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To cite this version:

Chiara Finocchiaro, F.-Xavier Alario, Niels O Schiller, Albert Costa, Michele Miozzo, et al.. Gender congruency goes Europe: A cross-linguistic study of the gender congruency effect in Romance and Germanic languages. Italian Journal of Linguistics / Rivista di linguistica, 2011, 23 (2), pp.161-198. hal-03578655

HAL Id: hal-03578655

https://hal.science/hal-03578655v1

Submitted on 7 Mar 2022

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Gender congruency goes Europe: A cross-linguistic study of the gender congruency effect in Romance and Germanic languages

Chiara Finocchiaro, F.-Xavier Alario, Niels O. Schiller, Albert Costa, Michele Miozzo, Alfonso Caramazza

We report a thorough investigation of the gender congruency effect previously reported by Cubelli, Lotto, Girelli, Paolieri, and Job (2005) in a picture-word interference study, namely slower RTs at producing Italian bare nouns in the presence of same-gender distractors than in the presence of different-gender distractors. In order to account for this finding, the authors hypothesised a double competition mechanism of lexical selection. By capitalizing on the two key-concepts of morphological decomposability and gender transparency, we conducted a series of picture-word interference experiments in Italian (the language of Cubelli et al's study; Experiments 1-2), and Spanish (a language with very similar relevant characteristics for which a gender effect in bare noun production has also been found, see Paolieri, Lotto, Leoncini, Cubelli, & Job (2010) ; Experiment 3) as well as French, German, and Dutch, i.e. three languages with variable degrees of correspondence between gender and phonology (Experiments 4-6). Overall, our cross-linguistic data do not provide reliable evidence for an effect of grammatical gender in bare noun naming. Hence, they raise substantial problems for the hypothesis of double-competition in lexical access.*

Keywords: Grammatical gender; Lexical access; Morphological processes

* We acknowledge the support of the Fondazione Cassa di Risparmio di Trento e Rovereto. The research of Niels O. Schiller was supported by the Royal Netherlands Academy of Arts and Sciences (*Koninklijke Nederlandse Akademie voor Wetenschappen*; KNAW) and by grant no. 453-02-006 from the Netherlands Organization for Scientific Research (*Nederlandse Organisatie voor Wetenschappelijk Onderzoek*; NWO). F.-X.A. was supported by a grant from Agence Nationale de la Recherche (ANR, France) and bythe European Research Council under the European Community's Seventh Framework Program (FP7/2007-2013 Grant agreement n° 263575). The authors would like to thank Caroline Pierrisnard for running Experiment 4, Athena Demertzi for setting up and running Experiment 5 and Daan van de Velde for setting up and running Experiment 6.

 (received October 2011)

Introduction

Grammatical gender is a pervasive feature in many languages of the world (Corbett 1991). In those languages, nouns belong to one of two or more distinct gender categories. Such classification is reflected in agreement, whereby the gender of nouns modulates the form of grammatically dependent words. This is the case within noun phrases (NPs; *e.g.*, Italian: *il*$_{mas}$ *quaderno*$_{mas}$ *piccolo*$_{mas}$ 'the$_{[mas]}$ little$_{[mas]}$ notebook$_{[mas]}$'; *la*$_{fem}$ *matita*$_{fem}$ *piccola*$_{fem}$ 'the$_{[fem]}$ little$_{[fem]}$ pencil$_{[fem]}$'; [mas] = masculine, [fem] = feminine), and across different phrases, as in co-reference processes (*e.g.*, Spanish: *esta*$_{fem}$ *es roja*$_{fem}$ or *este*$_{mas}$ *es rojo*$_{mas}$ 'this$_{[fem/mas]}$ is red$_{[fem/mas]}$', when the noun referent previously mentioned is either *mesa* 'table$_{[fem]}$' or *coche* 'car$_{[mas]}$').

Grammatical gender processing has attracted the attention of psycholinguists because it can be considered in many cases an intrinsic property of lexical items, thus providing a window into the relationship between lexical processing and agreement. Indeed, a noun's gender does not depend on the sentential context in which it is used. Furthermore, although semantic and phonological criteria constrain gender categories in some languages, many classifications remain arbitrary and have to be represented explicitly rather than derived from statistical regularities. According to "The World Atlas of Language Structures" (WALS, Haspelmath et al. 2005),[1] 44% of the languages considered use semantic criteria (e.g., biological sex, animacy) to divide nouns into gender classes. However, in 53% of these languages, gender classification is also based on formal properties that cut across the semantic distinction. Formal assignment rules may be based on two types of information (phonological and morphological) such that languages with a formal assignment system may selectively use one rule type, or both of them. For instance, in Italian, both masculine and feminine gender classes contain inanimate nouns, while gender-marked nouns denoting animate entities do not necessarily specify natural gender. On the other hand, there is no exact correspondence between phonological form (word ending in the case of Italian) and gender (e.g., *tigre* 'tiger' is feminine, but may refer to male as well as female individuals, and the /*-e*/ ending does not constitute a phonological cue to either gender).

We report an investigation of grammatical gender retrieval during language production. The article begins with a presentation of the different approaches taken to address this issue. The focus is then placed on one particular set of findings reported by Cubelli et al. (2005) showing an effect of grammatical gender retrieval during bare noun produc-

tion. This effect is robust, as it was observed in three experiments and replicated in both Italian and Spanish (Paolieri et al. 2010 a, b) and it is intriguing because it is not predicted by current models of lexical access. We discuss the hypothesis put forward by Cubelli et al. (2005) to account for this finding and report the data from six experiments in five different languages (Italian, Spanish, French, German, and Dutch), in which we test the cross-linguistic robustness of the finding and some predictions derived from their proposal.

