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RESEARCH REPORT

Gender Affects Semantic Competition: The Effect of Gender in a Non-Gender-Marking Language

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English speakers tend to produce fewer pronouns when a referential competitor has the same gender as the referent than otherwise. Traditionally, this gender congruence effect has been explained in terms of ambiguity avoidance (e.g., Arnold, Eisenband, Brown-Schmidt, & Trueswell, 2000; Fukumura, Van Gompel, & Pickering, 2010). However, an alternative hypothesis is that the competitor's gender congruence affects semantic competition, making the referent less accessible relative to when the competitor has a different gender (Arnold & Griffin, 2007). Experiment 1 found that even in Finnish, which is a nongendered language, the competitor's gender congruence results in fewer pronouns, supporting the semantic competition account. In Experiment 2, Finnish native speakers took part in an English version of the same experiment. The effect of gender congruence was larger in Experiment 2 than in Experiment 1, suggesting that the presence of a same-gender competitor resulted in a larger reduction in pronoun use in English than in Finnish. In contrast, other nonlinguistic similarity had similar effects in both experiments. This indicates that the effect of gender congruence in English is not entirely driven by semantic competition: Speakers also avoid gender-ambiguous pronouns.

Keywords: reference, pronoun, gender, ambiguity, language production

Different languages encode different information in referring expressions. In gendered languages such as English, the referent's sex, or *gender* hereafter, determines the form of third-person singular pronouns (he vs. she), whereas in nongendered languages such as Finnish, the same pronoun (*hän*) is used to refer to both male and female entities. For theories of language production, this raises the question of whether and how differences in the languages affect the ways speakers take into account the properties of the referents (Pinker, 1989; Slobin, 1996).

In English, speakers tend to produce fewer pronouns relative to more explicit referring expressions like names (e.g., *Paul, Mary*) or definite descriptions (e.g., *the student, the teacher*) when the context includes an additional referential candidate (*competitor*) that has the same natural gender (hereafter *gender*) as the referent than when the competitor has a different gender (e.g., Arnold et al., 2000; Arnold & Griffin, 2007; Fukumura, Van Gompel, Harley, & Pickering, 2011; Fukumura et al., 2010). An obvious reason for this *gender congruency effect* may be that in English, a pronoun is ambiguous in a context with a same-gender competitor but not in a context with a different-gender competitor. Therefore, the effect results from the speaker's communicative effort to avoid gender-ambiguous pronouns (Arnold et al., 2000; Fukumura et al., 2010; Karmiloff-Smith, 1985). Indeed, evidence suggests that speakers are sensitive to referential ambiguity. Speakers tend to produce modified noun phrases (e.g., *small circle*) more frequently when unmodified bare nouns (e.g., *circle*) are ambiguous in the context (e.g., when the context contains a large circle) than when they are not (when the context contains a large triangle instead; e.g., Ferreira, Slevc, & Rogers, 2005; Horton & Keysar, 1996).

However, whether and the extent to which ambiguity avoidance determines the speaker's choice of linguistic form is controversial in language production research. For instance, whereas some researchers have shown that speakers avoid syntactic ambiguity (e.g., Haywood, Pickering, & Branigan, 2005; Kraljic & Brennan, 2003; Snedeker & Trueswell, 2003), others have found no evidence that speakers avoid syntactic ambiguity (e.g., Allbritton, McKoon, & Ratcliff, 1996; Ferreira & Dell, 2000). Thus, Arnold and Griffin (2007) provided a more speaker-centered interpretation for the effect of gender congruence in English. Arnold and Griffin argued that the gender congruency effect may not be due to ambiguity avoidance but to semantic competition. A same-gender competitor is semantically more similar to the referent than a different-gender competitor and hence competes more strongly, making the referent's representation less accessible. This semantic competition account fits well with many theories of reference that assume that the referent's accessibility determines the choice between a pronoun and more explicit expressions; the more acces-

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sible the referent, the more pronouns (relative to proper names or definite descriptions) speakers tend to produce (e.g., Ariel, 1990; Givón, 1983; Gundel, Hedberg, & Zacharski, 1993). The account is also consistent with a recent finding that speakers produce more pronouns when the referent is more accessible to them, regardless of how accessible it is to the addressee—that is, the speaker's choice between a pronoun and a repeated noun phrase is primarily driven by the referent's accessibility to the speaker rather than by his or her communicative effort to assist the addressee (Fukumura & Van Gompel, 2012).

Indeed, consistent with the semantic competition account, research suggests that similarity between referential candidates affects the choice of referring expressions. Fukumura and Van Gompel (2011) found that people produce fewer pronouns (relative to definite descriptions) when the referent and the competitor have the same animacy (e.g., both are human) compared with when they do not (e.g., the referent is human, whereas the competitor is inanimate and nonhuman) regardless of whether pronouns are ambiguous. Similarly, Fukumura et al. (2011) showed that congruence in situation-specific properties can also affect competition: When speakers had to describe a king getting off a horse, they tended to use fewer pronouns when a competitor was also sitting on a horse than when the competitor was standing. Fukumura et al. (2011) thus proposed a cue-based retrieval model, which claims that when initiating reference, speakers use the referent's features as retrieval cues to identify the referent's representation in the memory. When the competitor shares the referent's feature, on average, the referent's representation gets less accessible, because the shared feature sometimes activates the referent's representation but it activates the competitor's representation in other cases.

