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The masculine form and its competing interpretations in French: When linking grammatically masculine role names to female referents is difficult.

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Abstract

Using a word association paradigm we examined the extent to which readers can overcome the specific interpretation of the grammatical masculine form in French when instructed to embrace its generic meaning. In two experiments participants were to decide whether a person introduced by a kinship term (e.g. *aunt*) could be part of a group represented by a role name (e.g. *musicians*). After the completion of the first half of the experiment, participants were explicitly reminded about the generic interpretation and use of the masculine form. Although the reminder resulted in some level of generic interpretation, there were still strong traces of the specific interpretation in the response times, regardless of participants' inhibition capacities (Experiment 1). Adding a supplementary constraint by exposing readers to distractor role names in feminine forms (Experiment 2) did not reveal any different effects. The results indicated that although readers can be motivated to elaboratively activate the generic interpretation of the masculine form, the latter can not completely overrule a more passively activated specific one.

<164 words>

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In gender marked languages such as French or German, the grammatical gender of a noun referring to a person typically matches the sex of the person referred to, such as *une* artiste [a *female* artist] and *un* libraire [a *male* librarian]. In addition, the grammatical form is often explicitly signalled not only by the form of the determiner or the article but also by the morphological form of the noun. This is most often true for *role names*, defined as names that incorporate features used to describe a person or a group of people such as, for example, *musicians* or *swimmers.* In French, you would use *une musicienne (feminine form),* to refer to a female musician but *un musicien (masculine form)* for a male musician, and you would use *une nageuse (feminine form)* to refer to a female swimmer*,* but *un nageur (masculine form)* for a male swimmer.

Although as a general rule, in French, the grammatical gender of a human referent noun as well as its morphological form indicate the sex of the person referred to, this rule is somehow misleading, as there are instances when it does not apply: When referring to persons of unknown sex, to persons where the sex of the person is irrelevant or to a group of people of both sexes, the masculine form is also used and is supposed to be dissociated from its biological or specific meaning (i.e., referring to men), and interpreted in a generic way (i.e., *equally* referring to men *and* women). The rule stating that grammatical gender indicates sex is actually only truly reliable for feminine forms (i.e., feminine form → female referent). For masculine forms, readers have to rely on additional cues to decide whether the grammatical information of a human referent noun is relevant for the sex (i.e., masculine form → male referent) or not (i.e., masculine used as a generic). As a consequence, masculine forms often generate semantic ambiguity (Irmen & Kurovskaja, 2010). This ambiguity is enhanced by the possible interpretations of the very notion of *generic* (Gygax & Gabriel, 2010). Formally, a *group of people of both sexes* can mean that there is a majority of men and one or two women,

that there is an equal share of both, but also that there is a majority of women and only one or two men.

Previous research suggests that the ambiguity of whether a masculine is used in a specific or generic way is typically resolved to the disadvantage of women (for a review: Stahlberg, Braun, Irmen, & Sczesny, 2007). However, empirical investigations have not yet addressed whether masculine forms can *at all* be understood generically, i.e. whether readers can be brought to link masculine forms equally to female and male referents.

The present study is intended to fill this gap by exploring how readers embrace the generic interpretation of the masculine form using a particular word association paradigm. Gender being a genuine part of readers' mental representations of the text (e.g., Garnham, Oakhill, & Reynolds, 2002), we were interested in whether readers can easily mentally represent women and men *equally* when encountering role names written in the masculine form when explicitly asked to do so. Although based on a word association paradigm, the present study tackles processes at stake when readers encounter masculine forms in particular messages that theoretically equally target persons of both sexes (e.g., a job advertisement).

In terms of a mental representation of a text, readers already have multiple meanings that may or may not be activated when encountering a role name in the masculine form. Memory-based approaches would suggest that through a passive bottom-up process (e.g., resonance mechanism), textual elements activate all associated meanings (Gerrig & McKoon, 1998) in readers' long-term memory. Only through a subsequent evaluation phase is the final information chosen and integrated in readers' mental model of the situation (Cook & Guéraud, 2005). Explanation-based approaches, on the other hand, would suggest a more active process, driven by readers' need to maintain a coherent representation of the text (Graesser, Singer & Tabasso, 1994), whereby readers search the appropriate meaning of the masculine form in long-term memory. Both approaches assume that at one point in the integration process, an evaluation has to take place to decide which meaning is referred to in

the text.

A reasonable assumption to make here is that when confronted with the ambiguity accompanying the masculine form, readers rely on very easily and rapidly activated information to form a somehow *good-enough representation* (as in Ferreira, Bailey, & Ferraro, 2002). As will be discussed later, research on the mental representation of gender when reading role names has so far mainly identified two types of information as being *easily* activated: (a) stereotypical knowledge and (b) the specific meaning of the masculine form (in gender-marked languages). However, to our knowledge, much less attention has been devoted to instances where readers are explicitly prompted to rely on other, correct meanings, such as the generic meaning of masculine form.

On an applied level, clarifying the preconditions and limits for a *successful* use of the masculine as a generic becomes important for languages such as French, in which the use of less ambiguous alternatives, such as balanced forms (i.e., *les musiciens et musiciennes*), is not widely implemented (e.g., Sarrasin, Gabriel & Gygax, *in press*). On a more theoretical level, identifying the conditions that may favour the activation of the generic meaning over the specific one may provide us with important insights into the way the masculine form is represented in memory.

Before describing our research in detail, we briefly review the literature on reader's mental representation of gender in role names and the different sources of information they might rely on.

Constructing a representation of gender: Activations of different sources of information

Past research has mainly focused on the influence of two non-exclusive sources of information on the mental representation of gender, namely grammatical and stereotypical information. Most empirical research on the use of the masculine intended as generic in French (e.g., Colé & Segui, 1994; Gygax & Gabriel, 2008), in German (e.g., Gygax, Gabriel, Sarrasin, Oakhill & Garnham, 2008; Irmen, 2007; Stahlberg et al., 2007), in Spanish (e.g.,

Flaherty, 2001) and to some extent in Norwegian (e.g., Gabriel, 2008; Gabriel & Gygax, 2008) suggests that when reading a noun referring to persons – such as role names – the use of the masculine induces male dominant representations of gender, hinting at a very strong influence of grammatical cues on the mental representation of human referents' gender. A reliable influence of stereotypical information when building a representation of gender has been shown for readers of unmarked languages such as English (e.g., Banaji & Hardin, 1996; Carreiras, Garnham, Oakhill, & Cain, 1996; Garnham et al., 2002).

