

# **The Gender Congruity Effect: Evidence from Spanish and Catalan**

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In five picture-word interference experiments we explore the gender congruity effect observed in Dutch in two languages, Spanish and Catalan. Participants' performance was not affected by the relationship between the gender of the picture and the gender of the word. The results show that the gender congruity effect is not a universal effect, but varies from language to language, depending on crucial characteristics of the gender/determiner selection system used to process a given language. Consistent with the cross-linguistic hypothesis presented by Miozzo and Caramazza we argue that the retrieval of the noun's gender is enough to specify the determiner's phonological form in Dutch, but not in Catalan or Spanish, and this is the cause of the failure to replicate the Dutch results in these two languages.

## INTRODUCTION

The grammatical information needed to produce noun phrases (NPs) is not the same across languages. In many languages, one of the grammatical features needed to produce an NP is the gender of the noun. The retrieval of this grammatical property of the noun is necessary for the selection of

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the phonological form of determiners and the morphological suffixes of adjectives. However, in some languages the grammatical information is not enough to specify the determiner's form required for a given NP. In such languages, the phonological form of the determiner is specified by a complex interaction between the noun's grammatical properties and the phonological context in which the determiner is to be produced. Here we address the extent to which this interaction affects the way speakers of different languages retrieve the determiner form when producing NPs.

In a series of experiments, Schriefers (1993) explored the processes involved in the retrieval of the gender feature in Dutch. Dutch has a very simple gender/determiner system. The determiner *het* is used for nouns with neuter gender, and the determiner *de* is used for nouns with non-neuter gender (historically masculine or feminine; see van Berkum 1997). For plural nouns the determiner is always *de*, regardless of the gender of the noun. The noun's gender (and number) fully specifies the determiner form in an NP. In his study, Schriefers asked subjects to produce an NP for a given picture while ignoring the presentation of a distractor word. The relationship between the target's gender and the distractor's gender was manipulated. Schriefers argued that when the picture and the word have different genders there should be interference in the selection of the right gender since the gender selection mechanism encounters contradictory information. The results of his study were clear: subjects were slower initiating production of the NP when the picture and the distractor word had different genders than when they had the same gender. This gender congruity effect has been replicated for Dutch speakers by La Heij, Mak, Sander, and Willeboordse (1998) and by van Berkum (1997).

Schriefers located the interference effect at the level where gender selection takes place. However, the gender congruity effect might reflect competition in the retrieval of the proper determiner rather than competition at the gender selection stage (Miozzo & Caramazza, in press). In an attempt to distinguish between these two possibilities, Miozzo and Caramazza carried out a series of experiments in Italian. Italian is one of those languages in which the determiner form is specified by a complex interaction between grammatical and phonological properties. In order to produce the proper determiner, Italian speakers must access not only grammatical information (the gender of the noun) but also phonological information about the onset of the word following the determiner.<sup>1</sup> Italian has two determiner forms for feminine gender—*la* for singular and *le* for plural nouns; and it has four determiners for masculine gender—*il* and *lo* for singular, and *i* and *gli* for plural nouns. The choice of the proper

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<sup>1</sup> Other properties that must be accessed include number, mass/count, and definiteness information.

masculine determiner depends on the phonology of the word following the determiner. If the following word starts with a vowel, a consonant cluster like “s+ consonant” or “gn”, or an affricate, the determiner *lo* (*gli*) is required; in all the other cases, the determiner *il* (*i*) is selected.<sup>2</sup>

Although Miozzo and Caramazza used the same paradigm and fairly comparable conditions to those employed by Schriefers, they failed to replicate the gender congruity effect. In their experiments, the time required to produce a given NP was independent of the distractor’s gender. Miozzo and Caramazza argued that the explanation for these conflicting results may be found in the different roles played by phonological context in determining the selection of determiner forms in Dutch and Italian. Unlike Dutch, where the determiner form is fully specified by grammatical properties and can be selected and prepared for output immediately upon selection of the noun’s gender, in Italian, the selection of the right determiner must be delayed until the phonology of the following word is known.<sup>3</sup> In this situation, there might be enough time to resolve or compensate for any delay that may have arisen at the gender selection stage. So, according to Miozzo and Caramazza it is possible that in Italian, too, there is gender congruity interference at the level of gender selection but this effect is not detected because determiner forms are selected late enough to render the effect invisible.