However, it is not clear whether gender congruence between the referent and a competitor also causes interference and reduces pronoun use independently from ambiguity avoidance, because the gender congruence effect in English may be due to ambiguity avoidance. One way of teasing apart these two possibilities is to test a nongendered language, where pronouns do not express gender, because the ambiguity avoidance account and the semantic competition account make different predictions. The ambiguity avoidance account assumes that gender congruence has an effect in English because it makes pronouns ambiguous. If a pronoun does not express the referent's gender so that the competitor's gender congruence does not affect the ambiguity of a pronoun, gender congruence should have no effect on the speaker's use of pronouns. According to the semantic competition account, however, gender congruence affects the choice of referring expressions because the competitor's gender congruence increases its similarity with the referent. That is, gender congruence should affect the choice of referring expressions even when pronouns are not gender marked.

We thus investigated the effect of gender in Finnish, which is a nongendered language: The pronoun *hän* does not express the referent's gender, so the use of *hän* is ambiguous in the presence of an additional character regardless of its gender congruence with the referent. Using the same method and materials as in Fukumura et al. (2011), we examined if Finnish speakers produced *hän* less often (or definite descriptions more frequently) when the competitor had the same gender as the referent than otherwise. Following a context sentence like Sentence 1 (below), participants referred back to the first-mentioned subject in Sentence 1 (*kuningas*, "king") when describing the character's action depicted in a photo (see Figure 1) to an addressee. For instance, the bottom halves of the photo panels in Figure 1 could typically be described as in Sentence 2 (below). The addressee could not see the bottom panels and had to act out the speaker's description using toys. The oblique object in Sentence 1 had either the same gender (*lentäjä*, "pilot") or different gender (*lentoemäntä*, "stewardess") from the referent and was also present in the photo.

1. Kuningas vieraili linnassa lentäjän/lentoemännän kanssa.

"The king visited the castle with the pilot/stewardess."

2. a. Kuningas laskeutui hevosensa selästä.

"The king got off his horse."

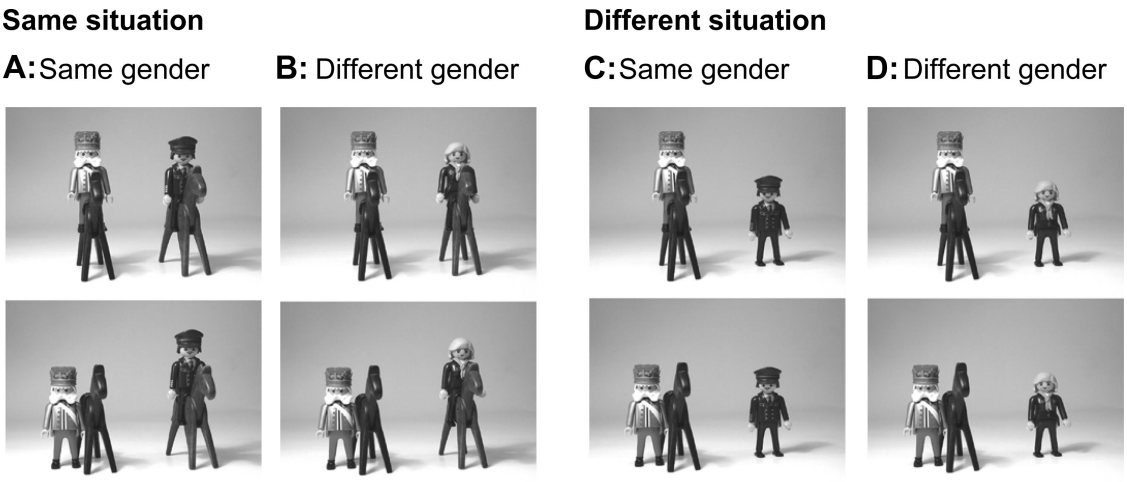

Figure 1. Example pictures by conditions. Adapted from "How Does Similarity-Based Interference Affect the Choice of Referring Expression?" by K. Fukumura, R. P. G. Van Gompel, T. Harley, and M. J. Pickering, 2011, *Journal of Memory and Language, 65,* p. 339. Copyright 2011 by Elsevier.

b. Hän laskeutui hevosensa selästä.

"He got off his horse."

In addition, as in Fukumura et al. (2011), we manipulated situation-specific similarity between the referential candidates: The characters either possessed the same object or did not possess it in the visual context. Figure 1 shows example stimuli. In Figure 1A and B the characters are in the same situation, because both are sitting on the horse, whereas in Figure 1C and D, they are in different situations, because only one character is sitting on the horse and the other is just standing. These situational properties (e.g., if an entity is or is not sitting on a horse) are expressed in neither Finnish nor English pronouns (*she, he, hän*). If the use of Finnish pronouns is also affected by semantic competition, Finnish speakers should be similarly affected by situational congruence as English speakers; that is, they should produce fewer pronouns (more repeated noun phrases) in the same-situation condition than in the different-situation condition. Importantly, if situational congruence affects the use of pronouns but gender congruence does not, then gender congruence should not affect semantic competition. That is, the gender-congruence effect is specific to languages where pronouns are gender marked and gender congruence affects ambiguity, supporting the ambiguity avoidance account. If the gender congruence affects semantic competition, however, Finnish speakers should produce fewer pronouns in the same-gender condition than in the different-gender condition.

