

## The Absence of a Gender Congruency Effect in Romance Languages: A Matter of Stimulus Onset Asynchrony?

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Using the picture–word interference paradigm, H. Schriefers and E. Teruel (2000) found that in German the grammatical gender of the distractor word affects the production of phrases composed of article+picture name: Latencies were longer for picture–word pairs of different genders. However, the effect was found only at positive stimulus onset asynchronies (SOAs; i.e., when pictures were presented 75 or 150 ms earlier than word distractors). This gender congruency effect is not obtained in Romance languages. The present article examines whether in these languages, as in German, the effect appears at positive SOAs. No effect was observed in Italian and Spanish at positive SOAs. An account is proposed to explain why the gender congruency effect is obtained in Germanic (Dutch and German) but not in Romance languages.

In the picture–word interference paradigm, participants are asked to name a picture (or a color) and ignore a word appearing concomitantly. Naming latencies increase significantly as an effect of distractor presentation. Word distractors are believed to disrupt the process of word production; and consistent with this hypothesis, the picture–word interference paradigm is viewed as an opportunity to elucidate the mechanisms involved in word production. Different types of picture–word relations (e.g., semantic, as in the pair *chair–stool*, or phonological, as in the pair *chair–chain*) have been used to reveal various aspects of lexical production. Schriefers (1993) explored the effects of syntactic relation, as a window on the processes of grammatical feature selection in noun phrase production. In Schriefers’s experiments, Dutch speakers produced noun phrases—for example, phrases composed of article+picture name (e.g., *de stoel* [the chair]). On some trials, pictures and distractors had the same gender; on other trials, their gender was different. Dutch nouns have one of two grammatical genders, either the so-called common gender or the neuter gender. Gender is involved in agreement and, along with other grammatical features, dictates the form of the articles and other words that agree with the noun. Thus, nouns that are singular and have common gender take the article *de* (e.g., *de stoel* [the chair]), whereas nouns that are singular and neuter take the article *het* (e.g., *het boek* [the book]). Schriefers obtained a sizable gender congru-

ency (GC) effect: Responses were faster for picture–word pairs with the same rather than a different gender.

Two aspects of the GC effect have been addressed in the literature. One issue concerns the causes of the GC effect—whether word distractors disrupt the selection of the gender feature, the selection of the article form, or both. The other issue, which is the focus of our article, concerns the discrepant results obtained in German and Romance languages. Whereas the GC effect has been reported in a number of studies in Dutch (La Heij, Mak, Sander, & Willeboordse, 1998; Schriefers, 1993; van Berkum, 1997) and recently in German (Schiller & Caramazza, 1999; Schriefers & Teruel, 2000), it has not been found in four Romance languages—Italian (Miozzo & Caramazza, 1999), French (Alario & Caramazza, 2002), Catalan (Costa, Sebastian-Galles, Miozzo, & Caramazza, 1999), and Spanish (Costa et al., 1999). These contrasting results have been interpreted to reflect cross-language differences in the information needed for selecting article forms (see, e.g., Caramazza, Miozzo, Costa, Schiller, & Alario, in press). In German and Dutch, article forms depend on two types of features—semantic–syntactic features (number [singular vs. plural]–definiteness [definite vs. indefinite article]) and lexical features (the noun’s gender). Once semantic–syntactic and lexical features have been specified, article-form selection can take place. Article selection is more complex in Italian, French, Catalan, and Spanish, where phonological features also dictate the form of the article. In Italian, for example, masculine nouns starting with a vowel, an affricate, *s* plus a consonant, or *gn* agree with the article *lo* (the plural is *gli*); in all other cases, the correct form is *il* (the plural is *i*). It is not until the phonology of nouns and adjectives has been selected from the lexicon and inserted into their corresponding positions in the phonological phrase that all the features necessary for article selection become available. In short, in Dutch and German, lexical and semantic–syntactic features are sufficient for article selection; in contrast, in Romance languages, article selection also needs information that is available later (at the level of phrasal phonology). These differences could provide the basis

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for explaining the cross-linguistic discrepancies observed with the GC effect. In Dutch and German, events that perturb the selection of lexical and semantic–syntactic features would interfere with article processing. In Romance languages, because article selection has to be deferred until phonological phrase information is available, the interference caused by gender-incongruent distractors may have dissipated by the time article selection takes place. A GC effect would be visible in Romance languages only if the time to resolve the interference produced by the gender-congruent distractors exceeded the time necessary for acquiring the critical information from the phonological phrase.

