Altering male-dominant representations: A study on nominalized adjectives and participles in first and second language German

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Abstract

The generic use of masculine plural forms in grammatical gender languages has been criticized for activating unequal gender representations that are male dominant. The present study examined whether the recently introduced gender-neutral forms of nominalized adjectives and participles in German provide references that induce more balanced representations. We used cross-linguistic differences as a means to illustrate the flexibility of the gender representation system and investigated both native and non-native (French-German bilinguals) speakers of German. Although a masculine bias persisted when participants read role nouns in the masculine plural form, the study suggests that the usage of nominalized forms can attenuate this male bias, even for non-native speakers. The results of the study provide further support for the use of gender-neutral language.

Keywords
gender representation, grammatical gender, second language comprehension, gender-fair language, male bias

Research in social psychology and psycholinguistics has revealed striking differences in language-based gender biases that act as a vehicle for communicating and perpetuating gender disparity (Prewitt-Freilino, Caswell, & Laakso, 2012; Stahlberg, Braun, Irmen, & Sczesny, 2007; Wasserman & Weseley, 2009). Especially for grammatical gender languages like German, French and Spanish, gender information embedded in the grammatical system has been found to activate a specific gender during language comprehension processes, even in the case of word forms that are not intended to refer to any gender (Stahlberg et al., 2007). In particular, a substantial amount of research has shown that individuals tend to associate masculine forms of words with a male-specific gender, even when the word is intended to refer to both genders (Gygax, Gabriel, Sarrasin, Oakhill, & Garnham, 2008; Irmen, 2007; Irmen & Kurovskaja, 2010; Stahlberg, Sczesny, & Braun, 2001). Furthermore, this general facilitation to activate the male-specific gender has been found to override stereotypical gender information (e.g., Gygax, Gabriel, Lévy, Pool, & Grivel, 2012; Gygax et al., 2008). With an increasing societal demand for an equal representation of the sexes, changes in language use (i.e., gender-neutral language) have been encouraged in an attempt to make the two sexes equally visible. Paradoxically however, gender-fair language has also been criticized as distorting language, with research suggesting that its production requires more effort and language competence (e.g., Koeser, Kuhn, & Sczesny, 2014; Kuhn & Gabriel, 2014) than the more common generic masculine forms.

In the present paper, we aimed to demonstrate that using gender-neutral language might possibly be very efficient in alleviating male biases in German despite their strength, as shown in past research. We explored how the use of particular grammatical forms can directly tap and eventually influence our mental representations by comparing grammatically masculine and nominalized forms in German. Whereas the former masculine form (e.g., *die Käufer* [the buyers] has been found to trigger male-biased representations despite its possible generic sense, the latter nominalized form refers to nouns that are derived from adjectives and participles (e.g., *die Konsumierenden* [those that consume]) and are thus grammatically neutral and gender-unbiased.

Although there are similar on-going debates on the use of gender-neutral forms for most grammatical gender languages, nominalized forms are particularly interesting in German (in contrast with other languages, as discussed later), as they are truly neutral (i.e., completely dissociated from semantic and grammatical gender). Considering these cross-linguistic differences as well as the limited usage of gender-neutral forms, we assessed whether these forms could be representationally effective in neutralizing activated gender biases.

In particular, a bilingual population was employed in our study to observe whether language does indeed influence the representation process. If we observe a difference between the representations according to the bilinguals' linguistic domain, it should provide us with convincing evidence as to the extent the language being used for comprehension dominates representation tendencies. Specifically, bilinguals who have acquired two grammatical gender language systems that differ in gender-neutral forms (i.e., French and German) were employed for the study. The idea that specific languages influence mental representations is linked to the thinking-for-speaking hypothesis (Slobin, 2003). This hypothesis suggests that engaging in language processing directs readers' attention to certain attributes that are grammaticized within a language (Slobin, 2003). In terms of gender representations, if bilinguals switch to a language that specifically integrates certain gender information in its grammar, they would need to attend to this information for the purpose of basic comprehension. We argue that as nominalized forms in German have no grammatical association to either gender, they should not activate any gender during reading. Similarly, non-native German speakers (i.e., native French speakers) should be able to effectively alter their representations when reading nominalized forms in German even if a matching form does not exist in their first language (L1). In the following, we review research associated with gender representation during language comprehension and broaden our case for the usage of nominalized forms in our study.