Experiment 1

Method

Participants. Thirty-five undergraduate students were recruited from the University of Turku, Finland, in exchange for course credit. They were all native speakers of Finnish whose parents used only Finnish at home, were aged below 30 years, and were not dyslexic. Data from one participant, who reported to have received his primary education in English, were replaced by data from another participant. We also excluded two participants who produced neither pronouns (*hän*) nor repeated noun phrases in over 40% of all experimental trials. Thus, data from 32 participants were analyzed.

Materials, design, and procedure. These were the same as in Experiment 2 of Fukumura et al. (2011), except that the linguistic materials were translated from English into Finnish. Each item had a context sentence like that in Sentence 1, where the referent was always the subject (e.g., *kuningas* "king") and the competitor an oblique object in a prepositional phrase. In the same-gender conditions, the competitor had the same gender as the referent (e.g., *lentäjän,* "pilot," when the referent was *kuningas*), whereas in the different-gender condition, the competitor had a different gender from the referent (e.g., *lentoemännän,* "stewardess"). In order to make sure that participants knew the character's gender, we chose toy characters that had gender-specific or typical roles and had male or female visual features. Overall, the characters in the scene were quite dissimilar in terms of visual characteristics (e.g., color and type of clothing and physical characteristics) because we also wanted to ensure that they were easily distinguishable from each other, regardless of whether they were male or female. Figure 1A and 1C represent the same-gender conditions, and Figure 1B and 1D represent the different-gender conditions. In both conditions, the characters were either in the same situation (A and B; e.g., both are on a horse in the first panel) or in a different situation (C and D; e.g., only the referent is on a horse and the competitor is standing). The bottom half of each panel depicted the referent's subsequent action (e.g., getting off the horse).

We used a 2 (gender: same vs. different) × 2 (situation: same vs. different) repeated measures design. Together with the 30 filler items, which were also translated from Fukumura et al. (2011), the 24 sets of experimental items were distributed across four lists. Each list had six experimental items in each of the four Gender × Situation conditions, with one version of each item occurring in each list. Eight participants were randomly assigned to each list.

The participant and the confederate sat side-by-side at a table, each facing a computer screen. In the beginning of each trial, a photo of two toy characters (Figure 1, top panels) was presented on their computer screens. The confederate arranged the toys on the table as they appeared in the photo. Next, the participant read aloud the context sentence (Sentence 1), which was presented only on the participant's computer screen. The participant then saw a second photo (Figure 1, bottom panels), which appeared below the first photo, and described the scene to the confederate (Sentence 2), who could not see the photo. The confederate then had to act out the participant's description using the toys.

Scoring. We scored whether participants produced a pronoun (*hän*) or a repeated noun phrase when the referent was the subject in the first clause of their utterance. We excluded 8% of total responses ($N = 62$) from further analyses because participants inadvertently used the competitor's character role ($N = 15$), referred to nontargets ($N = 30$), produced neither pronouns nor repeated noun phrases ($N = 7$), did not start a new sentence (e.g., a Finnish equivalent of *And then drove away*; $N = 9$), or replaced a pronoun with a repeated noun phrase (e.g., *He tried to shoot with his gun, the Indian did*; $N = 1$).

Results and Discussion

Figure 2 presents the means. Because the dependent variable was categorical (pronouns vs. repeated noun phrases), we analyzed

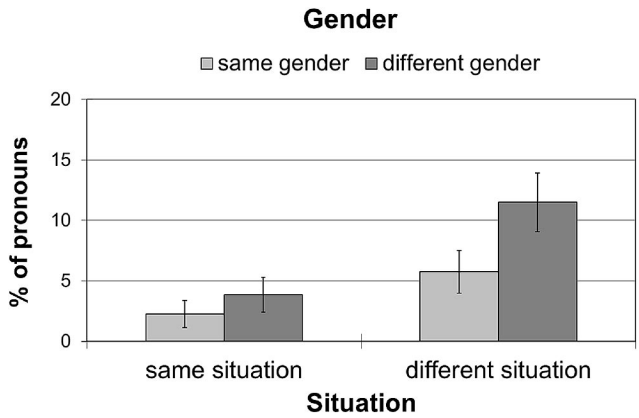

Figure 2. Mean percentages of pronouns out of all pronouns and repeated noun phrases (Experiment 1). Bars represent standard errors.

Table 1
Summary of the Fixed Effects for the Choice of Referring Expressions (Experiment 1)

Predictor	Coefficient	*SE*	*Wald Z*	*p*
(Intercept)	−4.49	0.49	−9.26	< .001
Gender	0.49	0.20	2.49	.013
Situation	0.65	0.21	3.14	.002

the data using logit mixed-effects modeling (Baayen, Davidson, & Bates, 2008; Jaeger, 2008). In keeping with traditional psycholinguistic research, however, we also conducted *F*1 and *F*2 analyses of variance (ANOVAs) on arcsin-transformed proportions of pronouns relative to repeated noun phrases, which also revealed the same pattern of results. Therefore, we report the results only from mixed-effects analyses, but for each critical finding, the values of eta-squared from *F*1 ANOVAs are included as an indication of the effect sizes. In all the analyses, we used log-likelihood ratio chi-squared tests to determine the random effect structure in the model including all the fixed variables, and to analyze the effects of predictors of interest. The analyses contained a by-subject or by-item random slope for any of the fixed factors if inclusion of it improved the model fit (Baayen et al., 2008). In Experiment 1, gender and situation were predictors of interest, which were both centered so that coefficients could be interpreted in a similar way to main effects and interactions in ANOVAs (Baayen, 2008). Neither by-subject nor by-item random slopes for either fixed factor significantly improved the model fit, so the analyses contained by-subject and by-item intercepts as random effects.