Although these studies have documented a certain imbalance in the activation of male and female representations when reading role names in the masculine form, most of them, if not all, do not suggest an *all-or-none* process (i.e., either masculine *or* feminine). Even when written in the masculine form, role names have been found to activate some level of female representation. One wonders, therefore, whether this gender representation imbalance may fluctuate depending on contextual factors. To our knowledge, only two studies have explicitly addressed this issue, one investigating textual elements that could affect readers' representations of gender (Gabriel, Gygax, Sarrasin, Garnham & Oakhill, 2011) and the other exploring circumstances where a male dominant representation might even be intensified (Gygax & Gabriel, 2008). Both studies, described further, as well as previously mentioned studies, are the basis for the specific issue that is tested in this paper, namely the possibility of establishing or generating a balanced mental representation of gender.

Exploring both mitigation (in German) and reinforcement mechanisms (in French and to some extent in English), Gabriel et al. (2011), in a partial replication of Gygax et al.'s experiment (2008), investigated the effect of adding gender marked pronouns on the mental representation of role names written in the masculine form. In their experiment, they presented participants with the same pairs of sentences as in Gygax et al. (2008), one sentence of each pair comprising a role name in the masculine (plural) form (e.g., *Les voisins sortirent de la cafeteria.* [The neighbours came out of the cafeteria.]) and one sentence containing

explicit information about the characters' gender (e.g., *A cause du temps nuageux un/e des femmes/hommes avait un parapluie.* [Because of the cloudy weather one of the women/men had an umbrella]), but also added a pronoun in a small statement associated to the first sentence (e.g., Les voisins sortirent de la cafeteria. *Ils partirent*. [The neighbours came out of the cafeteria. They went away]). Participants had to decide whether the second sentence was a sensible continuation of the first one (and its associated statement). In English, the congruent pronoun is gender neutral (*they*), in French masculine (*ils* - masculine form used as a generic) and in German generic but morphologically identical to the singular feminine form (*sie*). Adding pronouns did alter participants' mental representations of gender, but only in German. The male dominance found in previous experiments significantly decreased - yet was still apparent - both in the female and neutral stereotypicality conditions as a result of using the pronoun *sie*.

Based on a paradigm used initially by Banaji and Hardin (1996) and subsequently by Garnham et al. (2002), Gygax and Gabriel (2008) presented participants with a word association paradigm in which pairs of words were presented, each composed of a kinship term in the singular form (e.g., *a sister* or *a brother*) and a stereotypically male, female or neutral role name in the masculine plural form (i.e., *musicians*). Participants had to decide, as fast as possible, if the person represented by the kinship term could be part of the group represented by the role name. In the first part of the experiment, all role names were in the masculine plural form, whereas in the second part, some role names were also in the feminine plural form. In line with previous research, in the first part of the experiment, participants were more likely to respond *yes* to a pair when it contained a male kinship term, regardless of the stereotypicality of the role name. In the second part, participants were *even* more likely to do so for the same pair (i.e., role name in the masculine form-male kinship), demonstrating an even more pronounced dominance of the specific interpretation. The authors concluded that the mere presence of role names written in the feminine form increased an already dominant

activation of the specific interpretation when confronted with the masculine form.

Taken together, these studies document firstly that although there is some malleability <plasticity? Formeability?> in the interpretation of masculine forms, grammatical information has a strong influence on readers' mental representation of gender. Secondly, readers are constantly confronted with different sources of information (grammatical, morphological, semantical), at times contradictory, when constructing a representation of gender. Finally, in gender marked languages, a true activation of the alternative meanings of the specific interpretation of the masculine form has never been shown, at least never to the extent of occupying a primary role in readers' mental representation.

Overcoming the influence of grammatical information

With reference to masculine forms, research suggests that the specific meaning of the masculine form (i.e., masculine form → male human referent) prevails over the generic one (i.e. masculine form → refers equally to both, male and female human referent) indicating that readers strongly rely on grammatical cues and in general might need additional information to interpret masculine forms as truly generic.

We therefore wanted to explore the effects of reminding readers of the generic interpretation and consequently motivate them to consider masculine forms as representative of both women and men. We employed the word association task from Gygax and Gabriel (2008) and gave participants specific instructions in the middle of the experiment on how to resolve the ambiguity initiated by the use of the masculine form. We reminded them of the rule that *masculine forms can be used to equally refer to male and female referents* and asked them to keep this in mind when responding.

We were interested in three central ideas. First, we wanted to examine the ease with which readers would embrace the generic interpretation. Based on the presumption that linking masculine forms to female referents is more difficult than linking masculine forms to male referents, we hypothesized that a general increase in readers' proportion of positive

answers for *masculine form/female referent* combinations after having received the instructions might nevertheless be accompanied with differentiated response times, positive response times still being slower to *masculine form/female referent* combinations than to *masculine form/male referent* combinations, regardless of the instructions.

Second, we examined whether a possible mitigation of the masculine form influence, even if only partial, would reveal some influence of stereotypical information. When testing bi-gendered role names in Italian (i.e., non-gendered role names in a gender-marked language), Cacciari and Padovani (2007, Experiment 2) found that when a pronoun (*e.g., lui* [he] or *lei* [she]) was primed by a matching stereotyped role name (e.g., *engineer-he* or *housekeeper-she*), participants were faster to decide whether the pronoun was masculine or feminine than when primed by a counter-stereotype role name. Similar results have been found in Spanish (e.g., Carreiras et al., 1996, fourth experiment) and in German (Irmen, 2007). If instructing the participants does reveal some stereotype effect, it would provide us with evidence that both sources of information are generally activated when readers encounter role names written in the masculine forms, and that removing the dominant source may give way to the less dominant one.

Third and finally, we were interested in the possibility that the processes at hand may well depend on readers' inhibition capacities as measured by a Flanker task (Fan, Flombaum, McCandliss, Raz & Posner, 2002; based on Eriksen & Eriksen, 1974). Individual differences might appear in the way participants process the specific interpretation of the masculine form and integrate our instructions to overcome it. In fact, we believe that readers may require inhibition processes with reference to the grammatical information to consider a generic meaning as a possible alternative, as "overlooking grammatical information" could be one way to meet the instructions. Following this line of reasoning, we expected individuals with higher inhibition capacities to embrace the generic meaning with more ease than those with lower inhibition capacities.

Experiment 1

Method

Participants. Fourty-nine native French-speaking first and second year psychology students (42 women and 7 men) from the University of Fribourg (Switzerland) participated in this experiment to gain course credits. As most of the studies on the generic interpretation of the masculine form – presented in the introduction – found no gender differences, we were not interested in this variable and hence did not control for gender balance.