In this report we explore the effects of gender congruity in determiner selection in Catalan and Spanish. The two languages differ in the extent to which they depend on phonological context for the selection of determiner forms. Therefore, they provide the opportunity for testing the cross-linguistic hypothesis proposed by Miozzo and Caramazza. In Catalan, the singular and plural determiners are respectively *el* and *els* for the masculine gender and *la* and *les* for the feminine gender. However, the form of the determiner depends on the phonological properties of the following word. When producing an NP in the singular, the phonological form of the determiner depends on whether the following word starts with a vowel or with a consonant. If it starts with a consonant the determiner forms will be *la* or *el* for feminine and masculine nouns, respectively; if it starts with a vowel the phonological realisation of the determiner form will be *l’*, for both female and masculine nouns. For example, the female determiner is *la* in the context of “casa” (*la casa*; the house) but it is realised as *l’* in the context of

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<sup>2</sup> Note, however, that the forms of the singular determiner *lo* (masculine) and *la* (feminine) are contracted into *l’* if the following word starts with a vowel.

<sup>3</sup> Because Italian allows some adjectives to be located prenominally the relevant phonological context for selecting the determiner is not always the noun’s onset but it can be the onset of the prenominal adjective (e.g., *lo scienziato* but *il grande scienziato*, the great scientist).

“ona” (*l'ona/lona/*, the wave). The same principle holds for masculine nouns. For example, “got” (glass) takes the determiner form *el* (*el got*, the glass) but “ull” (eye) takes the determiner *l'* (*l'ull/lui/*, the eye). Thus, in Catalan, as in Italian, specification of the phonological form of the determiner has to wait until the phonology of the next word in the noun phrase is known. In most cases this means the noun, but it can also be an adjective. In Catalan, adjectives usually occur post-nominally (e.g., *la casa blanca*, the white house). However, in some cases, as with possessives, adjectives may occur pre-nominally. Interposing an adjective between a determiner and a noun can affect the form of the determiner, as can be seen by comparing *el meu ull* (literally, the my eye) and *l'ull* (the eye). Thus, in Catalan as in Italian, the phonological form of the determiner is specified very late—at the point where the phonological properties of the following word in the noun phrase are known.

Spanish has also two genders, masculine and feminine. The singular and plural determiners are respectively *el* and *los* for the masculine gender, and *la* and *las* for the feminine gender. These forms are used in almost all phonological contexts. The one exception involves the feminine determiner when it is followed by a noun beginning with a stressed /a/. In these cases, the correct form is not *la* but *el* (the determiner typically used with masculine nouns). For instance, the feminine word *agua* (water) takes the determiner *el* although the adjective remains marked for feminine (*el agua fria*; literally, the water cold). However, these exceptions represent less than 0.5% of all contexts (percentage of feminine nouns starting with a stressed /a/). Nonetheless, in these very few cases, the selection of the correct form of the determiner can only be made when the phonological information about the following word in the phonological phrase becomes available.

In short, Catalan and Spanish are qualitatively similar to Italian in that phonological context contributes to the selection of determiner forms. However, if we were to order Catalan, Spanish, Italian and Dutch on a scale representing how frequently phonological context affects determine selection, Catalan would be placed close to Italian but Spanish would be very close to Dutch. These contrasting properties of Catalan and Spanish allow the opportunity to test the cross-language generality of the gender congruity effect reported by Schriefers. We address two issues. First, we assess Miozzo and Caramazza's (in press) claim that the gender congruity effect is not observed in languages in which determiner selection occurs late—that is, at the stage of phonological phrase construction. This hypothesis can be tested with Catalan. Will Catalan speakers perform like Italian or Dutch speakers in a gender congruity, picture–word interference task? If they do not show a gender congruity effect we would be able to conclude that the effect reported for Dutch speakers is not a universal