Inclusion of situation significantly improved the model fit (relative to a model containing only gender), $\chi^2(1) = 11.51$, $p < .001$, suggesting that Finnish speakers used fewer pronouns in the same-situation condition (3.1%) than in the different-situation condition (8.6%). Importantly, inclusion of gender congruence also significantly contributed to the fit of the model (relative to a model containing situation only), $\chi^2(1) = 6.69$, $p = .010$, with fewer pronouns in the same-gender condition (4.0%) than in the different-gender condition (7.6%). The interaction between gender and situation did not significantly improve the fit (relative to a model containing the two fixed effects only), $\chi^2(1) = 0.11$, $p = .740$. Table 1 contains the summary of the fixed effects in the final model.[1] The mean difference between the two gender conditions seems relatively small (4%), but we should note that Finnish speakers generally did not produce many pronouns (6%). Indeed, the value of eta-squared (η^2) for the gender congruence effect in the *F*1 ANOVA was .05 (partial eta-squared, η_p^2, which accounts for the number of variables in the data, was .220), which suggests that the effect was sufficiently robust, according to Cohen's (1988) classification.

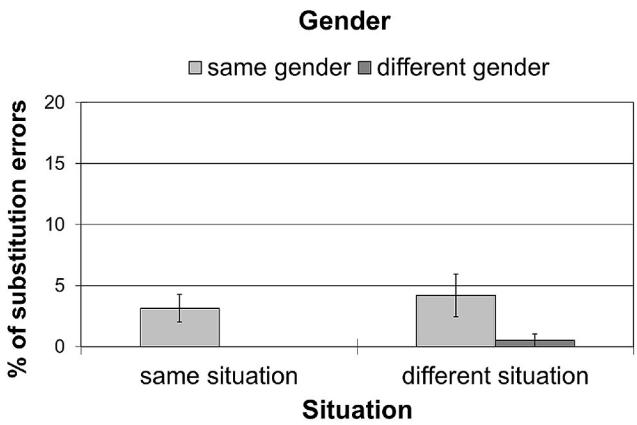

Figure 3. Mean percentages of substitution errors out of all trials (Experiment 1). Bars represent standard errors.

Table 2
Summary of the Fixed Effect for Substitution Errors (Experiment 1)

Predictor	Coefficient	*SE*	*Wald Z*	*p*
(Intercept)	−7.14	1.01	−7.07	< .001
Gender	−1.45	0.60	−2.41	.016

Furthermore, we analyzed substitution errors where participants mistakenly produced the competitor's role name (e.g., the Finnish equivalent of *The pilot, sorry, the king got off the horse*). Substitution errors have been assumed to be affected by competition among activated lexical candidates (e.g., Dell & O'Seaghdha, 1992; Levelt, Roelofs, & Meyer, 1999). We were interested in whether competition that affects the choice between pronouns and other expressions is affected by the same factors that influence lexical competition. Figure 3 shows the means. Because participants never produced speech errors in the same-gender/same-situation condition, coefficient estimates for the model including all the fixed effects suffered from complete separation, which refers to situations where logit approximation fails when the parameter estimate diverges to infinity (e.g., Field, Miles, & Field, 2012). Thus, we had to re-parameterize the analyses by dropping the Gender × Situation interaction, the variable that was causing the separation. The analyses contained by-subject and by-item random intercepts as random effects.

Gender significantly improved the fit of the model (relative to a model containing only situation), $\chi^2(1) = 14.36$, $p < .001$, suggesting that there were more substitution errors in the same-gender (3.7%) than in the different-gender (0.3%) condition ($\eta_p^2 = .289$). In contrast, inclusion of situation did not improve the model fit (relative to a model containing only gender), $\chi^2(1) = 0.42$, $p = .517$ ($\eta_p^2 = .036$). Table 2 summarizes the fixed effect in the final model.[2]

In summary, like English speakers (e.g., Arnold & Griffin, 2007; Fukumura et al., 2010, 2011), Finnish speakers produced fewer pronouns when the competitor had the same gender as the referent than otherwise. Because pronouns do not express gender in Finnish, the effect cannot be due to ambiguity avoidance. Instead, the results support the semantic competition account: A same-gender competitor makes the referent's representation less accessible compared with a different-gender competitor. In addition, we found that gender congruence had an effect on substitution errors: Speakers erroneously produced the competitor's role name when the competitor had the same gender as the referent more

[1] The coefficients for all the fixed factors are provided in Appendix A.
[2] The coefficients for all the main effects are provided in Appendix B.

often than when it had a different gender. Interestingly, situational congruence had no effect on substitution errors. We come back to these findings in the General Discussion.

Experiment 2

Experiment 2 investigated whether the gender congruence effect in English is entirely driven by semantic competition or whether ambiguity avoidance also plays a role. We asked Finnish native speakers to take part in the English version of this experiment (Fukumura et al., 2011). If gender congruence also affects ambiguity avoidance, the competitor's gender congruence should more severely reduce the use of pronouns in English (Experiment 2) than in Finnish (Experiment 1), because gender congruence makes the use of pronouns ambiguous in English, but not in Finnish. In contrast, if the gender congruence effect in English is purely nonlinguistic, the effect should be similar whether pronouns are gendered (Experiment 2) or not (Experiment 1). Critically, in neither English nor Finnish are situational properties (whether someone is sitting on a horse) linguistically marked on pronouns. Thus, situational congruence should similarly influence pronoun use, whether participants speak in English or Finnish.