Materials and procedure. As in Gygax and Gabriel (2008), participants were presented with pairs of terms, each pair composed of a role name in the plural form and a kinship term in the singular form. The participants' task was to decide as quickly as possible whether the person represented by the kinship term (e.g., *une soeur* [a sister]) could be part of the group represented by the role name (e.g., *musiciens* [musicians]). If participants thought, for example, that *a sister* could be part of a group of *musicians*, they pressed the *yes* button, but if they thought that *a sister* could not be part of a group of *musicians*, they pressed the *no* button. Thirty-six role names from Gabriel, Gygax, Sarrasin, Oakhill and Garnham (2008) were used in this experiment. They were composed of 12 stereotypically female role names, 12 stereotypically male role names and 12 stereotypically neutral (i.e., with no stereotype) role names. The role names are presented in Table 1. As in Gygax and Gabriel (2008), six kinship terms were used to create the pairs. These were *sister*, *aunt*, *mother*, *brother*, *uncle*, *father*. The experiment was divided into two parts, in the first part of the experiment (i.e., Part I), 18 out of the 36 role names (6 female, 6 male and 6 neutral role names) were used. Each role name was associated with all kinship terms. In Part I, each role name appeared 6 times resulting in 108 experimental items. Fifty-four filler items, each composed of an unambiguous gender role name (e.g., *godfathers*) and an incongruent kinship term (e.g., *a mother*) were added. These filler items were added to ensure that participants would not consistently press

the *yes* button without properly reading the pairs. For each participant, the pairs were presented in a random order.

In Part II, the remaining 18 role names were used, and, as in Part I, each role name was associated with all kinship terms and appeared 6 times resulting in 108 experimental items. Fifty-four filler items were also added. In total, each participant was presented with 324 items, half in Part I and half in Part II. Two fixed lists were created to ensure that each role name appeared both in Part I and in Part II across the experiment (i.e., a role name in Part I in List 1 would appear in Part II in List 2).

When Part I was completed, participants were presented with additional instructions. They were reminded of the grammatical rule that when referring to persons of unknown sex, to persons where the sex is irrelevant or to a group of people of both sexes, the masculine form is used and is supposed to be interpreted in a generic way and were explicitly asked to keep this in mind when responding to Part II.

After a short break, when both Part I and Part II were completed, participants were presented with an inhibition *Flanker Task* (FT) from Fan et al. (2003). In this task, 30 sets of five black arrows pointing to the left or the right are presented on the screen (i.e., white background). The arrows are .58 cm large and placed .06 cm from each other, resulting in an approximate total of 3.27 degree angle of vision, taken that each participant is 30 cm away from the screen. In each set of arrows, the central one is the target. Participants have to focus on it and determine as fast as possible its direction (i.e., left or right), while ignoring the other ones. The other arrows are considered as distractors and can either point in the same direction (i.e., congruent condition) or in the opposite direction (i.e., incongruent condition) of the target arrow. A third condition (i.e., neutral condition), in which the distracting arrows are substituted by simple strokes, is also presented to the participants. In all, each condition is represented by 10 sets. Before each set appears, a 1-second fixation point appears in the

middle of the screen at the very same location as the target arrow. The 30 items were presented in a random order.

Apparatus. Participants completed both tasks on a Power Macintosh 4400 using the PsyScope Software (Cohen, MacWhinney, Flatt, & Provost, 1993). Participants were tested individually in a quiet laboratory room.

Results and discussion

Before proceeding to the main analyses, we removed incorrect response times of the Flanker task (2.6% of the data) and replaced correct response times that were 2.5 standard deviations above or below each participant's mean (3.8% of the correct responses) by their cut-off values.

For both the *proportion of positive responses* and the *response times* analyses, we then separated participants into *high* and *low inhibition* participants by computing response times to the FT as followed: As in Fan et al. (2003), we subtracted the time it took participants to respond to neutral items to incongruent ones and performed a median split to divide the participants into high inhibition participants (M = 21 ms; SD = 55) and low inhibition participants (M = 133 ms; SD = 141; $t(47)=3.62$; $p<.001$)[1].

Proportion of positive responses. The mean proportions of positive judgements were analysed both by-participants (F1) and by-items (F2). In the former (F1), mixed design ANOVAs were conducted by considering Kinship (Men vs. Women), Part (Part I vs. Part II) and Stereotype (Female vs. Male vs. Neutral) as within-participant variables and Flanker (Low vs. High) as a between-participant variable. In the latter (F2), mixed design ANOVAs were conducted by considering Flanker (Low vs. High), Part (Part I vs. Part II) and Kinship (Men vs. Women) as within-item variables (i.e., the same role names were presented in each part, and each role name was followed by male and female continuations) and Stereotype (Male vs. Female vs. Neutral) as a between-item variable. We only report the main and interaction effects that were significant ($p < .05$) for both F1 and F2.

A 2 (Part) by 2 (Flanker) by 3 (Stereotype) by 2 (Kinship) mixed-design ANOVA on the proportions of positive judgements revealed a main effect of Part (F_1 (1, 47) = 53.11, p < .001; F_2 (1, 33) = 274.90, p < .001), the proportion of positive judgements being higher in the second part (.97) than in the first part (.76) of the experiment, and a main effect of Kinship (F_1 (1, 47) = 41.58, p < .001; F_2 (1, 33) = 108.69, p < .001), participants responding more often *yes* to pairs including a male kinship (.97) than to pairs including a female kinship (.76). Both main effects were qualified by a Part by Kinship interaction effect (F_1 (1, 47) = 37.72, p < .001; F_2 (1, 33) = 108.12, p < .001), showing an increase in the proportion of positive answers to pairs including a female kinship, from .58 in Part I to .95 in Part II, but only a slight increase to pairs including a male kinship, from .95 to .98. There was no other main or interaction effect including Stereotype or Flanker.

The instructions given to our participants, regardless of their level of inhibition (capacities), as measured by the Flanker task, and regardless of stereotypicality, resulted in the participants increasing their positive responses to *female kinships-role names* pairs, indicating that they were able to encompass a more generic interpretation of the masculine form. Note that in Part I, the proportion of positive responses to *female kinships-role names* was of .58, indicating that the process by which participants responded, when given no specific instructions, was not exclusively linked to the specific interpretation of the masculine form, though still dominant, as suggested by Gygax and Gabriel (2008).