1. Gender retrieval during language production

The retrieval of grammatical gender during language production has been investigated from at least three perspectives. One approach addressed the issue of gender priming. Jescheniak & Levelt (1994) observed that the recent use of a noun in a Dutch gender-marked NP (e.g., *de*$_{com}$ *auto*$_{com}$ 'the$_{[com]}$ car$_{[com]}$' or *het*$_{neu}$ *huis*$_{neu}$ 'the$_{[neu]}$ house$_{[neu]}$'; [com] = common, [neu] = neuter) facilitated a later gender (DE/HET) decision for the same picture nouns. They suggested that the speed with which a noun's grammatical gender information is retrieved depends on how recently it has been accessed. By contrast, Van Berkum (1997) reported that the recent production of a gender-marked adjective noun phrase (e.g., *groene*$_{com}$ *auto*$_{com}$ 'green$_{[com]}$ car$_{[com]}$'/*groen*$_{neu}$ *huis*$_{neu}$ 'green$_{[neu]}$ house$_{[neu]}$') did not facilitate the later production of another gender-marked adjective noun phrase (e.g., *rode*$_{com}$ *auto*$_{com}$ 'red$_{[com]}$ car$_{[com]}$'/*rood*$_{neu}$ *huis*$_{neu}$ 'red$_{[neu]}$ house$_{[neu]}$', EXP. 1 or *de*$_{com}$ *auto*$_{com}$ 'the$_{[com]}$ car$_{[com]}$'/*het*$_{neu}$ *huis*$_{neu}$ 'the$_{[neu]}$ house$_{[neu]}$', EXP. 2). Similarly problematic for the hypothesis of gender recency/priming are the results reported by Jescheniak & Schriefers (1999) for German. These authors found no effect of type of prime (bare Noun *vs.* Det + Noun) in the production of gender-marked pronouns, suggesting that the previous access to the gender of the item to be pronominalized did not affect participants' performance. Further evidence on gender priming comes from paradigms in which participants name pictures in gender – homogeneous or – heterogeneous blocks (Vigliocco et al. 2002; Perdijk et al. 2007). These studies are described in more detail in the General Discussion, in light of the evidence we report. For now we note that the conditions and mechanisms by which gender may be primed remain to be clarified.

A second line of investigation is concerned with how gender (or number) is used to compute agreement during sentence production. What is investigated in this case is how sentence structure and other

linguistic or semantic parameters influence the process by which a noun's grammatical features such as gender affect the form of distant words (*e.g.,* adjectives, pronouns or verbs; see Vigliocco & Franck 1999; for number agreement see Eberhard et al. 2005).

Finally, the third line of research has investigated the use of grammatical gender in noun phrase production. In this context, one important issue has been whether gender features compete for selection or, alternatively, whether they are automatically retrieved as a consequence of the selection of a given lexical node. This research has made extensive use of the picture-word interference paradigm. Participants are presented with target pictures and written distractor words whose relationship is manipulated (e.g. same or different grammatical gender). They are asked to name the picture and to ignore the word. When the task requires the production of a Det+adjective+noun NP (*e.g., de*$_{com}$ *groene*$_{com}$ *stoel*$_{com}$ 'the$_{[com]}$ green$_{[com]}$ chair$_{[com]}$' or *het*$_{neu}$ *groene*$_{neu}$ *bed*$_{neu}$ 'the$_{[neu]}$ green$_{[neu]}$ bed$_{[neu]}$'), responses are faster if the target and distractor words have the same gender (the so-called "gender-congruency" effect; Schriefers 1993). This effect has been replicated in a variety of languages, (e.g., Dutch, German, and Croatian: Costa et al. 2003; La Heij et al. 1998; Schiller & Caramazza 2003, 2006; Schiller & Costa 2006; Schriefers & Teruel 2000; Van Berkum 1997).

The original interpretation of the effect was in terms of gender feature competition. When the distractor is gender-incongruent, the distractor and the target activate different gender representations which compete for selection. The time needed to resolve this competition is reflected in the naming latencies. Later studies have challenged this conclusion on the basis of several observations. The congruency effect is not observed when the gender feature manipulation does not translate into a determiner form variation. This is the case of plural NPs in German and Dutch whose determiner forms are invariant with respect to gender (Schiller & Caramazza 2003) or diminutive NPs in Dutch, which have the same determiner independent of gender (Schiller & Caramazza 2006). On the other hand, it has been shown that, in both cases, the gender of the base noun is accessed even though logically unnecessary (Janssen & Caramazza 2003). The gender-congruency effect is not observed in the Romance languages tested so far (Italian, Spanish, Catalan, and French), where the determiner form derived from grammatical gender agreement can be overruled by the phonological context in which the determiner appears (Miozzo & Caramazza 1999; Miozzo et al. 2002; Costa, Sebastián-Gallés et al. 1999; Alario & Caramazza 2002). There are also findings

indicating that responses involving agreement on bound morphemes rather than on free-standing determiners (e.g. in Dutch *rode auto* 'red car' or *rood huis* 'red house') do not show the gender congruency effect (La Heij et al. 1998; Costa et al. 2003; but see Lemhöfer et al. 2006; Bordag & Pechmann 2008; Schriefers 1993; Schriefers et al. 2002, 2005; for extensive discussion see Schiller & Costa 2006). Finally, when there is no overt agreement to be produced, for example, in the production of bare nouns in Dutch, the gender congruency effect is not observed either (La Heij et al. 1998).