Grammatical Gender Languages and Gender Representation

In grammatical gender languages such as German, French or Spanish, gender is a fundamental grammatical element that exerts an influence at different levels of language processing. In these languages, most regular nouns are attributed to an arbitrary gender class (e.g., masculine, feminine, and sometimes neutral) that is not directly associated with its meaning (e.g., German: *eine Tür*$_{feminine}$ [a door]; *ein Schüssel*$_{masculine}$ [a key]). In contrast, most person nouns have a gender attribution directly linked to the biological sex of the person taking the position (e.g., German: *ein Schüler* [a male student]; *eine Schülerin* [a female student]). While this latter rule appears rather well-defined, the markedness of the two gender forms differs for female and male references, often causing asymmetry when interpreting them. The feminine form refers solely to a woman or a group of women, showing a direct relation between grammatical gender and biological sex. In comparison, the masculine form can refer to a man, or a group of men, but also to a group composed of both men and women (i.e., generic), or is applied in circumstances when sex is deemed unimportant. The generic interpretation of the masculine form is thus inconsistent with the association of its grammatical gender. The two possible interpretations of the masculine form posit a certain level of ambiguity (e.g., Gabriel & Gygax, 2008; Gygax et al., 2008; Irmen, 2007; Lévy, Gygax, & Gabriel, 2014), which has been illustrated in existing research in German (e.g., Braun, Gottburgsen, Sczesny, & Stahlberg, 1998; Braun, Sczesny, & Stahlberg, 2005; Irmen, 2007), French (e.g., Brauer & Landry, 2008; Gygax et al., 2008; Lévy et al., 2014), Norwegian (Gabriel & Gygax, 2008) and Spanish (Nissen, 2013).

As suggested by the mental models theory of language comprehension (Garnham & Oakhill, 1996; Johnson-Laird, 1983), readers will integrate explicitly-provided morphological information (i.e., grammatical gender information) and their individual world knowledge about gender biases during gender representation. Inferences about the probable gender will be generated irrespective of whether it is essential for comprehension or not. Research shows that generic inferences when reading the masculine form (e.g., *Geburtshelfer* [birth attendants]) are particularly difficult to

activate, and is commonly interpreted as referring more to men than to women (e.g., Braun et al., 2005; Gygax et al., 2008; Irmen & Knoll, 1999; Stahlberg et al., 2001). Association to the male gender is heightened through its morphological form, and its generic sense becomes more difficult to activate. Note that studies on anaphor resolution have reported the effects of stereotype when investigating the interaction between stereotype and grammatical gender information in grammatical gender languages, yet only when looking at particular processing time windows (e.g., Esaulova, Reali, & von Stockhausen, 2013; Irmen, Holt, & Weisbrod, 2010; Irmen & Schumann, 2011; Reali, Esaulova, & von Stockhausen, 2015). This strongly suggests that although most studies have reported strong male associations from specific morphological associations, stereotype information is still activated, but is most likely overridden.

In sum, these studies demonstrate that grammatical gender impacts the interpretation of human referents by increasing the saliency of a specific gender. These representation mechanisms enhanced by grammatical cues provide a context for investigating the impact of gender-neutral language, which is often encouraged by formal institutions (e.g., American Psychological Association, 2001; Gleichstellungsbeauftragte der Universität zu Köln, 2008). Presenting gender-neutral forms that are morphologically unrelated to either gender should serve to attenuate the gender-emphasizing effect, leading to a more neutralized representation. If the process of understanding language guides readers' attention to focus on specific information such as gender, then we should also see an impact of nominalized forms on gender representations for non-native speakers in their second language (L2), even if their representation preferences are well characterized by their L1.

Nominalized Forms as Gender-Neutral Language in German

The implementation of gender-fair language aims to establish a symmetry between the sexes by making women more linguistically and grammatically visible through means such as feminization (e.g., pair forms: *Politikerinnen*$_{feminine}$ *und Politiker*$_{masculine}$ [female politicians and male politicians];

splitting forms: *Politiker/innen*; adapting capital I to emphasize the feminine in German - *PolitikerInnen*) or by means of neutralizing the expression of both sexes (e.g., neuter nouns: *Individuum* [individual]; nominalized forms : *Alten* [elderly]) (Duden, 2009). Psycholinguistic literature on the influences of gender-fair language use has focused mostly on the effects of feminization (e.g., Bem & Bem, 1973; Chatard, Guimont, & Martinot, 2005; Stout & Dasgupta, 2011; Vervecken, Hannover, & Wolter, 2013), yet research addressing the impact of gender-neutral language usage still remains scarce. The present study aims to add on to this paucity by examining a specific case of gender-fair language – neutralized forms in German through nominalized forms – and its impact upon mental representations of gender.