Positive response times. Although in Figure 1 we present raw response times, we performed two transformations in Parts I and II before analysing the data, mainly to account for two critical issues First, as role names differed in length in terms of number of letters composing each role name and as each role name appeared either in Part I or in Part II for each participant, we transformed the raw response times following Trueswell, Tanenhaus and Garnsey's (1994) regression method. For each participant, we produced a regression equation of time (i.e. reading time) against length (i.e. number of characters in the target role name)

using all positive response times. For each participant, a *time* by *role name length* regression was calculated by computing the slope and the intercept of the regression. Residual response times for each participant were then calculated by subtracting the actual raw response times from the response times predicted by the regression equation.

We then transformed the data into z-scores *per participant* and *per Part* to account for individual variability as well as the fact that naturally, participants responded faster in the second part of the experiment, regardless of the materials presented to them (i.e., participants get habituated to the task and hence gradually respond more rapidly), as shown in Figure 1. Statistical analyses were then conducted on the z-scores. Again, only response times for positive judgements were analysed. The low proportion of positive responses in some conditions (i.e., few positive responses, especially when the kinship term was female) lead to an imbalanced data set. To accommodate this problem, the data were analysed by fitting linear mixed-effects models (using the R software by the R Development Core Team, 2010)[2], including both participants and items as random factors (Brysbaert, 2007). This kind of procedure avoids cumbersome manipulations due to missing data and provides a particularly adequate alternative to traditional repeated measures ANOVA as it includes both participants (F1) and items (F2) in the same model which in turn represents a potential solution to the "language-as-fixed-effect-fallacy" (see Brysbaert, 2007 for an initial presentation of the controversies related to separate F1 and F2 analyses). In our analyses, experimental factors (Flanker, Stereotype, Kinship and Part) were treated as fixed effects; participants and role names were treated as random effects.

Our main interest in this experiment lay in a potential Kinship effect, expressing the dominance of the specific interpretation of the masculine form, as well as a Part by Kinship effect, evaluating the impact of our instructions on the above Kinship effect. Two other models were subsequently tested. One that added Stereotype to inspect the differential effects due to the role names stereotypicality and one that added Flanker to evaluate whether the

effects that might be found could be explained in terms of inhibition capacities.

Hence, we initially tested a model encompassing Kinship and Part as fixed factors and participants and role names as random effects. Our first and simplest model included Kinship as a main effect and Kinship by Part as an interacting effect. We then added Stereotype to the initial model as a fixed factor, to test a Kinship by Stereotype as well as a Kinship by Part by Stereotype interaction effect. We assessed the model fitness improvement by means of $\chi 2$– difference based on the models log-likelihoods. The model encompassing Stereotype improved the model significantly ($\Delta\chi 2 = 29.78$, $\Delta df = 8$, $p<.001$). Conversely, adding Flanker to the model by testing a Kinship by Flanker as well as a Kinship by Part by Flanker (inhibition (capacity) hypothesis) interaction effects did not improve the model at all ($\Delta\chi 2 = .33$, $\Delta df = 4$, *ns*).

The model that fit the data best (i.e., with Stereotype) revealed a main effect of Kinship (F (1, 9128) = 110.78, $p <.001$), positive responses (see Figure 1) to pairs including male kinships being faster (.13 standard deviations) than to pairs including female kinships (-.10 standard deviations), and more importantly, no interaction effect of Part by Kinship (F (2, 9128) = 2.53, *ns*). The model also revealed a Kinship by Stereotype interaction effect (F (4, 9128) = 3.96, $p<.01$), responses to pairs including female kinships being only .15 standard deviations (z-score) slower than pairs including male kinships in the female stereotype condition compared to .27 slower in the male stereotype condition and .26 in the neutral stereotype condition. This difference has to be considered in light of a three-way Kinship by Stereotype by Part (F (4, 9128) = 3.59, $p<.01$) interaction effect, suggesting that this effect was greater in Part I (.20 std-difference in the female stereotype condition; .43 in the male condition and .43 in the neutral condition) than in Part II (.12 std-difference in the female stereotype condition; .22 in the male condition and .20 in the neutral condition). This latter interaction suggested that with no particular instructions, the masculine bias found in previous research was less pronounced in the female stereotype condition than in the others, as

indicated by Figure 1. As one of our primary interest resided in a possible increase of the influence of stereotypical information as a result of our manipulation, the fact that stereotypical information seemed pertinent in Part I, and not in Part II, was somehow unexpected. We believe that this result corroborates the idea that when given no particular instructions as to how to interpret the masculine form, multiple sources of information are activated, increasing variance in the information readers use to build a representation of gender. We will come back to this idea in the *General discussion* section.

Overall, the data substantiate our first hypothesis, assuming a possible increase in readers' proportion of positive answers for *masculine form/female referent* combinations after having received the instructions accompanied with differentiated response times, positive response times still being slower to *masculine form/female referent* combinations than to *masculine form/male referent* combinations, regardless of the given instructions.

If none of the variance could be accounted for significantly by inhibition capacities, as measured by the Flanker task – contrary to our expectations –, ruling out the influence of inhibition capacities when dealing with the multiple sources of information associated with role names might be premature. Indeed, in more applied settings (e.g., job advertisements or newspaper articles), the masculine form is most often imbedded in texts also using *feminine forms*, the latter adding critical constraint as to interpreting the masculine as a generic form (Gygax & Gabriel, 2008). Such a supplementary constraint might add cognitive workload (i.e., inhibition capacities might explain some of the variance in the results), and might also generally impact upon the increase in the proportion of positive responses for *masculine form/female referent* combinations, apparent in Experiment 1.

In the following experiment, we tested whether adding role names written in the feminine form in the second part of the experiment would alter the effects found in Experiment 1, both in terms of the proportion of positive responses and inhibition capacities.

Experiment 2

Method

Participants. Fourty-six native French-speaking first and second year psychology students (40 women and 6 men) from the University of Fribourg (Switzerland) participated in this experiment to gain course credits. None of the participants took part in Experiment 1. As in Experiment 1 (see comment in the *Participants* section of Experiment 1), we did not control for gender balance.

Materials and procedure. The materials and procedure were the same as in Experiment 1, except for Part II, which, in addition to being preceded by instructions on the generic interpretation of the masculine form, also included role names written in the feminine form. In Part I, as in Experiment 1, each of 18 role names appeared 6 times resulting in 108 experimental items. Fifty-four filler items, each composed of an unambiguous gender role name (e.g., *godfathers*) and an incongruent kinship term (e.g., *a mother*) were added. These filler sentences were added to ensure that participants would not consistently press the *yes* button without properly reading the pairs. For each participant, the pairs were presented in a random order.