A common feature of most of these findings is that the presence of the congruency effect depends on properties of the determiners involved in the task, rather than on properties of the gender features. A conclusion that follows is that the so-called gender-congruency effect is not a consequence of competition between syntactic features, but rather reflects processes involving the retrieval of the determiner forms (Caramazza et al. 2001). On this interpretation, the available evidence does not support the hypothesis of grammatical gender competition.

2. An intriguing finding in single word production

In the light of the results reported above, manipulations of grammatical gender in the picture-word interference paradigm are not expected to affect the production of single nouns across languages. No such effect was found in a Germanic language (Dutch, La Heij et al. 1998), and it is not predicted to occur in Romance languages, where even Det+noun NPs fail to show a gender congruency effect. In contrast to these predictions, Cubelli et al. (2005) reported a grammatical gender congruency effect in Italian single word production (see also Paolieri et al. 2010 a,b for a replication of the results in both Italian and Spanish). Furthermore, this effect was in an unexpected direction. Participants were *slower* to produce target picture nouns (*e.g.*, *MELA* $_{fem}$ 'APPLE') when the distractor word was gender-congruent (e.g., *sedia* $_{fem}$ 'chair') than when it was incongruent (*e.g.*, *tavolo*$_{mas}$ 'table'). The effect was replicated in three experiments with different materials. These findings are important because, as the authors note, they are not predicted by any current model of gender processing in language production.

To account for their results, the authors proposed a double competition hypothesis, challenging the view that there is no competition at the level of grammatical feature selection. On this view, lexical

selection in bare noun production involves semantically- and grammatically-driven competitions: "At the lemma level, the semantic competition occurs first. Then, if the target and the distractor nouns have the same grammatical gender, their syntactic representations compete for selection, thus slowing the access to the correct vowel ending. Therefore, the gender interference effect originates at the level of representation that precedes the level specifying the morpho-phonological form" (Cubelli et al. 2005:34). Morphological decomposability plays a central role in their explanation of why this effect was observed in Italian (Cubelli et al. 2005) but not in Dutch (La Heij et al. 1998). The proposal is that the retrieval of gender-determined word endings is a competitive process and therefore gender competition only occurs when the noun to be produced is decomposable in root and ending. On this view, Italian nouns such as *casa* 'house' are represented in the mental lexicon in decomposed form (*cas-a* in this example). The final /*-a*/ is tied to gender information, and alternates with /*-e*/ in the paradigm of the noun (*case* 'houses' is the plural form). By contrast, Dutch nouns such as *huis*, 'house', are not morphologically decomposable, hence suffix retrieval is not required and gender competition does not happen.

3. Critical discussion of the current account

Two important points can be noted in this pattern of results and their interpretation. The first concerns the use of competition mechanisms to account for opposite phenomena: congruent faster than incongruent, in all the cases of gender congruency effects in NP production, and congruent slower than incongruent, in the case of Italian and Spanish bare noun production reported by Cubelli's group. The second concerns the contrasting patterns of gender congruency effects depending on the language and the response to be produced, and the possible role of decomposability in accounting for these differences. We discuss these two points in turn.

3.1. What mechanism underlies competition?

One potential problem in Cubelli et al.'s (2005) account of the gender effect is the hypothesis that syntactic representations compete for selection. Generally, the competition hypothesis describes the situation where the activation of a non-target representation slows down the selection of the target representation. Accordingly, in the current

case, the activation of an alternative gender representation would be expected to slow down processing in the gender-incongruent condition. For example, if the target were the word *CASA*$_{fem}$ ('HOUSE'), the distractor *pollo*$_{mas}$ ('chicken') would be expected to interfere more than the distractor *stella*$_{fem}$ ('star') because *CASA* and *pollo*, but not *CASA* and *stella*, have different genders that would presumably compete for selection. However, Cubelli's group repeatedly reported a gender effect in the other direction – congruent condition slower than incongruent condition – and thus it is unclear how a competitive mechanism would work to produce greater interference when bound morphemes share a common gender feature.

Perhaps the mechanism underlying the putative competition in the selection of a noun's gender concerns something else than the gender nodes themselves. One possibility is that processing the target picture activates its gender node, and the gender node in turn sends activation to all the lexical items sharing that gender value. This means that lexical nodes sharing their gender with the target are more activated than lexical nodes of the opposite gender (for a discussion of the effects of gender activation on noun activation, see Alario et al. 2004; Bates et al. 1996; Jescheniak 1999; Jacobsen 1999). If gender-congruent lexical items receive extra-activation from a gender-congruent distractor, and if one assumed that lexical selection is a competitive process (La Heij et al. 1998; Levelt et al. 1999; for arguments against this assumption see Miozzo & Caramazza 2003; Costa et al., 2003; Costa, Alario, & Caramazza, 2005; Finkbeiner & Caramazza, 2006; Mahon, Costa et al. 2007; Janssen et al. 2007), they would be expected to compete more than if the distractor activated lexical items from the opposite gender. This mechanism predicts interference in the gender-congruent condition following a logic similar to that used to account for the semantic interference effect in selection-by-competition frameworks. However, this account assumes that interference arises because grammatical gender contributes to the overall activation and competition of lexical nodes, not because the double competition mechanism proposed by Cubelli et al. (2005) is operating. Furthermore, this account would predict a gender effect in bare noun naming in all gender marked languages, but no such effect was observed in Dutch (La Heij et al. 1998).