Method

Participants. Thirty-eight Finnish native speakers from the same population as in Experiment 1 took part in exchange for cash or course credit. They reported that both of their parents spoke only in Finnish at home and they learnt English as a foreign language through Finnish-speaking school education. To ensure that our participants were sufficiently proficient in English, we administered an English test after the experiment (Oxford Placement Test, Part 1; Allan, 1992). Six participants who scored lower than 70% in the test were excluded from the analyses. The average score of the remaining 32 participants was 83% (SD = 8%).

Materials and procedure. These were the same as in Fukumura et al. (2011).

Scoring. We scored whether participants produced a pronoun (*she* or *he*) or a repeated noun phrase. We excluded 6% of total responses (N = 43) because participants inadvertently used the competitor's character role (N = 7), referred to the nontarget first (N = 17), produced neither pronouns nor repeated noun phrases (N = 6), did not start a new sentence (N = 3), replaced a pronoun with a repeated noun phrase (N = 9), or misread the context sentence (*policeman* instead of *policewoman*; N = 1).

Results and Discussion

We compared the number of pronouns and repeated nouns produced in Experiment 2 with those produced in Experiment 1. Figure 4 shows the means. The analyses included by-participant and by-item intercepts and a by-participant random slope for situation. Experiment (Experiment 1 vs. Experiment 2) was a between-participants and within-item fixed factor, and gender and situation were within-participant and within-item fixed factors.

Overall, inclusion of experiment significantly improved the model's fit (relative to a model containing gender and situation only), $\chi^2(1) = 24.74$, $p < .001$, suggesting that participants used somewhat more pronouns in Experiment 2 (28%) than in Experiment 1 (6%). One possible reason for this is that Finnish third-person pronouns were always ambiguous whenever the context contained more than one human entity, so participants generally avoided pronouns in Finnish. Both gender congruence, $\chi^2(1) = 81.34$, $p < .001$, and situational congruence, $\chi^2(1) = 7.57$, $p = .006$, significantly contributed to the fit. Most important, the addition of the Gender × Experiment interaction significantly improved the fit (relative to a model that contained only the Gender × Situation and Situation × Experiment interactions), $\chi^2(1) = 4.46$, $p = .035$, whereas inclusion of the Situation × Experiment did not improve the fit (relative to a model with the two other interactions), $\chi^2(1) = 0.001$, $p = .970$. Consistent with these, in the $F1$ ANOVA, the value of η_p^2 for the Gender × Experiment interaction was .232, whereas the η_p^2 for the Situation × Experiment interaction was .028. This suggested that the effect of gender congruence was significantly larger in Experiment 2 (21%; $\eta_p^2 = .496$) than in Experiment 1 (4%; $\eta_p^2 = .220$), whereas the effect of situation was similar in Experiment 2 (11%; $\eta_p^2 = .244$) and in Experiment 1 (6%; $\eta_p^2 = .144$). Neither the Gender × Situation interaction (relative to the model with the two other interactions), $\chi^2(1) = 0.62$, $p = .432$, nor the three-way interaction (relative to the model with the three 2-way interactions), $\chi^2(1) = 0.04$, $p = .851$, significantly improved the fit. Table 3 summarizes the final model.[3]

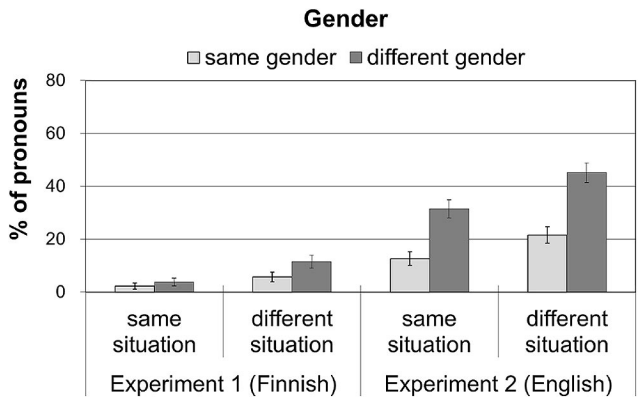

Figure 4. Mean percentages of pronouns out of all pronouns and repeated noun phrases in Experiment 1 (Finnish) and Experiment 2 (English) by Finnish native speakers. Bars represent standard errors.

In sum, although participants generally produced more pronouns when they spoke in English than when they spoke in Finnish, congruence in situation-specific properties similarly influenced the use of pronouns in both languages, perhaps because situational congruence was purely a nonlinguistic variable. In contrast, the effect of gender congruence was significantly larger when participants had to speak in English. This difference cannot be explained by semantic competition, because the degree of similarity between the referential candidates was the same in both experiments. Ambiguity avoidance can, however, explain the difference: Because the competitor's gender congruence made the use of pronouns ambiguous in English, speakers avoided gender-ambiguous pronouns in English, which led to a larger reduction in pronoun use in the same-gender condition in English.

[3] See Appendix C for the coefficients for all the fixed effects.