In Part II, the remaining 18 role names were used, but this time, each role name appeared 6 times (i.e., associated with the six kinship terms) in the masculine plural form and 6 times in the feminine plural form. Thus in Part II, each role name appeared in total 12 times (i.e., instead of only 6 times in Part I). In Part II, there were 216 experimental items. Only twenty-seven filler items were added, as experimental items written in the feminine form associated with a male kinship already constituted occasions for participants to respond negatively.

As in Experiment 1, when Part I was completed, participants were presented with additional instructions. They were reminded of the grammatical rule stipulating that when referring to persons of unknown sex, to persons where the sex of the person is irrelevant or to a group of people of both sexes, the masculine form is used and is supposed to be interpreted

in a generic way, and they were explicitly asked to keep this in mind when responding to Part II. When both Part I and Part II were completed and after a short break, participants were presented with the same inhibition *Flanker Task* (FT) presented in Experiment 1.

Apparatus. Participants completed both tasks on a Power Macintosh 4400 using the PsyScope Software (Cohen, MacWhinney, Flatt, & Provost, 1993). Participants were tested individually in a quiet laboratory room.

Results and discussion

All analyses were conducted following the same principles as in Experiment 1. As in Experiment 1, before proceeding to the main analyses, we removed incorrect responses to the Flanker task (3% of the data) and replaced correct response times that were 2.5 standard deviations above or below each participant's mean by their cut-off values (3.18% of the correct responses). To examine the FT, we then subtracted the time it took participants to respond to neutral items to incongruent ones and performed a median split to divide the participants into high inhibition participants (M=37 ms; STD=69) and low inhibition participants (M=126; STD=49; $t(44)=5.07$; $p<.001$).

Proportion of positive responses. A 2 (Part) by 2 (Flanker) by 3 (Stereotype) by 2 (Kinship) mixed-design ANOVA on the proportion of positive judgements to pairs with role names in the masculine form revealed a main effect of Part (F_1 (1, 44) = 12.31, $p < .001$; F_2 (1, 33) = 37.35, $p < .001$), the proportion of positive judgements being higher in the second part (.94) than in the first part (.85) of the experiment, a main effect of Kinship (F_1 (1, 44) = 16.34, $p < .001$; F_2 (1, 33) = 46.89, $p < .001$), participants responding more often *yes* to pairs including a male kinship (.95) than to pairs including a female kinship (.83), and a main effect of Stereotype (F_1 (2, 88) = 15.27, $p < .001$; F_2 (2, 33) = 3.49, $p < .05$), participants giving more positive responses to neutral stereotyped role names (.92) than to female stereotyped role names (.89) and male stereotyped role names (.87).

Those main effects were qualified by a Part by Kinship interaction effect (F_1 (1, 44) = 15.18, $p < .001$; F_2 (1, 33) = 37.74, $p < .001$), showing again a significant increase in the proportion of positive answers to pairs including a female kinship from .75 in Part I to .92 in Part II, but no increase to pairs including a male kinship (.95 in both parts). As shown in Figure 2, the increase was most apparent in the male stereotyped condition (from .68 to .93). This larger increase was substantiated by a significant Part by Kinship by Stereotype interaction effect (F_1 (2, 88) = 21.26, $p < .001$; F_2 (2, 33) = 5.56, $p < .01$). As in Experiment 1 and even though the experimental materials were more constraining, participants managed to use a generic interpretation of the masculine form when reminded of the grammatical rule.

Positive response times. Before analysing response times of positive judgements to pairs with role names in the masculine form, we performed the same transformations as in Experiment 1. In Figure 3, we present raw response times in Parts I and II of the experiment. As in Experiment 1, we initially tested a simple model including Kinship and Part as fixed factors and participants and role names as random effects. Our first model included Kinship as a main effect and Kinship by Part as an interacting effect. We then added Stereotype to the initial model as a fixed factor, to test a Kinship by Stereotype as well as a Kinship by Part by Stereotype interaction effects, which improved the model significantly ($\Delta\chi2 = 49.54$, $\Delta df = 8$, $p<.001$). Conversely, when we added Flanker to the model to test a Kinship by Flanker as well as a Kinship by Part by Flanker (inhibition (capacity) hypothesis) interaction effects, as in Experiment 1, there was no significant improvement to the model ($\Delta\chi2 = 6.60$, $\Delta df = 4$, *ns*).

The model that fit the data best (i.e., with Stereotype) revealed a main effect of Kinship (F (1, 8844) = 121.93, $p <.001$), positive responses to pairs including male kinships being faster (.11 standard deviations) than to pairs including female kinships (-.14 standard deviations), and more importantly, no interaction effect of Part by Kinship (F (2, 8844) = 0.16, *ns*). As in Experiment 1, the model also revealed a Kinship by Stereotype interaction

effect (F (4, 8844) = 8.39, p<.001), responses to pairs including female kinships being only .12 standard deviations (z-score) slower than pairs including male kinships in the female stereotype condition compared to .28 slower in the male stereotype condition and .30 in the neutral stereotype condition. A three-way Kinship by Stereotype by Part (F (4, 8844) = 4.65, p<.001) interaction effect suggested, as hinted by Figure 3, that this effect was only present in Part I (.003 std-difference in the female stereotype condition; .41 in the male condition and .43 in the neutral condition) as in Part II, all conditions were similar (.23 std-difference in the female stereotype condition; .24 in the male condition and .23 in the neutral condition). Overall, the additional constraint enforced by role names written in the feminine form did not alter the results found in Experiment 1. Again, there was an increase in readers' proportion of positive answers for *masculine form/female referent* combinations, and of differentiated response times, as positive response times were slower for *masculine form/female referent* combinations, regardless of the given instructions. Again, and contrary to our expectations, none of the variance could significantly be accounted for by inhibition capacities, as measured by the Flanker task. Considering the strong similarities between the results of Experiments 1 and 2, we deemed it unnecessary to run an analysis to compare the two experiments.

General discussion

In this paper, we present two experiments that examined (a) whether motivating readers to consider the masuline form as representative of both women and men could mitigate the *male dominance* found in previous studies (e.g., Gygax & Gabriel, 2008), (b) whether such a mitigation would reveal stereotypicality effects rarely found in studies on gender marked languages and (c) whether such a mitigation depended on readers' general inhibition capacities, as measured by the Flanker task. Overall, we expected that although readers may be able to improve their performance when given our particular instructions, response times should still signal the activation of the specific meaning of the masculine form.

In both experiments, when explicitly reminded of the possible generic interpretation of the masculine form, participants did increase their proportion of positive responses when they had to decide whether a woman could be part of a group represented by a role name written in the masculine plural form (i.e., *sister-musicians*). However, response times showed that it took them longer to do so, with or without the instructions. Our results therefore support the idea that linking masculine forms to female referents is more difficult than linking masculine forms to male referents, regardless of what readers are instructed to do. Although our experiments were conducted in French, in light of previous research on the topic, we expect very similar results in other gender-marked languages.