3.2. An account of the cross-linguistic contrasts

The cross-linguistic contrasting pattern of gender effects is twofold (see Table 1). First, there is the congruency effect in Det+noun

NP production (congruent faster than incongruent) in Germanic languages, but not in Romance languages. Second, there is the reverse congruency effect (congruent slower than incongruent) in bare noun production in Italian (reported by Cubelli et al. 2005) but not in Dutch (La Heij et al. 1998). The cross-linguistic contrast observed in Det+noun NP production has been tied to the role of phonology in constraining determiner forms (see above and extensive discussion in Caramazza et al. 2001). The cross-linguistic contrast observed in bare noun naming calls for a novel explanation. As noted above, Cubelli et al.'s (2005) account is based on the notion of morphological decomposability, a proposal that is not without problems.

Table 1. Pattern of gender effects across languages in the picture-word interference paradigm.

	BARE NOUNS	DET + NOUN
GERMANIC LANGUAGES	-	congruency << incongruency
ITALIAN-SPANISH	congruency >> incongruency	- *

Consider the $CASA_{fem}$ ('HOUSE') example given above. From a purely descriptive perspective, the putative root /*cas-*/ is not invariably associated with the ending /*-a*/. In the word $caso_{mas}$ 'chance' a homophonous root is combined with a different ending. Similarly, the ending /*-a*/ is not invariably associated with the root /*cas-*/. This poses the problem of how the root and suffix are combined in the course of lexical retrieval. In addition, the suffix /*-a*/ does not carry feminine meaning systematically (*e.g.*, *poeta* 'poet', *fantasma* 'ghost' are masculine). Conversely, feminine meaning is not exclusively expressed by the suffix /*-a*/. For instance, a number of Italian words ending in /*-e*/ have unpredictable gender ($leone_{mas}$ 'lion' , $volpe_{fem}$ 'fox', $fiume_{mas}$ 'river' , $valle_{fem}$ 'valley'). If *casa* is assumed to be decomposable into *cas-a*, then, *valle* and *leone* should also be decomposable into *vall-e*, *leon-e*. This poses the problem of linking the endings /*-a*/ and /*-e*/ with both gender representations in a way that allows their competitive retrieval along with the appropriate roots. Some of these observations, together with the advantage of having a unified treatment of verbal and nominal morphology, have been used by linguists in favor of a morphological system based on the stem (root + thematic vowel) rather than on the root (*e.g.*, Scalise 1994). On this view, the basis for nominal morphology would coincide with the whole word (e.g., root *cas-* + thematic vowel /*-a*/ = *casa*; root *volp* + thematic vowel /*–e*/ = *volpe*).

If despite these theoretical arguments, words such as *casa* are thought to be represented as decomposed units (e.g., *cas-a*), then the account of the reverse gender congruency effect in terms of grammatical feature competition is tantamount to stating that this effect is observed only with bound morphemes. This is because /*-a*/ would have to be considered a bound morpheme given that it cannot occur in isolation, but only with a content root. As noted above, there are diverging results regarding the gender congruency effect with bound morphemes – it has been found by some authors while others have failed to find such an effect (Schriefers 1993; Schriefers et al. 2005 vs. Costa et al. 2003; Schiller & Caramazza 2003; Schiller & Costa 2006). In any case, when such an effect with bound morphemes has been reported, the gender-congruent condition was faster than the gender-incongruent condition (i.e. the opposite of the finding reported by Cubelli's group).

3.3. Morphological decomposition and gender transparency

The interpretation of the reverse gender congruency effect put forward by Cubelli et al. (2005) highlights the role of cross-linguistic differences in morphological decomposability to account for the dynamics of grammatical gender retrieval in noun production. As described above, the authors argue that a noun is morphologically decomposable if it is describable in terms of a root morpheme and a suffix. Although the majority of Italian nouns meet this criterion, the relationship between suffix and gender value is far from transparent. We have already noted that a large proportion of nouns end in a gender unmarked vowel (/-e/) and the canonical masculine (/-o/) and feminine (/-a/) vowels do not always signal the canonical grammatical gender of the word. Furthermore, there are nouns (ending in stressed vowels, e.g., virtù $_{fem}$ 'virtue', città $_{fem}$ 'town', or imported words, e.g., *hotel*$_{mas}$ 'hotel') that do not meet the criterion of decomposability. Thus, even on the terms adopted by Cubelli et al., Italian nouns would have to be considered as points along a continuum of morphological gender transparency.

A related but different dimension is phonological gender transparency, as a measure of the correlation between grammatical features and phonological properties.[2] For a given language, a noun has a transparent association between its grammatical gender and its phonological form when this form (often the ending) is highly associated with a particular gender across the nouns in the language. The association is opaque if the form is associated with alternative gender values with comparable probabilities across the language (e.g., Italian

volpe$_{fem}$ 'fox', *leone*$_{mas}$ 'lion', where there are comparable probabilities for nouns ending in /*-e*/ to be masculine or feminine). Finally, a noun's form is unpredictive when it is highly associated with a gender different from that of the noun (e.g., Italian *mano* $_{fem}$ [f] 'hand', where the /*-o*/ ending is strongly associated with masculine gender). Experiment 4 of Cubelli et al. (2005) showed a gender congruency effect with opaque targets (e.g. Italian *volpe*$_{fem}$ 'fox' or *leone*$_{mas}$ 'lion') which was similar to that reported for transparent targets, suggesting that the gender congruency effect is not sensitive to the gender transparency of the target (see also Paolieri *et al*, 2010 a, b).