language effect but depends on language-specific properties of the gender/determiner system. Second, we address the issue of what constitutes a late-selection language. Spanish allows us to address this question. We have argued that Spanish is qualitatively like Italian and Catalan in that there are at least some contexts, albeit very few, in which determiner selection depends on phonological context. However, it is unlike these other languages in that the contexts that require the use of a “non-standard” determiner are extremely infrequent. Thus, Spanish is similar to Dutch in that in the vast majority of cases gender information alone (along with other grammatical/semantic properties) would suffice to pick the correct determiner form. If we fail to obtain a gender congruity effect in Spanish we would be able to conclude that it is not the absolute or relative number of contexts that require phonological information that determines the status of late-selection language but the mere existence of even a few cases.

We address these two issues in five experiments: two with Catalan speaking participants and three with Spanish speaking participants. Since the same paradigm and procedures were used in all five experiments we report the experiments together.

## METHODS

### Participants

The participants included in each experiment were always native speakers of either Spanish or Catalan. They were students at the University of Barcelona. They received course credit for their participation in the experiments.

### Materials

Half of the picture names were masculine and the other half were feminine. All the nouns start with a consonant and, therefore, the *la* and *el* determiner forms were required for feminine and masculine gender (for both Spanish and Catalan), respectively. The number of pictures shown in each experiment is reported in Table 1. Pictures were paired with two words (one masculine and one feminine) matched for frequency and length (see Table 1). The picture also appeared with a string of 6 Xs (control condition), except for Experiment 5. Picture–word pairs were neither phonologically nor semantically related. Pictures were presented in white outline on black background. The distractor words were shown in capital letters (Helvetica font, bold, 27 point), and were superimposed on the pictures.

## Procedure

Stimuli were presented in several blocks in a quasi-randomised order (pictures with the same gender could not appear more than twice in a row and no more than two trials from the same experimental condition in a row). Participants were instructed to name the pictures by producing a full NP (determiner+ noun). Before the experiment proper, participants were presented with the entire set of pictures along with their expected names. Participants performed a training block of 10 trials, followed by the experiment proper. Each trial had the following structure: (a) fixation point for 1 s, (b) blank interval of 500 ms, (c) the picture and the word were presented for 400 ms. If a response was not provided within 1.9 s, the next trial started automatically.

TABLE 1

Response language, Number (*N*) of Subjects, Number of Pictures, Distractors' Frequency and Length (number of letters) for Congruent (Cong.) and Incongruent (Incong.) Conditions, for all the five experiments

<i>Experiment Language (N Subjects)</i>	<i>N Pictures<sup>a</sup></i>	<i>Distractors' Frequency<sup>b</sup></i>		<i>Distractors' Length<sup>b</sup></i>	
		<i>Cong.</i>	<i>Incong.</i>	<i>Cong.</i>	<i>Incong.</i>
Experiment 1 Catalan (20)	50	1491	1416	5.4	5.5
Experiment 2 <sup>c</sup> Catalan (20)	20	856	856	5.6	5.6
Experiment 3 <sup>c</sup> Spanish (21)	20	169	169	6.3	6.3
Experiment 4 Spanish (20)	50	369	381	5.7	5.7
Experiment 5 Spanish (21)	50	369	381	5.7	5.7

<sup>a</sup>Each picture appeared twice: once paired with a word of different gender, and once paired with a word of the same gender.

<sup>b</sup>The difference between the frequency and length of the congruent and incongruent distractors was not significant in all the experiments (all the *F*s < 1). The frequency for the Catalan nouns was extracted from a 28 million word corpus (Rafel, 1996). The frequency for the Spanish nouns was extracted from a 6.5 million word corpus (Sebastian, Marti, Cuetos & Carreiras, 1996). In both cases the reported frequency corresponds to the number of times that a given word appears in the corpus.

<sup>c</sup>In Experiments 2 and 3 the same distractors were used for the congruent and incongruent conditions. In all the other experiments different distractors were used for congruent and incongruent conditions.