Both experiments also indicated some influence of stereotypicality. In the first part of each experiment (i.e., without specific instructions), and only in the first part, participants' male dominant representation was not as pronounced in the female stereotypical condition as in the other stereotypical conditions. Stereotypicality was central in this paper, but we assumed that stereotypicality effects would only be apparent in the second part of the experiments. In fact, we hypothesised that by lifting the influence of the masculine-as-specific form, our results would mirror those of Cacciari and Padovani (2007, Experiment 2) who found some signals of stereotype effects for *both* male and female stereotyped role names[4]. In both our experiments, stereotypicality effects in response times were associated only to female stereotyped role names and vanished in the second part of each experiment. We believe that this bound-to-Part I stereotypicality effect, together with a strong male bias imputed to the masculine form, suggests the idea that when given no particular instructions, readers are faced with different sources of information – most likely activated in parallel – when dealing with the ambiguity of the masculine form. Both the means and standard deviations in Part I highlight the more difficult task that readers have when no clear instructions are given as to how to interpret the masculine form. When given clear instructions, readers may well override some of the processes initially activated, especially

those only sparsially so, such as stereotypes.

We also expected, in both experiments, inhibition capacities to be influential. We hypothesised that, as overlooking grammatical information could be one way to meet our instructions, participants would require particular inhibition capacities to do so. Executive control, which capacities we measured using the Flanker task, might thus be required. Our results indicate no influential effect of inhibition capacities. If null effects are often quite difficult and delicate to interpret (see note #3 for a short discussion on the different strategies that we adopted to analyse our inhibition scores), we would like to propose a tentative explanation to account for the lack of inhibition capacities influence. Although we introduced the paper by assuming that to adopt a generic interpretation of the masculine form, the specific one must be inhibited, one could argue that this is not quite true. Recall that the masculine generic interpretation is supposed to be activated in three cases: when referring to persons of unknown sex, to persons where the sex (of the person) is irrelevant or to a group of people of both sexes. In all three cases, the likelihood of a man or men being represented is actually quite high. In fact, the grammatical rule stipulates that one man suffices for a group to be written in the masculine form. Therefore, a generic interpretation could be considered as one that is not different from the specific interpretation per se, but more as one that *includes* the specific one *and* also embraces an additional female representation. As such, a generic interpretation should be considered a *cumulative* representation which may not require inhibition processes, but instead additional activation. Investigating working memory capacities might therefore be interesting to access readers' difficulties in embracing such a representation, as well as focusing on some measure of *activation capacities* (although these often seem to be referred to as, or at least associated with, inhibition capacities). In sum, any explanation of the mechanisms involved in the resolution of the semantic ambiguity introduced by the use of the masculine form has to account for the semantic association, or even overlap, between the two meanings. For this, one might also want to consider a task

involving semantic activation such as the Stroop task (e.g., Brown & Besner, 2001; Klopfer, 1996). Altogether, we believe that future work should investigate more closely the cognitive factors – not just societal factors (e.g., *sexist attitudes* as in Gabriel et al., 2011) –, that contribute to differences in the way readers process the masculine form as well as the way they switch from one interpretation to another.

With reference to our paradigm, we should keep in mind that although the proportion of positive responses does suggest that readers managed to adopt a generic interpretation of the masculine form, it only constitutes an off-line indication of what might be. It might even only mirror participants' attentional capacity to detect the signals that activate the rule that was given to them just before the second part of the experiment, without them truly embracing a balanced representation associated with positive responses. Response times, on the other hand, may more accurately reflect the content of participants' mental representation constructed (Keenan, Potts, Golding, & Jennings, 1990) when reading the role names in the masculine form. If this is the case, our results indicate two different processes : (a) readers, by default, maintain a rather superficial processing of the masculine form (i.e., by default, they go for the *good-enough* representation), as hinted by the response times, and (b) the generic interpretation is being activated only when a more elaborate processing is motivated, forcing readers to reassess their mental model and change their initial representation. Essentially, our data suggest that the specific meaning, as the default value, is activated through a passive process, whereas the generic, more elaborate one, needs active processing. The specific meaning of the masculine form typically fits a *good-enough representation*, but when readers are motivated to build a representation based on another meaning, they need to go beyond this representation. The term *beyond* is crucial – and we purposely do not use the term *replace* here –, as our response times do indicate traces of this initial good-enough representation. Now that we have shown differential processes for both meanings, more data is needed to examine the conditions favoring them.

Thus, future work might also consider more implicit ways (as you would expect in everyday life) to motivate readers to interpret the masculine form as generic, explicit instructions as the ones reported in this paper potentially triggering counter-productive reactance processes.

Still, our results have one main implication. Giving specific instructions for an intended generic meaning of the masculine form may not result in truly balanced mental representations of gender. People, being reluctant to replace the masculine form with gender-fair forms (e.g., *les musiciennes et musiciens* [the female and male musicians]) yet still keen to target both men and women (e.g., in job advertisements), often chose to explain at the beginning of a text (or in a footnote, as discussed by Rothmund & Scheele, 2004) that the masculine form is "aimed at both men and women". In light of the results of our experiments, we believe that this is not the most adequate solution. If our proportion of positive answers suggests that it might, our response time data suggest that it might not, resulting in a possible hampering of women's visibility in society (e.g., Braun, 1996; Bussmann, 1995; Peyer & Wyss, 1998).

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Footnotes

[1] In the analysis, there were 24 participants in the high inhibition group and 25 in the low inhibition group. We also tried the analyses first by taking 25 participants in the high inhibition group and second by extracting the extra participants. All analyses were identical, hence we present only the one with 24 participants in the high inhibition group and 25 in the low inhibition group.

[2] All analyses were conducted using version 2.10.1 of R for Mac OS X. The models were tested with the *lme4* package. The Chi-squared values for evaluating log-likelihood differences between models were obtained with the *anova()* function (Baayen, 2008). And finally, the p-values, F-values and degrees of freedom estimates were obtained with the *aovlmer.fnc()* function.

[3] To ensure that the null results associated with the Flanker factor were not due to our median split, we performed extra analyses adopting different strategies: (a) we only compared the lower and the higher quartiles, (b) the lower and the higher thirds, and (c) included Flanker task scores as a covariate. None of these bared any difference to the analyses presented in this paper. Finally, as a last attempt to examine possible inhibition effects, we performed correlation analyses between Flanker scores and positive response times to pairs including a female kinship in the second part of each experiment (overall and per stereotyped condition). We presupposed that if any, inhibition capacities should have an effect on the most difficult positive responses to generate. No correlation was significant, or even close to significant (all $p>.10$).