In German, nominalized nouns are commonly derived from adjectives and participles, and although they maintain grammatical gender in their singular form, many plural forms are neutralized and lose grammatical gender completely (e.g., *die Alten* [the elderly]-*alt* [old$_{\text{adjective}}$], *die Studierenden* [the students] – *studieren* [to study$_{\text{verb}}$]). As these forms do not originate from nouns that carry grammatical gender but from gender-unmarked adjectives and participles, they are considered entirely unassociated with any gender and should not in theory activate any gender connotations. While nominalized forms offer an attractive possibility to decrease male biases, studies on neutral forms nonetheless remain sparse. For example, Braun et al. (1998), in a series of experiments, presented participants with a text about a fictitious meeting of a scientific association written with either masculine generic forms (e.g., *die Geophysiker* [the geophysicists]), pair forms (e.g., *Geophysikerinnen und Geophysiker* [female and male geophysicists]) or neutral forms (composed of nominalized forms, e.g., *die wissenschaftlich Tätigen* [the people active in science], as well as other neutralizing forms such as *die Geophysik* [the field of geophysics]). The authors found that the usage of pair forms increased readers' estimation of female attendees to the meeting, yet there was no clear evidence of neutral forms having any impact. Similar findings were reported by Stahlberg et al. (2001) who compared the same three categories and asked participants to name their favorite heroes, musicians, athletes and singers.

More relevant for our study, Irmen and Roßberg (2004) investigated the relationship between grammatically neutral forms and gender stereotypical information. They examined reading times of sentences with specific gender continuations (e.g., female continuation: *When going out they prefer for example a dress*.) that were preceded by a sentence including either pair forms (e.g., *Male and female soldiers only wear uniforms when on duty*.) or gender unmarked nominalized forms in German. Nominalized present participles with neutral (e.g., *Lehrende* [those who teach]), female (e.g., *Alleinerziehende* [those who raise a child alone]) or masculine stereotype (e.g., *Vorstandsvorsitzende* [those who chair the steering committee]) were presented. Reading times for nominalized forms indicated that a match between male stereotypical role nouns and male continuations showed accelerated reading times, while a match between female stereotypical role nouns and female continuations did not. Interestingly, when role nouns did not have a gender stereotype, participants not only showed accelerated reading times for continuations that were neutral (i.e., did not specify gender), but also for male continuations, at least when compared to female continuations. The authors interpreted these results in terms of neutral grammatical forms that also generated male-biased representations, based on the idea that *people* = *male* (Hamilton, 1991; Silveira, 1980). While this is a plausible explanation, their study was published in 2004 when nominalized forms had just started to emerge in German. The lack of exposure to these forms could have been the reason for why there was no substantial effect in mitigating the masculine bias.

Cross-Linguistic Issues on Nominalized Forms and Gender Representation

In the present study, we explored the impact that language has on the construction of gender representation by examining the neutralizing effects of German nominalized forms among native and non-native speakers of German (i.e., French-German bilinguals). French-German bilinguals provide an interesting contrast to native German speakers as nominalized forms in their L1 French differ from German forms. In contrast to German, nominalized forms in French carry a specific grammatical gender (e.g., *étudiante*$_{\text{feminine}}$ vs. *étudiant*$_{\text{masculine}}$ [a female vs. a male person who

studies]). While a similar notion of neutralized grammar exists in a handful of nouns that refer to both sexes, which are used with a unique gender marked article (e.g., *une*$_{\text{feminine}}$ *personne* [a person]), in terms of grammatical status, they are not truly nominalized forms and are not frequently found.

Considering the discrepancies between the languages, one could ask to what extent bilinguals are constrained by the representational restrictions present in each of their languages. Will these linguistic discrepancies generally impose a greater difficulty in terms of comprehension, or will either language guide the basis for representation processes? Studies have shown that the disparate structures of the bilinguals' languages interact and interfere with one another, lending support to the notion that readers are prone to be influenced by elements grammaticized in the language being used (Slobin, 2003). For instance, Sato, Gygax and Gabriel (2013) found that gender representation among bilinguals of French and English leaned toward the representational tendency of the language in use. In terms of bilingual representation, these results also concur with theories suggesting that bilinguals are cognitively flexible and may shift their perceptual patterns in ways similar to native speakers of the L2 (e.g., Athanasopoulos, 2009; Athanasopoulos, Damjanovic, Krajciova, & Sasaki, 2011). These findings hint that bilinguals face the challenge of having to integrate gender information based on the language being used, even if relevant grammatical forms are not shared, or used differently, in the other (possibly activated) language. Examining the representation of grammatical forms that differ between one's L1 and L2 should thus advance our understanding of the extent to which readers rely on and are influenced by grammatical properties of the language being used for comprehension. Therefore, the comparison of these two language groups (French and German) provides a basis to further qualify the impact of gender-neutral language.