3.4. Active inhibition of the distractor

More recently, Cubelli and collaborators put forward an alternative account for the gender congruency effect that could allow dispensing with the double competition hypothesis. This proposa refers to the work of Miozzo & Caramazza (2003) and Colzato et al. (2008). The former proposed that distractors in the picture word interference paradigm need to be excluded from a response buffer before the target could be produced. Different conditions may lead to differences in the ease of distractor exclusion, and hence to experimental effects visible in response times. For the case of the grammatical gender effect in bare noun production, Paoleri et al. (2010a) state that:

> In Romance languages the active inhibition of the gender information of the distractor noun would cause additional delay if the target noun has the same grammatical gender. Accordingly, the interference effect found in Romance languages like Italian and Spanish, reflects the delayed selection of the ending vowel due to the inhibition of the gender feature of the distractor representation.
>
> Paoleri et al. (2010a, p. 343)

An important specification of the hypothesis, as implemented here, is made clear by Paolieri et al (2010b, p.2): "If the target and distracter nouns have the same grammatical gender the active inhibition of the distracter noun would cause additional delay".

Although this hypothesis would account for the gender interference effect, it would lead to other problems. For example, if the gender of the word is actively inhibited, one would expect a gender interference (rather than facilitation, as it is observed) in Dutch determiner noun phrase production (see above). Although Paolieri et al. (2010b, p. 3) discuss this evidence, they focus on the cross-linguistic contrast

between Italian and Dutch noun phrases, and the late selection hypothesis put foward by Caramazza et al. (2001). They do not discuss how the active inhibition of distractors may lead to the facilitation effects observed in Dutch. The "opposite pattern" (i.e., interference vs. facilitation) is mentioned, but only the "contrasting pattern" (i.e., cross-linguistic difference in noun phrase effect) is discussed.

More generally, under the hypothesis of active inhbition of the distractor, any relatedness between target and distractor is expected to result in a delay in the responses. If instead of sharing their grammatical gender, the target and distractor share some phonemes, then the inhibition of the distractor should result in the inhibition of its phonemes, which should be harder to select in the related than in the unrelated condition.[3] This is opposite to the widespread observation of phonological facilitation effects in this context.

4. The present study

The data reported by Cubelli's group appear to be reliable, but they are difficult to interpret on the basis of current models of lexical processing and gender retrieval. For this reason, these results could have major implications for our understanding of lexical access. It is important, therefore, to systematically investigate their reliability and generalizability. We report a series of cross-linguistic, picture-word interference experiments that were motivated by predictions explicitly derived from Cubelli et al.'s double competition hypothesis, or from reasonable extensions of this proposal.

The first three experiments we report were conducted in Italian (Experiments 1-2) and Spanish (Experiment 3), two languages in which the form of many nouns may be decomposable into a root and a gender-marked suffix. In these languages, the mechanism proposed by Cubelli et al. (2005) predicts that a reliable gender congruency effect should be observed in bare noun naming and that interference should be greater for gender congruent distractors. To provide an extensive test of these predictions, Experiments 1 and 2 included manipulations of the gender transparency of the target and/or the distractor words. Target gender transparency is not expected to affect the results; however, distractor gender transparency <u>may</u> affect the strength of the gender congruency effect if opaque distractors are hypothesized to provide a weaker activation of gender representations than transparent ones (results along these lines are reported in Paolieri et al. 2010 b).

In Experiments 4 to 6, we tested the gender congruency effect in languages in which many words do not have clear gender-marked, morphologically-decomposable suffixes and where the gender transparency of the nouns is variable. Experiment 4, conducted in French, tested whether or not the gender transparency of the distractor affects the outcome of the gender congruency manipulation. Experiment 5 was conducted in German with transparent targets and distractors. Finally, Experiment 6 tested whether or not the effect could be found in Dutch, a language where the association between gender and form is largely arbitrary.

The main purpose of these experiments was to test the gender congruency effect in a variety of relevant situations, without testing every possible combination of factors. Some of the experiments also included control conditions in the form of additional manipulations that produce well-known effects (e.g. phonological facilitation or semantic interference). These conditions were included to provide a measure of the experiments' sensitivity, and to strengthen the interpretation of the results if the outcome of the theoretically relevant gender congruency manipulation showed no significant difference. The experiments have very similar designs. However, because they were designed and conducted with different languages in different laboratories, there are minor methodological differences between them that are not expected to affect the theoretically relevant test.

4.1. Experiment 1: Italian

In this experiment, we set out to replicate Cubelli et al. (2005) using the same materials as those used in their experiments, focusing on gender transparent target nouns.

Participants

Twenty-four native speakers of Italian, students at the University of Pisa, participated in the experiment.