[4] Note that in Cacciari and Padovani (2007), the stereotype effects were only revealed when both the prime presentation time and the prime-target interval were prolonged (Experiment 2). In addition to this, female pronouns were responded to equally fast when primed by a male stereotyped role name or a neutral stereotyped condition, suggesting only a partial stereotype effects (i.e., female pronouns were still responded to faster when primed by

female stereotype role names). The explanation of these effects goes beyond this present paper.

Table 1

French role names chosen from Gabriel et al. (2008) along with the proportion of men evaluated by each language participant group.

	Role names	*English translation*	%
Male stereotypes	Espions	*Spies*	74
	Golfeurs	*Golfers*	73
	Politiciens	*Politicians*	72
	Policiers	*Police officers*	70
	Statisticiens	*Statisticians*	74
	Patrons	*Bosses*	74
	Informaticiens	*Computer specialists*	67
	Chirurgiens	*Surgeons*	75
	Techniciens	*Technicians*	75
	Ingénieurs	*Engineers*	74
	Etudiants en physique	*Physics students*	67
	Aviateurs	*Pilots*	74
		Mean	72
Neutral stereotypes	Chanteurs	*Singers*	48
	Promeneurs	*Pedestrians*	52
	Spectateurs de cinéma	*Cinema goers*	50
	Auditeurs de concert	*Concert goers*	51
	Ecoliers	*Schoolchildren*	53
	Spectateurs	*Spectators*	51
	Voisins	*Neighbours*	50
	Nageurs	*Swimmers*	50
	Joueurs de tennis	*Tennis players*	54
	Auteurs	*Authors*	54
	Musiciens	*Musicians*	59
	Skieurs	*Skiers*	55
		Mean	52
Female stereotypes	Esthéticiens	*Beauticians*	18
	Assistants maternels	*Birth attendants*	18
	Diseurs de bonne aventure	*Fortune tellers*	28
	Caissiers	*Cashiers*	24
	Infirmiers	*Nurses*	30
	Coiffeurs	*Hairdressers*	38
	Etudiants en psychologie	*Psychology students*	33
	Diététiciens	*Dieticians*	37
	Couturiers	*Dressmakers*	40
	Danseurs	*Dancers*	29
	Vendeurs	*Sales assistants*	37
	Assistants sociaux	*Social workers*	33
		Mean	30

Figure Captions

Figure 1. Raw response times of positive responses in the different conditions in Experiment 1. Note that the slight difference in response times between the three stereotyped conditions can be attributed to differences in word length, the female stereotyped condition being composed of role names longer (M=13.75) than the male (10.92) and neutral conditions (11.08). As explained in the *Results* section, word length was corrected for in all analyses.

Figure 2. Proportion of positive responses in Experiment 2.

Figure 3. Raw response times of positive responses in the different conditions in Experiment 2. Note that the slight difference in response times between the three stereotyped conditions can be attributed to differences in word length, the female stereotyped condition being composed of role names longer (M=13.75) than the male (10.92) and neutral conditions (11.08). As explained in the *Results* section, word length was corrected for in all analyses.

Figure 1

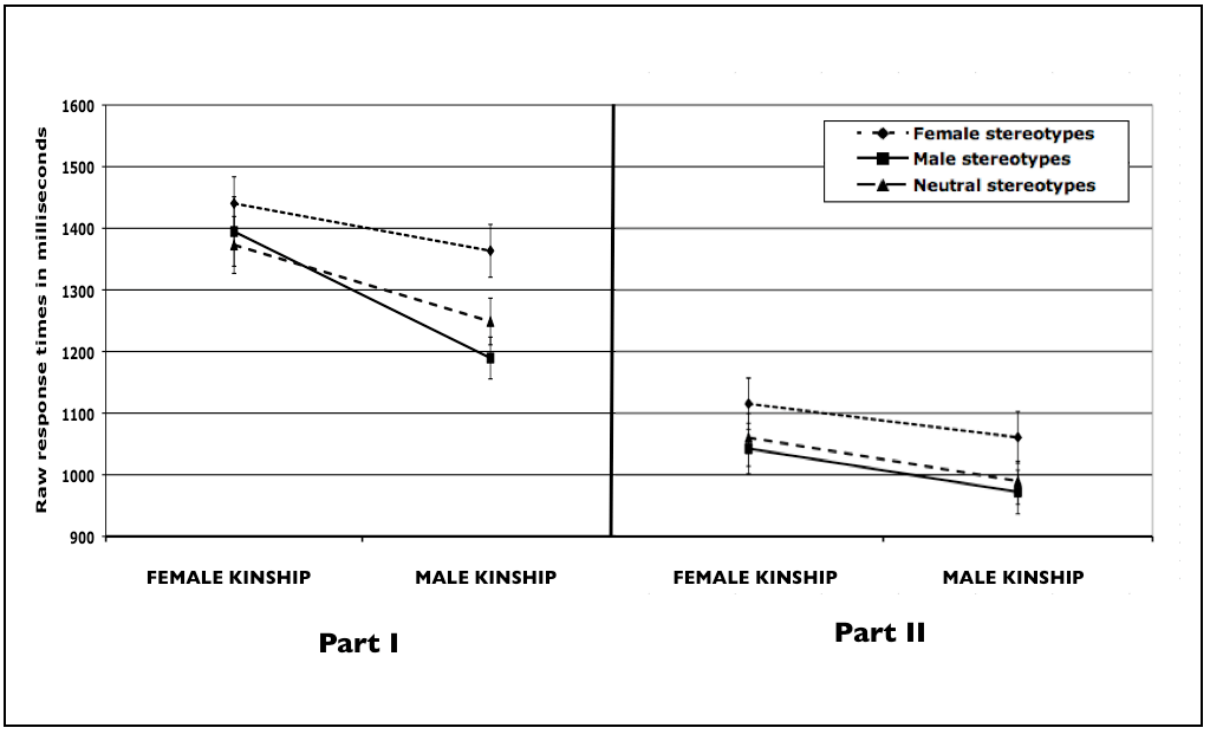

Raw response times in milliseconds
1600
1500
1400
1300
1200
1100
1000
900
Female stereotypes
Male stereotypes
Neutral stereotypes
FEMALE KINSHIP
MALE KINSHIP
FEMALE KINSHIP
MALE KINSHIP
Part I
Part II

Figure 2.