This explanation of the contrasting results in German and in Romance languages has two important implications: (a) It reveals that the process for article selection varies across languages, in part because of the differential role played by phonology, and (b) it predicts that the GC effect is not observable in languages in which article selection depends on information available at the phonological phrase level. The explanation presented above has been called into question by the results recently obtained by Schriefers and Teruel (2000) in German. They reported a GC effect only at positive stimulus onset asynchronies (SOAs)—that is, when distractor presentation was delayed by 75 or 150 ms with respect to picture appearance. These results contrast with the findings in Dutch,<sup>1</sup> in which the effect was obtained at negative or 0 SOAs, and they raise the possibility that there might be conditions in which the GC effect appears at positive SOAs. Because the GC effect was only tested at 0 SOA in the Romance languages, the results of Schriefers and Teruel (2000) raise the possibility that a GC effect was not observed in those languages because the right SOA was not tested. As argued by Schriefers and Teruel (2000), “a definitive conclusion on the absence of a gender interference effect in a given language should preferably be based on experiments with systematic manipulation of SOA” (p. 1372). It could be argued, therefore, that it is unclear whether the GC effect is subject to genuine cross-linguistic variation or whether past failures to observe the effect in Romance languages result from inappropriate SOA selection. The experiments presented here addressed this issue by examining the GC effect at positive SOAs in two Romance languages—Italian and Spanish.

### Experiment 1: Is There a GC Effect in Italian at Positive SOAs?

The objective of Experiment 1 was to reproduce, in Italian, the conditions that led to the observation of a GC effect in German (Schriefers & Teruel, 2000). At the positive SOAs at which the effect was observed in German, the effect of semantically related distractors disappeared. Therefore, in Italian, we showed pictures and written distractors at various SOAs (0, +100, and +200), and in one condition we included semantically related distractors (e.g., *carrot–onion*). Because we had previously found that the materials and procedure used by Miozzo and Caramazza (1999; Experiments 1 and 2) elicited a robust semantic effect at 0 SOA, we used the same materials and procedure in Experiment 1. As in the experiment of Schriefers and Teruel (2000), Italian speakers responded by producing determiner+noun phrases.

### Method

**Participants.** Fifteen native Italian speakers and students at the University of Padua took part in the experiment. They were paid for their participation.

**Material and procedure.** A detailed description of the material and the procedure can be found in Miozzo and Caramazza (1999, Experiments 1 and 2); here, we illustrate the main features. We selected two sets of pictures, Set 1 and Set 2, composed of 22 and 30 items, respectively. Half of the pictures and the distractors had feminine names, and the other half had masculine names that agreed with the article *il*. An equal number of gender-congruent and gender-incongruent pairs were shown in Set 1 (44 pairs) and in Set 2 (30 pairs). In Set 1, half of the pairs were semantically related (see examples in Table 1). Twelve additional filler picture–word pairs were used as warm-up items. The picture–word pairs were shown three times, at 0, +100, and +200 SOAs. For each SOA, we prepared two pseudorandomized lists, which were presented to an equal number of participants. The procedure for stimulus presentation varied across SOAs: At 0 SOA, pictures and words appeared together, whereas at positive SOAs, pictures preceded words by 100 or 200 ms. At all SOAs, stimuli remained in sight until a response was provided, up to a maximum of 700 ms. Thus, the period of time in which pictures and words were shown simultaneously differed across SOAs (700 ms at 0 SOA, 600 ms at +100 SOA, and 500 ms at +200 SOA). The experiment proper was divided into three parts, and in each part the items were presented at a given SOA. We used three orders of presentation, each shown to an equal number of participants. Response latencies were measured from the onset of the picture. For practice, the whole set of 55 pictures was divided into three blocks, each shown at 0, +100, and +200 SOAs, respectively. We analyzed three within-subject variables: semantic relatedness (related vs. unrelated pairs), target–distractor gender (same vs. different), and SOA (0, +100, and +200).