The Present Study

The present study aims to add to the sparse literature on the impact of gender-neutral language use on readers' mental representation of gender. We propose a study to examine the impact of language

by further scrutinizing the stimulus material and participant sample. As nominalized forms in German are grammatically dissociated from gender, they should not activate a specific gender. Essentially, when reading German nominalized forms, we expect a reduction in the persisting male bias triggered from reading the masculine form in grammatical gender languages. For non-native German readers, a similar male-attenuation effect is also expected in their L2 German, which should provide more direct evidence of language as a common source for bringing about changes in gender biases. Our non-native German sample was comprised of French L1 readers whose L2 German was well established (see Results section for L2 proficiency). With French as their L1, these participants were familiar with nominalized forms, although they are gender specific in their L1 French. More importantly, these participants were familiar with the concept of the generic interpretation of the masculine form. In Sato et al. (2013), L1 English readers demonstrated a male bias triggered by the grammatical gender marking in L2 French, even when grammatical gender features were not present in their L1. These results suggested that language was a strong source for the representational shift, and that grammatical features that were not apparent in one's native language could still be learnt and eventually surface in the representation.

The study differs from past research in the following three ways. First, we applied a more stringent definition of grammatically neutral forms by specifying nominalized forms. Past studies have applied related, yet different, assorted grammatical forms as a neutral grammar condition (Braun et al., 1998). These nominalized forms were paired with semantically resembling role nouns in the masculine form to attain a better comparison of the two grammatical forms (e.g., masculine form: *die Käufer* [the buyers]; nominalized form: *die Konsumierenden* [those that consume]). Second, our empirical focus was purely grammatical, comparing nominalized with generic masculine forms, as opposed to the study by Irmen and Roßberg (2004), which examined effects of gender stereotype as well as grammatical influences. Eliminating other gender-associated information from the experimental paradigm provides more convincing support for the debate on the promotion of gender-neutral language, as the heart of the discussion rests upon how linguistic

(i.e., grammatical) reform may bring about a shift in people's mental representations. Third and finally, the present study adapted both objective (i.e., response times) and subjective (i.e., response proportions) measures to gauge the intricate processing effects of gender representation. While the former is representative of less-monitored processing (i.e., automatic), the latter reflects readers' subjective judgments of gender information. A sentence evaluation paradigm that provides both these measures was thus implemented for the study.

Method

Participants

Forty-three native German-speaking students (mean age = 21.88 years, age range = 19 – 42, 2 males[1]) and 43 non-native German-speaking students (i.e., native French-speaking) (mean age = 21.47 years, age range = 19 – 40, mean start age of L2 acquisition: 9.04 years; range = 0 - 13 years; mean years of L2 study: 9 years; range: 6 -12 years, 7 males) participated in the experiment. All students were recruited from the University of Fribourg (Switzerland) and were granted course credit for participation.

Design and Materials

The experimental task followed the sentence evaluation task initially proposed by Tanenhaus and Carlson (1990) and later adapted in numerous reading comprehension studies (e.g., Garnham, Gabriel, Sarrasin, Gygax, & Oakhill, 2012; Garnham, Oakhill, & Cain, 1997; Garnham, Oakhill, & Reynolds, 2002; Kurtzman & MacDonald, 1993). In this task, participants read a passage, one sentence at a time, and evaluate whether the final target sentence is a good continuation of the previously presented sentences. Differences in judgments (i.e., yes / no responses), as well as response times, reflect the relative difficulty or ease with which readers map information onto their mental representation.

In our study, participants were asked to read a composite of three sentences, as in Garnham et al. (2012). The first sentence introduced a group of people denoted by a role noun, the second specified what they were doing, and the final sentence specified that there were "some (of the) men" or "some (of the) women" in the group referred to by the role noun in the first sentence (see sentences [1a] to [1c] in the example below). The manipulation of grammatical information was carried out by presenting the role nouns either in the masculine or in the nominalized plural form, both potentially interpretable as generic. It was presumed that positive *yes* responses to target sentences with female continuations (i.e., "some [of the] women") were indicative of a more flexible interpretation (i.e., not a gender-specific interpretation).

As we aimed only to examine the effect of grammatical information (i.e., masculine vs. nominalized forms), only role nouns that did not entail a gender stereotype were chosen. Furthermore, provided that the derivations of the two grammatical forms differ, only pairs of masculine and nominalized role nouns that shared similar semantic context were selected to maintain compatibility. To adhere to such criteria, 20 participants (who did not participate in the main experiment) estimated for 133 role nouns the extent to which they were made up of either men or women on an 11-point rating scale (as done in Gabriel, Gygax, Sarrasin, Garnham, & Oakhill, 2008 and Misersky et al., 2014). One side of the scale corresponded to 100% male composition and the other side to 100% female composition. The scales were reversed for half of the participants. Of the role nouns that received a close-to-neutral rating (i.e., 50% women: stereotypicality rating: M = 5.63, SD = .5), 32 role noun pairs (32 for each grammatical form, hence 64 in total) were made that matched in semantic relatedness. Another 20 participants rated the semantic relatedness of each pair on a 7-point scale (1 = *highly unrelated* to 7 = *highly related*). Finally, 20 stereotypically neutral pairs of role nouns (40 role nouns in total: see Appendix A) that received the highest semantic relatedness scores (relatedness rating: M = 5.32, SD = .9) were chosen for the experimental stimuli. All masculine plural forms ended with *–er* suffixes (e.g., *die Käufer* [the buyers]) and the nominalized forms with *–en* suffixes (e.g., *die Konsumierenden* [those that consume]).