Table 3
Summary of the Fixed Effects in the Comparison of Finnish (Experiment 1) and English (Experiment 2)

Predictor	Coefficient	*SE*	*Wald Z*	*p*
(Intercept)	−3.23	0.38	−8.54	< .001
Gender	0.79	0.12	6.64	< .001
Situation	0.51	0.13	3.84	< .001
Language	1.60	0.33	4.85	< .001
Gender × Language	0.24	0.12	2.06	.039

Table 4
Summary of the Fixed Effects in the Comparison of Finnish Native Speakers (Experiment 2) and English Native Speakers (Fukumura et al., 2011, Experiment 2)

Predictor	Coefficient	*SE*	*Wald Z*	*p*
(Intercept)	−1.38	0.33	−4.13	< .001
Gender	1.02	0.08	12.29	< .001
Situation	0.63	0.08	7.93	< .001
Speaker	−0.50	0.28	−1.76	.079

Although gender had an effect in both experiments, the impact may have been small relative to the results if English native speakers had participated. According to Slobin's (1996) thinking for speaking hypothesis, it is possible that native speakers of English have developed different message-encoding strategies from Finnish native speakers through their life-long experience with English, which obligatorily expresses gender in pronouns (cf. Boroditsky, Schmidt, & Phillips, 2003). That is, English native speakers might be more attentive to the gender of the referential candidates compared with Finnish native speakers. We, thus, examined whether the effect of gender congruence was modulated by the first language of the speakers (English vs. Finnish native speakers) by comparing Experiment 2 with the data from Fukumura et al. (2011, Experiment 2), where English native speakers took part.

Figure 5 compares the means. Speaker (Finnish native speakers vs. English native speakers) was a between-participants and within-item fixed factor, and gender and situation were within-participant and within-item fixed factors, and as random effects we included by-participant and by-item intercepts. As before, both gender congruence, $\chi^2(1) = 170.90$, $p < .001$, and situational congruence, $\chi^2(1) = 64.78$, $p < .001$, contributed to the model. There was also a marginal tendency for Finnish native speakers to produce fewer pronouns (28%) compared with English native speakers (38%), $\chi^2(1) = 3.01$, $p = .083$. Importantly, the Gender × Speaker interaction did not significantly improve the model fit, $\chi^2(1) = 1.07$, $p = .301$, $\eta_p^2 = .042$, suggesting that the effect of gender congruence was similar for Finnish native speakers (21%) and English native speakers (30%). The inclusion of the Situation × Speaker interaction did not contribute to the fit, $\chi^2(1) = 2.05$, $p = .152$, $\eta_p^2 = .059$, either, suggesting that the effect of situation was similar for Finnish native speakers (11%) and English native speakers (19%). Neither the Situation × Gender interaction, $\chi^2(1) = 2.14$, $p = .144$, nor the three-way interaction, $\chi^2(1) = 2.02$, $p = .152$, significantly improved the model fit. Table 4 summarizes the final model.[4] In short, the analyses found no evidence that because Finnish does not express the referent's gender, Finnish speakers, when speaking in English, would be unable to attend or use gender information as well as English speakers.

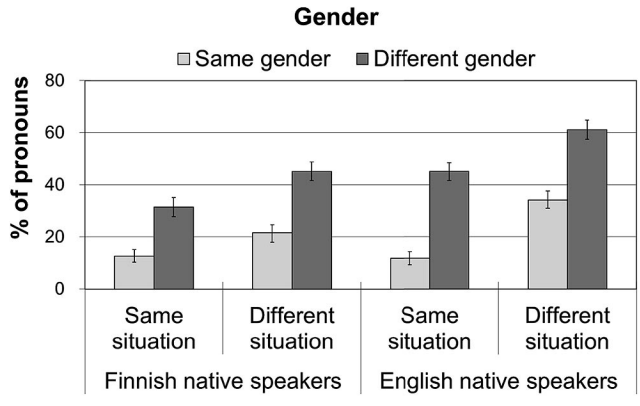

Figure 5. Mean percentages of pronouns out of all pronouns and repeated noun phrases in English by Finnish native speakers (Experiment 2) and English native speakers (Experiment 2 in Fukumura et al., 2011). Bars represent standard errors.

General Discussion

Experiment 1 showed that even in Finnish (a nongendered language) gender congruence between the referential candidates results in fewer pronouns. The results suggest that the effect of gender congruence on the use of English pronouns may at least in part be affected by semantic competition (Arnold & Griffin, 2007), in keeping with the growing body of evidence demonstrating that the choice of pronouns and repeated nouns is affected by the degree of similarity between the referential candidates (Fukumura et al., 2011; Fukumura & Van Gompel, 2011). According to Fukumura et al., higher similarity between the characters reduces the use of pronouns and increases the use of more explicit referring expressions such as definite descriptions, because the more similar the competitor is to the referent, the more strongly it interferes with the memory retrieval of the referent's nonlinguistic representation. To resolve the interference, speakers activate more specific features about the referent, leading to the production of semantically more constraining referring expressions. The fact that gender congruence reduced the use of Finnish pronouns suggests that gender is one of the nonlinguistic properties that speakers take into account, even when the language does not express the referent's gender and hence the presence of a same-gender competitor does not make the use of a pronoun ambiguous.