Materials

The sixteen pictures used in Experiments 1 and 2 of Cubelli et al. (2005) were used as targets. Their nouns were all transparent with respect to grammatical gender: masculine targets ended in /o/ and feminine targets ended in /a/. Sixteen transparent distractor words and sixteen opaque distractor words (i.e. ending in /e/) were also selected (all the materials are reported in Appendix 1).[4] Transparent distractors were taken from the semantically unrelated condition of

Cubelli et al.'s (2005) Experiments 1 and 2. Opaque distractors were selected from the database of the University of Padova (http://dpss.psy.unipd.it/files/strumenti.php) used by Cubelli et al. (2005). In each of these two sets, half of the words were masculine and the other half feminine. Masculine and feminine nouns were matched for length, frequency, familiarity, and age of acquisition (Lotto et al. 2001; Barca et al. 2002). Similarly, the two sets of transparent and opaque distractors were matched, with the only exception of the variable 'frequency'. The subjective frequency ratings, which were obtained by Lotto et al. (2001) on a 7-point scale, were lower for transparent distractors than opaque distractors (mean ratings:2.1 vs. 1.8; $t(1,30) = 2.3$; $p < .05$). Note, however, that our theoretical focus is not on comparing transparent and opaque distractors to one another, but rather on comparing congruent and incongruent distractors within each distractor set. Accordingly, this partial confound will not compromise the theoretical conclusions that will be drawn from the data.

Each target picture was combined with four distractor words. First, each picture was associated with one transparent and one opaque distractor, both gender-congruent. Then, transparent and opaque distractors were re-paired such that each picture was also associated with another transparent and another opaque distractor, both gender-incongruent. This procedure differs from the one used in Cubelli et al. (2005) and in the previous experiment. It ensures that the same distractors are used in the gender-congruent and the gender-incongruent conditions. In this way, differences between these conditions cannot be attributed to differing properties between two sets of different distractor words. Target picture nouns and distractor words were never semantically nor phonologically related. Their phonological overlap was calculated on the basis of the phonemes shared by the root of each target and the distractor. The pictures appeared in black and white in the center of the screen with a superimposed distractor in capital letters.

Following Cubelli et al. (2005), we included sixteen filler trials in the experiment. The filler pictures all had gender-transparent nouns, half of which were masculine and the other half feminine. They were paired with two gender-transparent distractor words each, one masculine and one feminine.

Design

Two factors were manipulated. The factor Gender Congruency between the target noun and the distractor word had two levels: congruent vs. incongruent. The factor Gender Transparency character-

izing the distractors had two levels: gender-transparent vs. gender-opaque. These two factors were manipulated within participants and within items (pictures) yielding a 2 x 2 design. To construct the experimental lists, four blocks of 32 trials were created. The experimental pictures appeared once per block, each time in a different distractor condition. Distractor conditions were equally distributed in each block. Filler pictures appeared equally often in each block. Trials were randomized with the following constraints: (a) there were no more than three consecutive trials from the same experimental condition, and (b) there was no semantic, phonological, or associative relationship between the nouns of pictures in consecutive trials. The order of presentation of the blocks within the lists was counterbalanced across participants.

Procedure

Participants were tested individually in a quiet testing room. They were first familiarized with the pictures and their nouns. In this phase, pictures were shown with five superimposed X's that simulated the distractors. Participants were instructed to name the picture. Feedback was provided when their response deviated from the expected noun. This was followed by a task familiarization phase. Participants were presented with a five-trial practice block whose structure and instructions were similar to those of the experiment proper.

The sequence of events in the experimental trials was similar to that used in Cubelli et al. (2005). A fixation point (+) appeared on the screen for 700 ms. and then it was immediately replaced by the picture with the superimposed distractor. The picture remained on the screen until participants responded or a 2,000 ms deadline was reached, whichever came first. The next trial started 500 ms later. Participants were seated about 60 cm from the computer screen. They were informed that they would see picture-word pairs and were asked to ignore the word written on the picture. They were instructed to produce the noun of the picture without the article as fast and accurately as possible. The experiment was controlled by the software Psyscope (Cohen et al. 1993). Naming latencies were measured by a voice-key. Response accuracy and voice-key failures were recorded online by the experimenter. The experimental session lasted between 20 and 30 minutes.

Analysis

Three types of responses were classified as errors: a) production of names which differed from those designated by the experimenter;

b) verbal disfluencies (stuttering, utterance repairs, production of nonverbal sounds which triggered the voice key); c) failures by the voice key to record the response; d) outliers – Rts below 300 ms or exceeding each participant's mean by more than 3 s.d. ANOVAs were performed to examine error rates and response latencies. For response latencies, separate analyses were carried out with subjects and items as random variable, yielding F1 and F2 statistics, respectively.

The same criteria were followed for all the experiments reported here.

Results

Mean naming latencies and error rates are presented in Table 3. In the analysis of errors, no main effect or interaction reached significance. In the analysis of latencies, there was an effect of Gender Transparency, significant by participants but not by-items (F1 (1,23) = 4.7, p = .04; F2 (1,30) = .8, p = .4). Responses were faster for gender-opaque than for gender-transparent distractors (749 ms vs. 762 ms). The main effect of Gender Congruency was not significant (both Fs < .3). There was no interaction between the two factors (both Fs < 1).[5]

Table 2. Response latencies (in ms) and error rates for Experiment 1 (Italian)

Distractor Conditions		RT	SD	E%
Transparent	Congruent	764	118	2.6
	Incongruent	760	134	2.3
	Effect	4		
Opaque	Congruent	746	122	2.1
	Incongruent	752	142	2.9
	Effect	-6		

Discussion

The results of this experiment reveal no gender congruency effect, neither for transparent nor for opaque distractor words, failing to replicate previous results reported in Italian bare naming. Furthermore, the lack of a gender congruency effect is reported in the context of a gender transparency effect, in which gender-transparent distractors led to slower latencies than gender-opaque distractors. However, the effect is difficult to interpret given that (a) was only visible in the analysis by-participants; (b) gender-transparent distractors were overall less frequent than gender-opaque distractors and previous results showed greater interference for low-frequency distractors (see Miozzo & Caramazza 2003 for a discussion of the distractor frequency effect).