(1a) *Die Käufer / Die Konsumierenden* waren schon im Restaurant.

[*The buyers* / *The consumers* were already at the restaurant.]

(1b) Sie aßen.

[They ate.]

(1c) Es war offensichtlich, dass ein Teil der *Frauen* / *Männer* gut gelaunt war.

[It was obvious that some of the *women* / *men* were in a good mood.]

As both grammatical forms could be interpreted as generic, participants could potentially answer *yes* to all experimental passages. To prevent participants from developing response strategies, 20 filler sentences that elicited a clear *no* response were added to each grammatical form condition. The structure of the filler passages was identical to that of the experimental passages but established a semantic inconsistency (sentences [2a] to [2c]).

(2a) Die Professoren verbrachten die Pause in der Sonne.

[The professors spent the break in the sun.]

(2b) Sie genossen das schöne Wetter.

[They enjoyed the nice weather.]

(2c) Wegen des schlechten Wetters hatte die Mehrheit der Frauen einen Regenschirm.

[Because of the bad weather, the majority of the women had an umbrella.]

Four lists of 20 experimental passages were created such that each role noun appeared exactly once in each list, but in all four experimental conditions (grammatical form by gender continuation) across the lists. Thus, every list had five passages per condition. Each participant read a passage only once, and each passage appeared in each list in different conditions. All filler items were included in each list. To prevent grammatical structures from encouraging and emphasizing certain biases, passages were presented in a random order, blocked by grammatical form. Block order was counterbalanced across the lists.

Apparatus

Passages were presented using the Psyscope Software (Cohen, MacWhinney, Flatt, & Provost, 1993) on a Power Macintosh 4400 computer. A button box (with milliseconds accuracy) with buttons labelled "*Ja*" [yes] and "*Nein*" [no] was connected to collect participant response data. For each participant, the "*Ja*" button was adjusted so that it was always pressed by the participant's dominant hand.

Procedure

Participants were individually tested in a quiet room. Each passage began with a "****Bereit?****" [Ready?] prompt that prepared the participants for a new passage. Their task was to read the passages that appeared sentence by sentence on the computer screen in front of them. Participants had to press the "*Ja*" [yes] button in order for the following sentence to appear after reading each sentence. The last target sentence was presented in blue print to visually indicate that participants had to respond by deciding whether this last sentence was a sensible continuation of the previously read sentences by pressing either the "*Ja*" or "*Nein*" button.

After completion of the main experimental task, non-native German speaking participants were given a list of role nouns that had appeared in the experiment to translate from German into French. This was done in order to scrutinize any items that participants did not understand[2]. Native German speaking participants were only asked to identify role nouns they did not know in a given list. None were reported.

Results

Analyses were conducted only on the proportion of positive responses to the final target sentence (i.e., "yes, this sentence is a sensible continuation") and their response times[3]. All target sentences containing gender continuations (i.e., some of the men / women) were grammatically accurate to their preceding sentences, and therefore should have been responded with a positive *yes* response.

If the target sentences were difficult to comprehend, this was reflected in longer response times or through negative judgments (i.e., *no* responses indicating "this is not a sensible continuation"). For example, if a role noun in the masculine grammatical form in the first sentence (e.g., *die Käufer*$_{\text{masculine}}$ [the buyers]) were interpreted as being male-specific (i.e., only a group of male buyers given its masculine form) instead of a generic sense, a participant could have responded negatively to a target sentence with a female reference (i.e., some of the women).

For non-native German speaking participants, items for which they did not provide a translation in the role noun check task were regarded as unknown, and thus excluded from the analyses (in total, 19% of the data were excluded, with an average of six items per participant).

The data for the proportion of responses and response times were examined with a mixed ANOVA on participants (F_1) and item (F_2) means[4]. Reported means are reflective of F_1 analyses. The by-participant analyses were conducted considering *experimental order* (masculine form presented before nominalized form vs. nominalized form presented before masculine form) and *language group* (native German speaking vs. non-native German speaking) as between-participants and *grammatical form* (masculine form vs. nominalized form) as well as *gender continuation* (men vs. women) as within-participant variables. Item analyses were conducted with *language group, experimental order* and *gender continuation* as within-item variables, and *grammatical form* as between-item variables. Post-hoc tests were adjusted with Bonferroni corrections.