### Results and Discussion

Erroneous responses (disfluencies, incorrect naming, and recording failures; 2.4% of responses) and outliers (responses exceeding a participant’s mean by 3 standard deviations) were excluded from analyses. No differences were observed in the error analyses. In Set 1, responses were slower for related than for unrelated pairs,  $F_1(1, 14) = 14.4$ ,  $MSE = 681.5$ ,  $p < .01$ ;  $F_2(1, 21) = 10.7$ ,  $MSE = 1,463.0$ ,  $p < .01$ . The finding of signs of interaction between relatedness and SOA suggests that the semantic effect was modulated by SOA,  $F_1(2, 28) = 6.1$ ,  $MSE = 813.1$ ,  $p < .01$ ;  $F_2(2, 42) = 2.9$ ,  $MSE = 2,223.8$ ,  $p = .06$ . The difference between related and unrelated picture–word pairs was reliable at 0 SOA,  $F_1(1, 14) = 16.7$ ,  $MSE = 1,093.0$ ,  $p < .01$ ;  $F_2(1, 21) = 15.4$ ,  $MSE = 1,651.8$ ,  $p = .001$ , but not at +100 SOA,  $F_1(1, 14) = 2.4$ ,  $MSE = 539.0$ ,  $ns$ ;  $F_2(1, 21) = 1.5$ ,  $MSE = 2,088.0$ ,  $ns$ , or at +200 SOA ( $F_s < 1$ ).<sup>2</sup> In Set 1, there was no main effect of distractor gender (congruent vs. incongruent distractors;  $F_s < 1$ ) nor an interaction between distractor gender and SOA,  $F_1(2,$

<sup>1</sup> Conflicting results have been obtained in German. Whereas Schriefers and Teruel (2000) found a GC effect only at positive SOA, Schiller and Caramazza (1999) consistently observed the effect only at 0 SOA. It should be noted that Schriefers and Teruel used auditory distractors, whereas Schiller and Caramazza used visual distractors.

<sup>2</sup> We presented distractors visually, whereas Schriefers and Teruel (2000) presented them auditorily. Damian and Martin (1999) showed that distractor modality may affect the time course of the semantic effect; they observed a semantic effect at 0 and negative SOAs with auditory distractors and at negative, 0, and positive SOAs with visual distractors. At positive SOA, we did not find a semantic effect with visual distractors. Our results are then different from those of Damian and Martin; crucially, however, they are in line with those replicated in a number of studies with auditory distractors (see Damian & Martin, 1999, for a review of these studies).

Table 1

Picture Naming Latencies (PNL; in ms) and Error Percentages as a Function of Stimulus Onset Asynchronies and Distractors in Experiment 1 (Italian)

Distractor	Example	Stimulus onset asynchrony					
		0		+100		+200	
		PNL	Error %	PNL	Error %	PNL	Error %
Set 1							
Semantically related							
Gender congruent	<i>limone</i> <sub>masculine</sub> [lemon]– <i>fico</i> <sub>masculine</sub> [fig]	771	1.8	770	3.3	712	2.7
Gender incongruent	<i>limone</i> <sub>masculine</sub> [lemon]– <i>pera</i> <sub>feminine</sub> [pear]	776	2.4	758	3.6	710	2.7
Gender congruency effect <sup>a</sup>			5		–12		–2
Semantically unrelated							
Gender congruent	<i>limone</i> <sub>masculine</sub> [lemon]– <i>polo</i> <sub>masculine</sub> [pole]	742	1.8	756	2.1	704	2.4
Gender incongruent	<i>limone</i> <sub>masculine</sub> [lemon]– <i>bara</i> <sub>feminine</sub> [coffin]	735	0.9	754	1.2	718	1.5
Gender congruency effect <sup>a</sup>			–7		–2		14
Semantic effect <sup>b</sup>			35		9		0
Set 2							
Semantically unrelated							
Gender congruent	<i>libro</i> <sub>masculine</sub> [book]– <i>ponte</i> <sub>masculine</sub> [bridge]	756	1.7	766	2.8	738	4.2
Gender incongruent	<i>libro</i> <sub>masculine</sub> [book]– <i>pasta</i> <sub>feminine</sub> [pasta]	750	2.2	771	3.3	739	2.6
Gender congruency effect <sup>a</sup>			–6		5		1

<sup>a</sup> Incongruent distractors minus congruent distractors. <sup>b</sup> Related distractors minus unrelated distractors.

28) = 1.2,  $MSE = 572.1$ ,  $ns$ ;  $F_2 < 1$ . An identical pattern emerged in Set 2: The  $F_s$  were less than 1 for distractor gender and its interaction with SOAs. In all the analyses, we found an effect of SOA ( $p < .01$ ), which is explained by the fact that responses became faster going from 0 to +100 to +200 SOAs.

In Experiment 1 we failed to observe a GC effect in Italian despite the fact that we were able to recreate the conditions that seemed critical for the appearance of this effect in German. One may attempt to explain our negative findings in Italian in terms of a power argument, which would hold that our experimental design did not have sufficient power to reveal a GC effect. It should be noted, however, that the semantic effect obtained in Experiment 1 has a size that is comparable to the one reported for the GC effect in German and Dutch. Thus, it seems that our experiment had the power to reveal effects of a size similar to the GC effect. Furthermore, a large set of stimuli (148) was used in our attempt to obtain a GC effect, and distractors were controlled for a variety of factors known to affect distractor interference (frequency, number of letters, grammatical class, and spatial position). These facts make it quite unlikely that our data result from the fortuitous selection of distractors that would mask a GC effect.

