et al. (2008) notes this alleged automatic activation of stereotypical gender may be due to the fact that they tested isolated words and thus, they could not measure the effects that discourse might have exercised when invoking stereotypical information and thus, the results were interpreted as part of lexical processing.

In addition Osterhout Bersick and McLaughlin (1997) conducted an event related potential (ERP) study considering the reading differences of sentences containing a stereotypical role noun or a definitional gender noun (e. g. king) followed by a congruent or incongruent reflexive pronoun. They expected to find an N400 effect related to pragmatic problems for stereotypical noun sentences and a P600 effect elicited by syntactic incongruities for definitional nouns. Nevertheless, since they found although a more pronounced positive wave for definitional than for stereotypical gender nouns, they interpreted the results as evidence supporting that processing of stereotypical gender behaves as definitional gender. Therefore, they concluded that stereotypical gender is encoded in the lexical representation of the noun as the lexical reinterpretation model would predict.

Similar results were obtained by the self reading task conducted by Duffy and Keir (2004). They examined the possible effects of context in the processing of stereotypical gender. The authors reported that when the context assigned a categorical gender prior to encountering the role noun, stereotypical gender was eliminated. Nevertheless, they obtained evidence for activation of stereotypical gender in the form of a mismatch cost reported when the gender of the reflexive noun was read later in the discourse. Duffy and Keir (2004) interpreted these results as evidence consistent with the lexical reinterpretation model. Nevertheless, the authors appear to be forgetting that if stereotypical gender is encoded as part of the lexical representation as assumed by the theory of Hess et al. (1995) then they will have to report a mismatch cost whenever this role noun is read. Thus, as Kreiner et al. (2008) states that only after this gender activation is made can the reinterpretation phase occur. Therefore, these results do not seem to consistently support the lexical reinterpretation model.

Moreover regarding procedural problems, the results obtained by Garnham et al. (2002) may be marred by the methodology they used. In their experiments, participants were involved in a judgement task in which they were required to answer to questions (e. g. does the final part follow on sensibly from the first two parts?) which explicitly draw their attention to gender implications which otherwise may be passed unnoticed (Kreiner et al. 2008). Therefore, according to Polatsek, Hyönä and Bertram (2000) eye-tracking studies seem to provide a natural method to analyse how the human brain processes language. Unlike other methods which require an active involvement of the participant (e. g. lexical decision tasks) and do not seem to provide a real picture of language processing, in eye-tracking experiments participants are solely involved in a reading task.

Hence, Kreiner and colleagues (2008) conducted two eye-tracking experiments in order to shed some light on this debate. Participants read anaphora sentences in which the first proposition contained a stereotypical gender noun (e. g. typist) or a definitional gender noun (e. g. duchess) followed by pronoun whose gender agreed (e. g. herself) or disagreed (himself) with their antecedents. Importantly, in the second experiment they create cataphora sentences in which the pronoun morphologically marked for gender occur prior to encountering the role name. Therefore, they expected to find a mismatching cost for anaphora sentences, similar to that obtained by Carreiras et al. (1996). Critically for cataphora sentences, the lexical view will predict stereotypical gender activation even when discourse context has previously assigned the role noun with a categorical gender, contrary to the inferential view which will not predict any gender

evocation. Thus, they found that readers do not resort to stereotypical gender inferences when discourse has already explicitly assigned to the role noun. In addition, they concluded that stereotypical gender is qualitatively different from definitional gender. In fact, the greater P600 effect elicited by definitional gender nouns in the ERP study conducted by Osterhout et al. (1997) would refer to such a qualitative difference and not to the quantitative character (regarding the probabilistic degree) interpreted by the authors.

CONCLUSION

In conclusion, readers do instinctively resort to their world knowledge to assign stereotypical gender to role nouns when they appear unspecified for gender in the discourse. There seems to be consistent evidence claiming that these inferences are made elaboratively, in a forward direction as soon as these occupation nouns are encountered posing serious challenges for the minimalist view which argue that inferences are only made when information is readily available or when are necessary for establishing local coherence. In addition, the activation of these stereotypical inferences is qualitatively different from activation of definitional gender. While the former can be eliminated when the context explicitly assigns a categorical gender to the noun, the gender of the latter cannot be suppressed by context since it is encoded as part of the lexical representation and thus is accessed with the activation with the word.

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