Interestingly, Experiment 1 showed that, whereas gender congruence affected substitution errors, situational congruence did not, even though both gender congruence and situational congruence affected the choice between pronouns and repeated noun phrases. Why did only gender congruence affect substitution errors? One possibility is that gender is not only a property of a person but also a property of the word that refers

[4] See Appendix D for the coefficients for all the fixed effects.

to her or him (e.g., *king*, *pilot*), such that gender congruence affects competition between the referential candidates as well as competition between lexical candidates or *lexical competition* (e.g., Levelt et al., 1999). In contrast, situation-specific properties such as sitting on a horse are not expressed in words, so similarity in those properties cannot affect lexical competition. This suggests that semantic competition that affects the choice of pronouns and repeated noun phrases may arise at a different production stage from the stage that affects lexical competition responsible for substitution errors: Whereas the choice of the referring expressions results from competition between *nonlexicalized* conceptual representations (so the overlap in both gender and situation-specific properties have an effect), substitution errors may originate from competition between conceptual representations of the activated words, so situation-specific properties that are not expressed in words have no effect on substitution errors.

By adapting Fukumura et al.'s (2011) cue-based retrieval model, Figure 6 illustrates semantic competition following situational congruence as well as gender congruence. As in Fukumura et al., we assume that in the speaker's memory, each person is represented in relation with features saliently associated with him or her, and the activation of these features guides memory retrieval of the referent, the ease of which then determines the choice between a pronoun and a more explicit expression. Although being male or female could be closely associated with other features, such as social roles (e.g., being a king) or visual characteristics (e.g., having a beard), and those features can help identify or reinforce the entity's gender representation, gender is a feature that is clearly separable from them: A person's gender does not completely determine the person's social role or visual characteristics (e.g., a male could be a king, a pilot, or a nurse, and they could be bearded or nonbearded). Thus, we assume that like other features (e.g., being on a horse), gender has its own designated memory node, and its activation can independently influence the memory retrieval of the person's representation; that is, even if the characters had social roles or visual characteristics that are gender atypical, gender congruence should have an effect, as long as the gender information is saliently represented in the speaker's message representation.

According to this model, when the referent and the competitor are both male, the activated gender node *being male* causes interference, leading to fewer pronouns, because by virtue of the link between the competitor's person node and the gender node, *being male* can activate the competitor's person representation instead of the referent's. But if *being male* is a unique feature of the referent, there will be no link between the competitor's person node and the activated gender node, so the activation can only strengthen the referent's person representation, increasing the use of pronouns. Note that the diagram also includes memory nodes for lexical representations. The model assumes that the representation of each person is connected to the corresponding lexical representations via the features that both the person and the word are associated with, and the activated feature node shared between the referent and the competitor can cause competition between the lexical representations if that feature node is connected to the lexical representations. In this diagram, *being male* is connected to the referent and the competitor's person representations as well as to the lexical nodes for KING and PILOT. Thus, the activation of *being male* can cause competition during the person recognition process as well as during the lexical retrieval process. In contrast, the property of *being on a horse* is connected to the person nodes of the referent and the competitor, but not to the lexical representations for these characters. Therefore, whereas gender congruence can affect lexical competition between KING and PILOT, causing substitution errors, similarity in situation-specific properties cannot affect the competition between them.

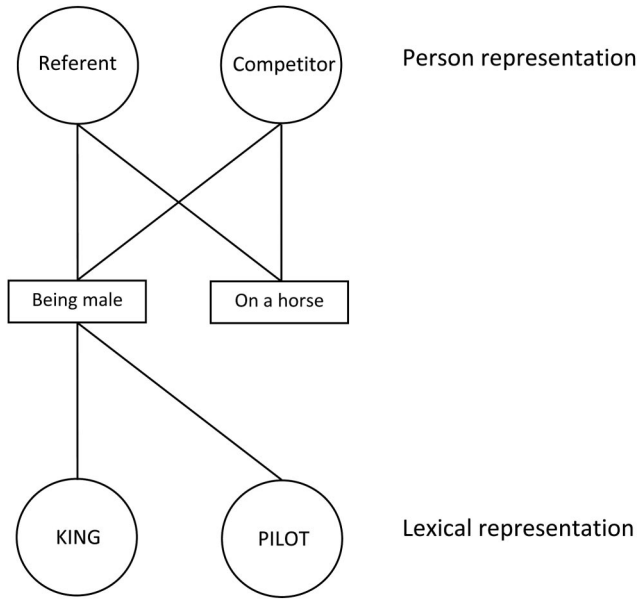

Figure 6. Diagram of competition at the level of person representation and lexical representation.

Experiment 2 showed that the gender congruence effect in English is not entirely due to semantic competition. There was a larger gender congruence effect when Finnish native speakers had to speak in English than when they spoke in Finnish, whereas situation-specific similarity had similar impacts in both languages, indicating that in addition to semantic competition, ambiguity avoidance had an effect in English. Ferreira et al. (2005) argued that speakers can avoid nonlinguistic ambiguity fairly effectively, whereas they often fail to avoid linguistic ambiguity. In their study, when the context contained more than one entity from the same semantic category (e.g., two flying bats in the context), speakers almost always modified the referent using size adjectives (*large bat*), but they often failed to do so when the competitor had a different semantic category (a flying bat vs. a baseball bat). When two entities had the same identity, it was obvious to speakers that the two entities had the same linguistic label and hence producing unmodified bare nouns would cause ambiguity, whereas when the entities had different identities, it was less obvious that unmodified nouns were ambiguous. Therefore, ambiguity avoidance is easy if ambiguity can be detected in the speaker's nonlinguistic representation.