### Experiment 2: Is There a GC Effect in Spanish at Positive SOAs?

To strengthen our conclusion about the absence of a GC effect in Romance languages, we tested whether the effect can be found in Spanish at a range of SOAs (0, +100, and +200). Moreover, in one condition pictures were shown with superimposed Xs (X condition). This condition was introduced to determine the extent to which words interfere with lexical semantic processing. The finding of greater interference for word distractors than X distractors, provides evidence that word distractors affect lexical seman-

tic processing. If such effects can be shown, then the lack of a GC effect cannot be attributed to the fact that word distractors did not affect lexical processing. As in Experiment 1, speakers responded by producing the picture name and its article (*el* for masculine nouns; *la* for feminine nouns).

### Method

**Participants.** Eighteen native Spanish speakers and students at the University of Barcelona took part in the experiment in exchange for course credit.

**Material and procedure.** Each picture (50 total) was paired with (a) a gender-congruent noun, (b) a gender-incongruent noun, and (c) a row of four Xs. Half of the pictures were of feminine and half were of masculine nouns in Spanish. Distractors were semantically and phonologically unrelated to picture names. Congruent and incongruent distractors were matched for frequency and length ( $F_s < 1$ ). The procedure was the same as that used in Experiment 1. Analyses examined SOA (0, +100, +200) and distractor gender (congruent vs. incongruent) or SOA and distractor type (word vs. X distractors). All the variables were treated as within-subject variables.

### Results and Discussion

As can be seen in Table 2, responses did not differ significantly between gender-congruent and gender-incongruent distractors ( $F_s < 1$ ), nor did the effect of distractor gender change across SOAs, as indicated by the lack of interaction between the variables SOA and distractor gender ( $F_s < 1$ ). Naming latencies were faster at positive SOAs,  $F_1(2, 34) = 50.6$ ,  $MSE = 2,077.7$ ,  $p < .01$ ;  $F_2(2, 98) = 249.0$ ,  $MSE = 1,194.4$ ,  $p < .01$ . Responses were faster for X distractors than for word distractors at 0 and +100 SOAs ( $ps < .001$ ), whereas at +200 SOA there was only a nonsignificant trend. Finally, errors occurred with 4.6% of the responses and were less frequent with X distractors than with word distractors ( $ps < .01$ ).

Table 2  
*Picture Naming Latencies (PNL; in ms) and Error Percentages as a Function of Stimulus Onset Asynchronies and Distractors in Experiment 2 (Spanish)*

Distractor	Stimulus onset asynchrony					
	0		+100		+200	
	PNL	Error %	PNL	Error %	PNL	Error %
Gender congruent	672	5.4	630	5.3	567	3.3
Gender incongruent	674	4.8	631	5.6	565	3.2
Gender congruency effect <sup>a</sup>		2		1		-2
Xs	603	2.8	564	3.3	559	2.8

<sup>a</sup> Incongruent distractors minus congruent distractors.

With new material, we found no GC effect; more important, we did not find it at positive SOAs. These results were based on a large number of items, a fact that makes it unlikely that the absence of a GC effect reflects either a lack of power or oddities in the stimuli. The findings of longer response latencies and higher error rates for pictures paired to word distractors than to Xs indicate that word distractors affect lexical semantic processing. The latter result also allows us to reject the claim that the GC effect was not found at positive SOAs because distractors were presented too late to interfere with lexical processing. (Note that this conclusion can be extended to the Italian results of Experiment 1, because the same SOAs were used in Experiments 1 and 2.)

### Conclusions

The finding of a GC effect only at positive SOAs in German (Schriefers & Teruel, 2000) calls for a reexamination of the claim that this effect is not found in Romance languages. This claim had been based on studies showing the absence of a GC effect at 0 SOA. However, if GC effects could be found at positive SOAs and not at 0 SOA in German, then we could not be sure that the reported absence of a GC effect for Romance languages might not reflect only the fact that these studies did not test a large enough range of SOA values. The experiments reported here remedied this situation and examined whether a GC effect is found at positive

SOAs in Italian and Spanish. No effect was found in either language. Our data show that the absence of a GC effect in these languages is not a matter of SOA. Further, our data corroborate the claim that this effect varies across languages, presumably as a consequence of cross-linguistic discrepancies in article-selection processing. A precise characterization of how article selection takes place in German and Romance languages awaits further investigation.

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