Proportion of Positive Responses

A significant main effect for *language group* indicated that the native German speaking group were more likely to respond positively (.74) than the non-native German speaking group (.54), $F_1(1, 84) = 624.38$, $p < .001$, $\eta^2 = .22$; $F_2(1, 38) = 56.98$, $p < .001$, $\eta^2 = .6$. The analysis, concurring with previous studies, also showed a main effect for *gender continuation*, $F_1(1, 84) = 6.08$, $p < .05$, $\eta^2 = .07$; $F_2(1, 38) = 6.22$, $p < .05$, $\eta^2 = .14$, that denoted a greater proportion of positive responses for *men* (.68) than *women* (.60) continuations. Most importantly, the effect was qualified by a significant *grammatical form* by *gender continuation* interaction (see Figure 1), $F_1(1, 84) = 6.44$, p

$< .05$, $\eta^2 = .07$; $F_2(1, 38) = 6.87$, $p < .05$, $\eta^2 = .15$, with post-hoc tests revealing that although participants manifested a greater male bias when role nouns were presented in the masculine form (men continuations = .71, women continuations = .57; $t(87) = 3.72$, $p < .001$) this bias disappeared when role nouns were presented in the nominalized forms (men continuations = .65, women continuations = .64; $t(87) = .17$, *n.s.*).

A *language group* by *experimental order* by *grammatical form* interaction approached marginal significance, although only in the by-participant analysis, $F_1(1, 84) = 3.67$, $p = .06$, $\eta^2 = .04$; $F_2(1, 38) < 1$ (see Table 1). Post-hoc pairwise comparisons revealed that responses to *grammatical form* did not differ in function of *experimental order* for non-native German speakers (masculine form: $t(43) = .09$, *n.s.*; nominalized form: : $t(43) = - .29$, *n.s.*), but differences were found for native German speakers. The proportion of native German speakers' responses to the masculine forms was lower when masculine forms were presented before nominalized forms than when nominalized forms were presented beforehand (masculine before nominalized form: .65; nominalized before masculine form: .80; $t(41) = - 2.79$, $p < .01$). However, responses to the nominalized form did not change in function of experimental order (masculine before nominalized form: .75; nominalized before masculine form: 77; $t(41) = - .25$, *n.s.*). These effects, focused on the order in which the masculine form was presented in native German speakers, could suggest that disambiguating the interpretation of the masculine form when presented first in a task such as ours was difficult. Consequently, this may have reduced the acceptance to any of the possible interpretations of the masculine form. In other words, the male-specific and generic interpretations of the masculine form compete, and as participants have to respond as fast as possible, no interpretation completely guides the cognitive system. However, there was an increase in response proportions for masculine forms when they were presented after nominalized forms. This could suggest that the processes involved when comprehending non-gendered nominalized forms may extend or spill-over in facilitating the acceptance to both gender interpretations of the masculine form (among native German speakers). Nonetheless, this experimental order effect showing an

increase in the acceptance of masculine forms, was not strong enough to completely alter the acceptance of specific gender continuations (as would be reflected in a higher order interaction also including *gender continuation,* i.e., *language group* by *experimental order* by *grammatical form* by *gender continuation* interaction, $F_1(1, 84) < 1$; $F_2(1, 38) < 1$). Consequently, as will be further argued in the Discussion section, this order effect should be considered with caution. No other main effects or interactions were significant (all $p > .1$).

Response Times

Following common psycholinguistic practice, response times were fitted onto a regression equation for each participant with sentence length as independent variables (Trueswell, Tanenhaus, & Garnsey, 1994). This accounted for differences in individual reading speed, while also taking sentence length of the stimuli into account. Negative response times indicate a faster response time than predicted, and positive response times indicate slower response times. Response times exceeding 2.5 standard deviations from each participant's mean were excluded from the analyses (2% of data for the native German speaking group and 2% for the non-native German speaking group).

There was a significant main effect of *language group*, with response times being faster for non-native German speakers (- 471 ms) than native German speakers (- 36 ms), $F_1(1, 84) = 12.4$, $p < .001$, $\eta^2 = .13$; $F_2(1, 37) = 38.99$, $p < .001$, $\eta^2 = .51$. Although significant only by by-participant analysis, the *gender continuation* effect was also consistent with the proportion of responses, showing that men continuations (- 361 ms) were accepted faster than women continuations (- 146 ms), $F_1(1, 84) = 5.76$, $p < .05$, $\eta^2 = .06$; $F_2(1, 37) = 2.25$, $p = .14$, $\eta^2 = .06$.