We thus set out to verify the impact of the implicit manipulation of distractor lexical frequency (log transformed). Results showed that distractor lexical frequency had a significant effect ($\beta = -6.62 \cdot 10^{-3}$, t [1458] = -1.93, p = .05). The negative β suggests shorter responses for high frequency distractors than low frequency distractors, as reported in previous studies.

The distractor frequency effect reveals that our experiment was sensitive enough for detecting significant differences produced by the distractor words.

4.2. Experiment 2: Italian experiment with gender opaque target nouns

In Experiment 1 we failed to replicate Cubelli et al., with the same experimental targets used in their experiments. In that experiment target names were all gender transparent. In Experiment 2 we aimed at replicating the gender-interference effect by changing some morphological characteristics of the nouns used as materials. Thus, the focus here is on gender opaque target names. We also increased the power of the analysis by having the same number of subjects as in each experiment reported in Cubelli et al. (2005).

Participants

Twenty-eight students at the University of Trento participated in Experiment 2.

Materials

The twenty target pictures used in this experiment all had gender-opaque masculine and feminine names (i.e. ending in /*-e*/). Forty distractors were selected and paired with the target pictures to obtain four target-distractor pairings for each picture (transparent, gender-congruent; transparent, gender-incongruent; opaque, gender-congruent; opaque, gender-incongruent).[6] Targets and distracters were matched for the same variables as in the previous experiment. The construction of the materials was similar to that of Experiment 1 (for the entire list of materials, see Appendix 2).

A set of filler pictures (N = 20) was also included. They were all gender-transparent, and appeared with gender-congruent and incongruent distracters (N = 40). For half of the filler pictures, distractors were gender-transparent, for the other half they were gender-opaque.

Design, Procedure and Analysis

The experimental design and procedure were the same as in Experiment 1 except for (a) the familiarization phase which now involved having participants see all the pictures with their names before naming them, and (b) the temporal parameters of experimental trials which were slightly different (fixation point: 500 ms; intertrial interval: 200 ms). The experiment was controlled by the software E-Prime 1.1 (Schneider et al. 2002).

Results and Discussion

Mean naming latencies and error rates are reported in Table 3. There were 5.1% errors overall. Error analysis showed no significant effects (all Fs < 1). The analysis of naming latencies showed neither a main effect of Gender Transparency ($F1(1,27) = 1.9$; $p = .2$; $F2(1,38) = .2$; $p = .6$), nor a main effect of Gender Congruency (both Fs = 1). The interaction between the two factors was not significant ($F1\ (1,27) = 1.9$; $p = .2$; $F2\ (1,38) = 1.3$; $p = .3$).

Table 3. Response latencies (in ms) and error rates for Experiment 2 (Italian)

Distractor conditions		RT	SD	E%
Transparent	Congruent	789	88	4.3
	Incongruent	777	74	4.6
	Effect	12		
Opaque	Congruent	773	91	5.4
	Incongruent	776	85	6.2
	Effect	-3		

The effect of distractor lexical frequency, analyzed and log transformed as in the previous experiment, was just fell short of significance ($\beta = -8.23$, $t\ [2088] = -1.89$, $p = .059$). In this experiment, we again failed to find a reliable overall effect of gender congruency, thus replicating our Experiments 1 and 2. Experiment 3 was designed as a further test of the gender congruency effect in Spanish, a language whose grammatical gender and gender transparency bear a number of similarities with Italian. Following Experiments 1 and 3 in Cubelli et al. (2005), targets and distractors were all gender-transparent (i.e. all masculine nouns ended in /o/, and all feminine nouns ended in /a/).

4.3 Experiment 3: Naming Spanish nouns

On the basis of the descriptive properties of noun gender in Spanish, and the theoretical proposal of Cubelli et al., O'Rourke (2007) anticipated a gender interference effect when testing Spanish transparent nouns in bare noun production. In contrast with this prediction and with the findings of Cubelli et al. (2005), O'Rourke failed to observe gender interference in an experiment in which there was a clear semantic interference effect. To account for these contrasting findings, O'Rourke (2007) drew attention to the fact that a good proportion of nouns in Spanish (but not in Italian) do not bear gender-marked inflections. This is the case with consonant-ending nouns, which are quite common in Spanish (e.g. *opinión*masc 'opinion') but fairly rare in Italian. This feature of Spanish nouns could make it superfluous to encode gender inflection. Accordingly, Spanish nouns could pattern with those of Dutch, a language where nouns do not carry gender inflections and in which gender interference has not been recorded (see above). Although the distributional properties of gender-marking transparency may play a role in the phenomenon of interest, O'Rourke's (2007) post-hoc account is certainly not straightforward. This account implies that Spanish transparent nouns (i.e. those that were tested, like *globo*masc 'globe', and *bota*fem 'boot') are not represented in a decomposed form (glob-o; bot-a), and that /-o/ and /-a/ do not constitute gender-marked inflections of Spanish nouns. Such a claim is at odds with various lines of evidence. First, endings like Spanish /-o/ and /-a/ have been traditionally described in linguistic analyses as gender-marked morphemes (Alarcos Llorach 1999). Consistent with this claim, they also appear in other parts of speech, including adjectives, possessives or determiners (e.g. roj-o_{masc}, roj-a_{fem}, 'red'; mi-o_{masc}, mi-a_{fem}, 'mine'; un-o-s_{masc}, un-a-s_{fem}, plural indefinite article). Second, various psycholinguistic findings on the visual recognition of Spanish words indicate that inflectional stems are represented independently of their affixes (including /-o/ and /-a/; Allen & Badecker 1999; Badecker & Allen 2002). Although this evidence has come from visual word recognition tasks, and has been interpreted to bear on the input lexicon, it certainly calls for caution when hypothesizing (post-hoc) that Spanish nouns lack morphological decomposability. An alternative explanation for the absence of gender interference is related to the experimental procedure. Where Cubelli et al. (2005) presented the distractor words printed on the pictures, O'Rourke (2007) used the auditory modality. Such a change in modality has been shown to affect the timing (or "stimulus onset asynchrony"; see footnote 2 in O'Rourke