## Analyses

Errors (i.e., production of incorrect nouns/determiners, verbal disfluencies and recording failures) and outliers (i.e., responses exceeding three standard deviations from an individual subject's mean) were excluded from the analyses of response latencies.

## RESULTS

Table 2 shows the distribution of mean response latencies and error rates as a function of type of distractor (same gender, different gender) for the five experiments. Mean latencies with gender-congruent and -incongruent pairs were statistically similar in all cases. Compared to the control condition (Xs as distractors), the presentation of a word distractor caused a significant slowing down in naming latencies in all the experiments (Experiments 1–4). La Heij et al. (1998) found that the magnitude of the gender congruity effect (in Dutch) depends on the frequency of the distractors: gender interference is much reduced when the distractors are low in frequency. In order to determine whether the effect of distractor gender varied as a function of distractor frequency, we carried out a series

TABLE 2

Mean Naming Latencies (RT), Error rates, Difference (msec) between Congruent and Incongruent Conditions, and *F* values for those Differences

Experiment Language	Picture-Distractor <sup>b</sup>			Difference (Congruent–Incongruent) <sub>b</sub>
	Control <sup>a</sup>	Congruent	Incongruent	
	RT errors (%)	RT errors (%)	RT errors (%)	
Experiment 1 Catalan	657 (2.2)	726 (2.5)	717 (2.1)	9 <i>FI</i> (1,19) = 2.9, MSE = 297, N.S. <i>F2</i> < 1
Experiment 2 Catalan	580 (3.0)	640 (4.2)	648 (4.0)	– 8 <i>FI</i> (1,19) = 1.7, MSE = 320, N.S. <i>F2</i> < 1
Experiment 3 Spanish	638 (1.5)	744 (2.2)	744 (2.3)	0 both <i>F</i> s < 1
Experiment 4 Spanish	637 (5.7)	701 (5.9)	697 (6.2)	4 both <i>F</i> s < 1
Experiment 5 Spanish		778 (6.7)	778 (6.8)	0 both <i>F</i> s < 1

<sup>a</sup>The difference between the control condition and the congruent and incongruent conditions was significant in all the experiments (all *P*s < .005).

<sup>b</sup>*FI* = ANOVA by subjects, *F2* = ANOVA by items.

of step-wise regression analyses for the experiments with a relatively large number of stimuli (Experiments 1, 4 and 5). In these analyses either distractor frequency or distractor gender was entered in the model first. Neither variable led to significant effects (all  $P$ s < .2). Thus, in our experiments there is no indication that distractor frequency modulates the gender congruity effect.

In five experiments using the picture–word interference paradigm we consistently found that participants' response latencies in producing NPs are not affected by whether or not the genders of the name of the picture and of the distractor noun are the same. In other words, we failed to replicate the gender congruity effect observed in Dutch (La Heij et al., 1998; Schriefers, 1993; van Berkum, 1997). However, the results with Catalan and Spanish speakers are consistent with those obtained in Italian by Miozzo and Caramazza (in press). What are the implications of these contrasting patterns of results on gender congruity across languages? Why is it that there is a gender congruity effect in Dutch but not in languages such as Italian, Catalan, and Spanish?

Miozzo and Caramazza (in press) noted that a potentially important distinction between Dutch and Italian NPs involves the role of phonological context in specifying the form of determiners. In Italian but not in Dutch the specific form of a determiner depends jointly on the grammatical properties of the head noun and the phonological context in which the determiner is to be produced. Since phonological information becomes available at a later point than grammatical information, the selection of determiner forms will be delayed until this later point in the production of NPs. This built-in delay in determiner selection would render “invisible” any congruity effect that might arise at the level of gender feature selection in Italian. This hypothesis can be stated as a cross-linguistic claim: gender congruity effects will be observed only in languages that allow early selection of determiner forms. Some languages can be classified as early selection languages—Dutch and German are two such examples; other languages can be classified as late selection languages—Italian is one such language. We have argued that Catalan and Spanish are like Italian in that phonological context plays a role in determiner selection, albeit to different degrees in the two languages, and therefore should be classified as late selection languages. Thus, if the cross-linguistic claim about determine selection is correct we should find that Catalan and Spanish pattern with Italian and not with Dutch; in other words, we should not find gender congruity effects in Catalan or in Spanish. The results we have reported unambiguously confirm the absence of a gender congruity effect in Catalan and Spanish, supporting Miozzo and Caramazza's proposal about the visibility of gender congruity effects in late selection languages.