Gender ambiguity of English pronouns may be what Ferreira et al. (2005) called nonlinguistic ambiguity, because the gender marked on an English pronoun is based on natural gender, which is a nonlinguistic property. We know from Experiment 1

that speakers are sensitive to the characters' gender congruence even when gender is not expressed in a pronoun, perhaps because, as discussed earlier, gender congruence intensifies competition between referential candidates by erroneously activating the referential competitor. Thus, if speakers have metalinguistic knowledge that gender congruence makes English pronouns ambiguous, they may become easily aware of ambiguity in the presence of a same-gender competitor. Consistent with this, Experiment 2 showed that Finnish native speakers and English native speakers were similarly affected by gender congruence in English, suggesting that Finnish native speakers avoided gender ambiguous pronouns as effectively as English native speakers. Speakers are generally sensitive to the gender of the referential candidates even when the language does not express gender, which is why gender congruence between the referential candidates affects the use of pronouns in Finnish. But if speakers know that the language in use expresses the referent's gender and hence the competitor's gender congruence causes referential ambiguity, speakers can take that into account to avoid ambiguity, which results in a larger gender congruence effect in English than in Finnish.

That speakers avoid gender ambiguous pronouns in English appears to be partly in contrast with the literature on syntactic ambiguity avoidance, where some studies have shown that speakers do not avoid ambiguity. For instance, Ferreira and Dell (2000) found that the insertion of an optional *that* is unaffected by whether the sentence contains a temporal ambiguity, as in *The coach knew you missed practice,* or does not contain ambiguity, as in *The coach knew I missed practice*. One possibility for this is that syntactic ambiguity is not immediately obvious to speakers, whereas referential ambiguity is, perhaps because the presence of a referential competitor highlights that more than one interpretation is possible. Interestingly, studies that have found evidence for syntactic ambiguity (Haywood et al., 2005; Kraljic & Brennan, 2005; Snedeker & Trueswell, 2003) have commonly used referential communication tasks. For instance, Haywood et al. found that syntactically ambiguous instructions, such as *Put the penguin in the cup on the star*, where *in the cup* could be either a modifier for *the penguin* or the destination of the act denoted by the verb, were less frequent (as opposed to unambiguous utterances such as *Put the penguin that's in the cup on the star*) in a context with more than one referential candidate (two penguins) than in a context with only one referent (one penguin). Perhaps speakers produce relative clauses like *that's in the cup* more often in the referential context with two penguins, because *that* relative clauses are more constraining than prepositional phrases like *in the cup*, which could be used attributively rather than restrictively, meaning that they do not always contrast the target against a set of alternatives. In other words, the speaker's sensitivity to referential ambiguity could help avoid syntactic ambiguity even when the speaker may not be aware of syntactic ambiguity per se.

To conclude, the current study provides the first demonstration that two referents of the same gender compete and affect the use of pronouns even in Finnish, a nongendered language. We also found that the competitor's gender congruence reduces pronoun use more greatly in English than in Finnish, whereas congruence in situation-specific properties similarly affect pronoun use in both languages. This suggests that gender congruence also affects ambiguity avoidance in English. Presumably, speakers can avoid gender ambiguous pronouns effectively in English, because gender congruence affects semantic competition, helping speakers become aware of the ambiguity of the to-be-produced pronoun within their nonlinguistic representation.

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Appendix A

Coefficients for All the Fixed Effects in Experiment 1

Predictor	Coefficient	*SE*	*Wald Z*	*P*
(Intercept)	−4.50	0.49	−9.25	< .001
Gender	0.47	0.22	2.15	.032
Situation	0.63	0.21	2.96	.003
Gender × Situation	0.07	0.22	0.32	.748

Appendix B

Coefficients for Gender and Situation in the Speech Error Analysis in Experiment 1

Predictor	Coefficient	*SE*	*Wald Z*	*p*
(Intercept)	−7.08	1.00	−7.10	< .001
Gender	−1.45	0.60	−2.42	.015
Situation	0.20	0.32	0.62	.534

(*Appendices continue*)

Appendix C

Coefficients for All the Fixed Effects in the Comparison of Finnish (Experiment 1) and English (Experiment 2)

Predictor	Coefficient	*SE*	*Wald Z*	*p*
(Intercept)	−3.22	0.38	−8.49	< .001
Gender	0.76	0.13	6.11	< .001
Situation	0.46	0.15	3.03	.002
Language	1.60	0.33	4.85	< .001
Gender × Situation	0.10	0.12	0.78	.435
Gender × Language	0.26	0.12	2.09	.037
Situation × Language	0.01	0.15	0.07	.944
Gender × Situation × Language	−0.02	0.12	−0.19	.853

Appendix D

Coefficients for All the Fixed Effects in the Comparison of Finnish Native Speakers (Experiment 2) and English Native Speakers (Fukumura et al., 2011, Experiment 2)

Predictor	Coefficient	*SE*	*Wald Z*	*p*
(Intercept)	−1.38	0.33	−4.14	< .001
Gender	1.03	0.09	12.12	< .001
Situation	0.64	0.08	7.81	< .001
Speaker	−0.44	0.28	−1.57	.117
Gender × Situation	−0.11	0.08	−1.39	.164
Gender × Speaker	−0.10	0.08	−1.23	.218
Situation × Speaker	−0.14	0.08	−1.70	.089
Gender × Situation × Speaker	0.12	0.08	1.43	.152

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