The anticipated *grammatical gender* by *gender continuation* interaction only trended towards marginal significance in the by-participant analysis, $F_1(1, 84) = 2.62$, $p = .11$; $F_2(1, 37) < 1$. Pairwise comparisons indicated that reading the masculine form resulted in faster approval of men (- 382 ms) than women (- 43 ms) continuations, $t(87) = - 2.81$, $p < .01$. In contrast, no differences between gender continuations (men continuations: -346 ms; women continuations: -259 ms)

resulted from reading nominalized forms, $t(87) = -.79$, *n.s.* Finally, an *experimental order* by *grammatical gender* interaction emerged, $F_1(1, 84) = 17.32$, $p < .001$, $\eta^2 = .17$; $F_2(1, 37) = 31.39$, $p < .001$ $\eta^2 = .46$. Post-hoc comparisons showed that when the masculine form was presented before the nominalized form, gender continuations following the nominalized form were faster than those following masculine forms (masculine forms: - 67 ms, nominalized forms: - 657 ms; $t(42) = 3.59$, $p < .001$). On the other hand, when nominalized forms were presented before the masculine form, acceptance of gender continuations following masculine forms was faster than those that followed nominalized forms (masculine forms: - 428 ms, nominalized forms: -115 ms, $t(44) = -3.05$, $p < .01$). These effects appear to be indicative of a training effect, in which responses to gender continuations following the grammatical form presented in the second half of the experiment were always responded to significantly faster than those following the grammatical form presented in the first half of the experiment. No other main effects or interactions were significant (all $p > .1$).

Discussion and Conclusion

Recent research on gender representation has provided consistent evidence that in grammatical gender languages such as German, mapping the male gender to a role noun is facilitated by the use of the default masculine form, whether it is intended as generic or not. This male bias suggests that information embedded in the surface structure of a noun has a definite role during gender representation. In the present study, we aimed to assess whether such a robust bias could be alleviated by employing neutral grammatical forms such as nominalized forms of adjectives and participles (i.e., nouns that are derived from adjectives and participles), and whether the main reliance of surface information still holds for non-native speakers.

The results of our study indicated a predicted and consistent global male bias, which was observed for both native German and non-native German speakers. These findings are consistent with our hypothesis that surface information, such as grammatical markings, has a substantial impact on readers' decisions about gender: grammatical masculine forms evoke male biased

representations and grammatical neutral forms evoke gender-neutral representations. These results speak to the idea that the language in which information is encoded guides readers' attention to specific pieces of information, which in turn, grounds the focus of comprehension processes (Slobin, 2003).

Importantly, these male-attenuating effects of nominalized forms manifested even for non-native German speakers, whose native language did not bear nominalized forms with a similar gender-neutral feature. Such findings suggest that new L2 grammatical forms that have or lack specific gender associations may be acquired in parallel with one's native language, to the point that they may impact readers' gender representations. These findings concur with those of Sato et al. (2013) who reported that bilinguals may alter their representational tendencies in function of the languages shifts they undergo during reading processes.

An important point that should be noted here, is the inconsistency of the results surfacing in our two measurements. The impact of the nominalized forms, as seen in the significant grammatical form by gender continuation interaction, was reflected in response proportions, yet the effect was moderately reduced in the response time measures as seen in the marginal significant effects. As was mentioned earlier, response proportions were considered to reflect readers' subjective judgments about gender, whereas response times were expected to reflect less-controlled processes. The fact that the response time measurements only indicated a moderated interaction of grammatical form and gender continuation could suggest the insufficiency of an automatic process to map neutral, non-gender representations, as opposed to the often-used masculine-generic form. Although our participants were fully knowledgeable with the nominalized forms tested, a few more years of habituation to these forms may be required for their processing to become automatic.

Nonetheless, these lines of evidence lend strong support for the idea that language is deeply responsible for guiding readers' attention to specific pieces of information given that readers need to attend to these linguistic regularities of the language. While the activation of a specific gender may not essentially be necessary to maintain local text coherence, the representation of gender has

been found to be automatic and difficult to avoid (Banaji & Hardin, 1996; Oakhill, Garnham, & Reynolds, 2005; Reynolds, Garnham, & Oakhill, 2006). However, the results of the present study suggest that although nominalized forms do contribute in suppressing gender biases, the processing of gender-neutral forms, in contrast to the frequently used masculine forms, are nonetheless complex.

Our results also showed a *language group* by *experimental order* by *grammatical form* interaction for the native German group in their response proportions. While we were able to posit a possible interpretation of an underlying mechanism, we suspect that given the lack of a statistically significant by-participant and by-items effect, as well as overall effect size, this interaction could have been suggestive of a statistical artefact and may therefore merit further exploration in future studies.

Processing the grammatical form of person nouns is intricate, as information associated with its surface structure influences gender representations. The current study showed that the use of nominalized forms can alleviate the robust male bias in grammatical languages, at least when *more* controlled processes are concerned. Although we observed a limited impact of these linguistic forms on less competent non-native speakers, they provide an attractive substitute for gender-balanced language forms when possible. Furthermore, we believe that assessing new gender-fair forms is crucial in an era where women's visible participation in society is fundamental.