In the Introduction we noted that Catalan and Spanish differ considerably in the degree to which phonological information plays a role in the selection of determiner forms. In Spanish there are very few instances in which phonological context would make a difference in determiner selection. These involve only feminine nouns that start with a stressed /a/—less than 0.5% (when considering both singular and plural cases) of all contexts. In these cases, the determiner form is not the standard *la* but *el*. Despite the paucity of such contexts we failed to find a gender congruity effect in Spanish. Thus, what seems to be crucial in determining whether a language is classified as a late or early selection language is whether the selection can be made unambiguously at the level of gender specification. This is not possible in Spanish because the selection of the gender of the noun does not unambiguously determine the form of the determiner and, therefore, it behaves no differently than languages that have many contexts in which the form of the determiner depends on phonological context—for example, languages such as Catalan and Italian. The results we have reported for Spanish also have implications for Miozzo and Caramazza’s “temporal optimisation” principle for speech production. This principle—prepare phonological material for production at the earliest possible stage of processing—was intended to provide the motivation for why languages differ on when determiner forms are selected. Optimising for temporal efficiency leads to the classification of Dutch as an early selection language and Italian as a late selection language. However, it seems that this principle of temporal optimisation of output processes may be incorrect. The reason can be found in the behaviour of masculine determiners in Spanish.

In Spanish, masculine determiners behave like Dutch determiners—they are fully determined once number and gender are selected. That is, there is only one singular masculine determiner, *el* that is used in all contexts. On the principle that NP material is organised for output as soon as possible, we would expect masculine determiners to behave just like Dutch determiners. That is, we would expect masculine determiners to be readied for output as soon as the gender of the head noun has been selected. But, if this were the case we would expect to observe a gender congruity effect in the production of masculine NPs in Spanish. However, this expectation is not supported by the results obtained in our study: we found no trace of a gender congruity effect in the production of masculine NPs.<sup>4</sup> This means that the processes of selection and speech output preparation for masculine and feminine determiners are the same despite the fact that they differ in terms of the ‘informativeness’ of the gender

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<sup>4</sup> The interaction between the gender of the distractor and the gender of the picture was non-significant in experiments 3, 4 and 5.

feature. In other words, selection of masculine determiners takes place at the level of phonological phrase assembly, just like feminine determiners, even though it could have occurred much earlier. This conclusion implies that the principle that governs the organisation of output processes is not one of temporal optimisation but, rather, optimisation of similarity of processes. That is, what is optimised in Spanish is how and where determiner selection takes place and not when.

In summary, in a number of experiments we failed to find effects of gender congruity in Spanish and Catalan, replicating and extending a similar set of results in Italian (Miozzo & Caramazza, in press). This raises important questions about the universality of the gender congruity effect, and therefore about the relevance of this effect for constraining a universal theory of lexical access. Instead, the results support the idea that cross-linguistic differences play a crucial role in determining whether a gender congruity effect is observed in speech production. This is because the gender congruity effect in determiner+ noun NP production may reflect not only properties of the gender selection mechanism but also characteristics of determiner form retrieval. These two levels of processing are not dissociable in Dutch, since the retrieval of the gender of the noun is sufficient to fully specify the determiner's form. By contrast, in Catalan, Spanish, and Italian, the selection of the noun's gender is not sufficient to specify the phonological form of the determiner. Other phonological processes have to take place before the form of the determiner can be selected for production. These constraints on determiner selection make the gender congruity effect (if it exists at all) invisible in these languages. Very likely, there are other factors that contribute to the "visibility" of this effect. Further research is needed in order to disentangle which levels and which factors are responsible for the gender congruity effect.

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