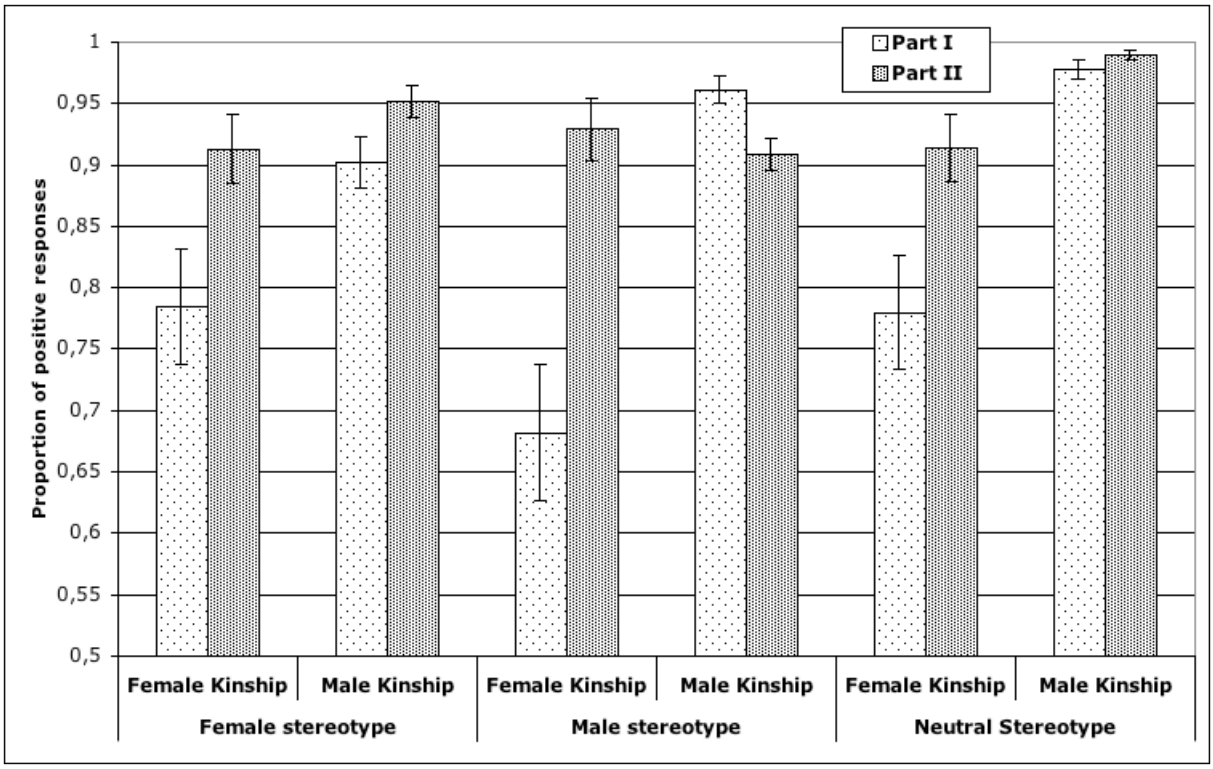
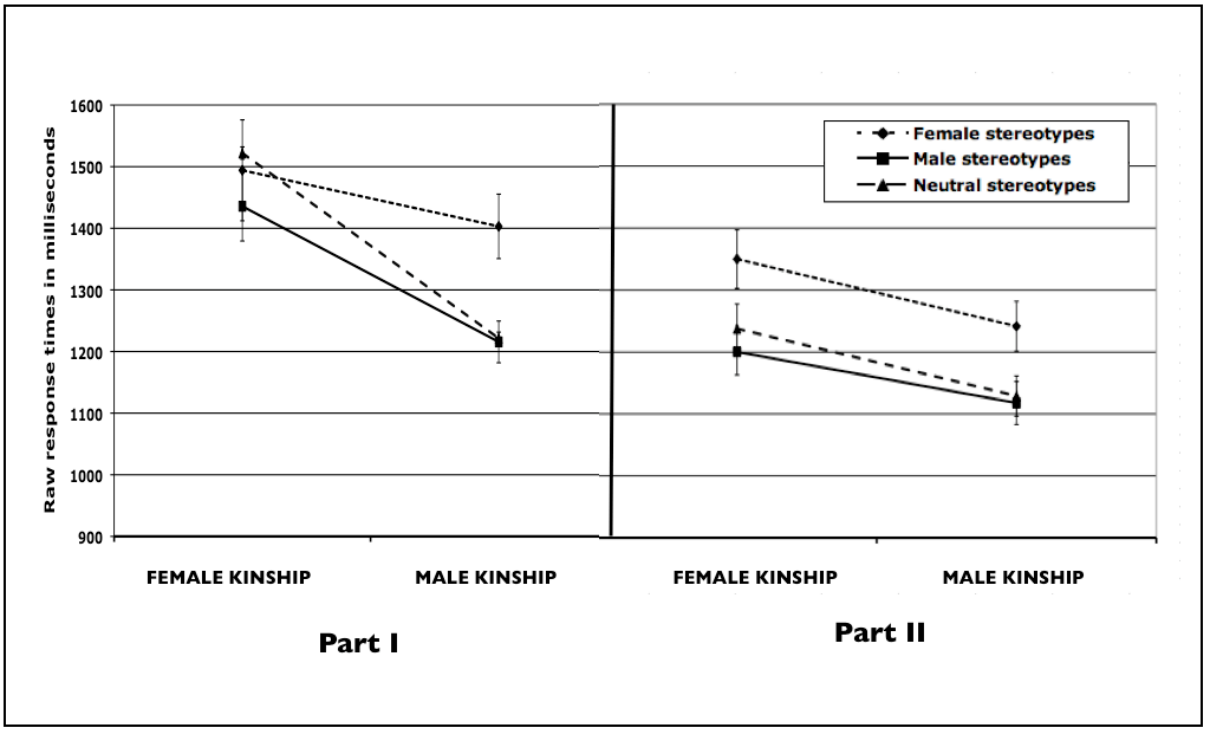

Part I
Part II
Proportion of positive responses
1
0,95
0,9
0,85
0,8
0,75
0,7
0,65
0,6
0,55
0,5
Female Kinship
Male Kinship
Female Kinship
Male Kinship
Female Kinship
Male Kinship
Female stereotype
Male stereotype
Neutral Stereotype

Figure 3.


Raw response times in milliseconds
1600
1500
1400
1300
1200
1100
1000
900
Female stereotypes
Male stereotypes
Neutral stereotypes
FEMALE KINSHIP
MALE KINSHIP
FEMALE KINSHIP
MALE KINSHIP
Part I
Part II