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Notes

1. As past studies assessing masculine plural forms as generic have never reported any participant sex differences in evaluating similar sentence paradigms, we did not control for their sex, and therefore there are fewer male than female participants. In addition, two older participants (i.e. participants over the 2 *SD* age limit) were kept in the analyses, as the results did not change with or without their inclusion.
2. Following Sato et al.'s study (2013), the L2 proficiency levels of the non-native German speaking group was initially taken into account. This was realised by conducting a c-test (i.e., a cloze-type task found to be an efficient measure of L2 proficiency, e.g., Eckes & Grotjahn, 2006; Raatz & Klein-Braley, 1982) in the participants' L2 German. However, exploratory analyses did not show any effects of L2 proficiency, and was therefore excluded in subsequent analyses. These results are most likely due to the fact that general L2 proficiency levels of our non-native German sample were homogenous, and hence did not give rise to pertinent performance differences.
3. Although being grammatical neutral, the item *Laien* (instead of *die Laienhaften*), sharing a similar ending as other nominalized items, was mistakenly included as a nominalized form in the experimental design. The item was therefore excluded from the analyses.
4. In psycholinguistic studies, both analyses of participant (F_1) and item (F_2) means are reported. The former refers to the mean obtained per participant per condition (i.e., indicating differences in experimental manipulation), whereas the latter analysis calculates the mean per item indicating whether the experimental data is generalizable to other stimuli.

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Table 1. Means and standard deviations (in parentheses) of proportion of positive responses following each grammatical form according to experimental order for both language groups (collapsed across gender continuation).

		Native German speaking group	Non-native German speaking group
Masculine form	M–N	.65 (.19)	.54 (.24)
	N–M	.80 (.15)	.53 (.27)
Nominalized form	M–N	.75 (.21)	.57 (.29)
	N–M	.77 (.23)	.60 (.25)

Note: Experimental Order M–N = Masculine before nominalized form, N–M = Nominalized before masculine form

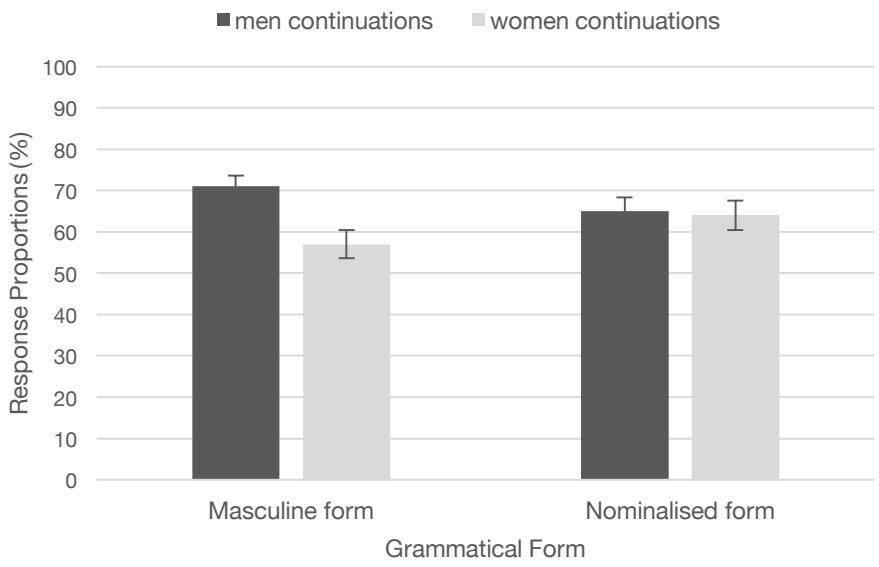

Figure 1. Proportion of positive responses for the native and the non-native German group in each grammatical form. Error bars indicate standard errors.

Appendix A. German non-stereotypical role nouns in the nominalized and masculine plural forms chosen for experimental items

English Translation	Nominalized Forms	Masculine Plural Forms
The married / spouses	die Verheirateten	die Ehepartner
The onlookers	die Schaulustigen	die Gaffer
The employees	die Angestellten	die Arbeitnehmer
The teachers	die Lehrpersonen	die Lehrer
The art lovers	die Kunstbegeisterten	die Kunstliebhaber
The consumers / buyers	die Konsumierenden	die Käufer
The tobacco addicts / smokers	die Tabak-Süchtigen	die Raucher
The learners / students	die Lernenden	die Schüler
The laypeople / beginners		die Anfänger
The animal lovers	die Tierliebenden	die Tierliebhaber
The diligent	die Fleissigen	die Streber
The doctors / academics	die Promovierenden	die Akademiker
The runners	die Rennenden	die Läufer
The old / retired	die Alten	die Rentner
The foreigners / strangers	die Fremden	die Ausländer
The trainees / employees	die Auszubildenden	die Mitarbeiter
The responsibles / managers	die Verantwortlichen	die Betreuer
The locals / residents	die Einheimischen	die Einwohner
The music-fans / musicians	die Musikbegeisterten	die Musiker
The travelers / frequent flyers	die Reisenden	die Vielflieger