2007) at which distractors can produce their effects (e.g. Damian & Martin 1999). The latter explanation seems preferable in the light of the results reported by Paolieri et al. (2010a), who replicated in Spanish the gender interference effect already shown in Italian.

In the present experiment we set out to replicate the gender interference in Spanish bare noun naming by using visually presented distractor words as in Paolieri et al. (2010a).

As in Paolieri et al. (2010a), targets and distractors were all gender-transparent (i.e. all masculine nouns ended in /o/, and all feminine nouns ended in /a/).

Participants

Thirty native speakers of Spanish, students at the University of Barcelona participated in the experiment for course credit.

Materials

All the picture nouns and the distractor words were gender-transparent. We selected twenty pictures (half with masculine and half with feminine gender nouns) as well as twenty distractor words (half of them masculine and the other half feminine. See Appendix 3). Targets and distractors were paired and re-paired as in the previous experiments to create twenty gender-congruent and twenty gender-incongruent picture-word pairs. In addition, we selected twenty words, each of which was phonologically related to one of the pictures nouns. These distractors were paired with the corresponding targets, and re-paired with another target to create twenty phonologically related and twenty phonologically unrelated picture-word pairs. All phonologically related picture-word pairs were gender-congruent. Finally, we included twenty filler pictures paired with unrelated distractors.

Design

Two factors were manipulated independently. The factor Gender Congruency between the target noun and the distractor word had two levels: congruent vs. incongruent. The factor Phonological Relatedness between target noun and distractor also had two levels: related vs. unrelated. Both factors were manipulated within subjects and within items. We did not attempt to investigate the relationship between the variables Gender Congruency and Phonological Relatedness. Rather the effect of the distractors' properties on picture naming latencies was assessed separately. This follows the design used by Cubelli et al. (2005), except for the fact that they used semantically related rather than phonologically related control conditions. The experimental lists were constructed as in the previous experiments.

Procedure

The procedure was similar to that of Experiment 1 except that the inter-trial interval was 2,000 ms long, and that the experiment was controlled by the software DMDX (Forster & Forster 2003).

Analysis

Errors and outliers were scored as in the previous experiments. In total, we discarded 6.5% of the data points (4.9 errors and 1.7 outliers). Two separate analyses, each using bilateral Student t-tests, were conducted to assess the effects of the two factors manipulated in the experiment.

Results

Mean naming latencies and error rates are presented in Table 4. There were no significant differences in the analysis of error rates (all ts < 1). The analysis of the naming latencies showed a main effect of Phonological Relatedness ($t1 = 4.78$; $p = .01$; $t2 = 5.34$; $p = .01$). By contrast, Gender Congruency revealed no effect (both ts < 1).

Table 4. Response latencies (in ms) and error rates for Experiment 3 (Spanish)

Distractor Type	RT	SD	E%
Congruent Gender	802	102	5.5
Incongruent Gender	802	94	5.2
Phonologically Related	754	96	4.7
Unrelated	801	99	4.3
Gender effect	0		
Phonological effect	-47		

Discussion

We observed a sizeable phonological facilitation effect, indicating that the distractors of this experiment were appropriately processed by the participants. By contrast, the data clearly show that gender congruency did not affect naming performance. This observation in Spanish fails to replicate the gender congruency effect reported in Spanish bare noun naming by Paolieri et al. (2010a). However, our results are aligned with those reported by O'Rourke (2007), suggesting that the previous absence of effect was not necessarily due to timing parameters associated with the auditory modality. The other possibility mentioned by the O'Rourke (2007) was that Spanish, by virtue of permitting coda consonants as word endings (e.g., *la opinión* 'the opinion', *el vendedor* 'the vendor'), "has fewer nouns than Italian that requires gender inflection". Hence, the failure to replicate Cubelli

et al. (2005), even if all the targets and the distractors used for the gender condition were all inflected with the standard endings (/-o/ for masculine and /-a/ for feminine). This account is not very convincing, because the same consideration may apply in Italian, where even if nouns ending in consonants are not allowed, there are many nouns for which grammatical gender is virtually unpredictable from the ending (see Introduction). Thus, in the light of the Italian experiments reported here, in which we consistently failed to replicate Cubelli et al. (2005), the most parsimonious account for the Spanish behavior – as reported here, Exp. 3 and as well as in O'Rourke (2007), is that the reverse gender-congruency effect is not a robust observation in bare noun naming in Romance languages. The contrast between the results reported by Cubelli et al. (2005) and those reported here remains unclear, and we defer any tentative speculation to the General Discussion. In the second part of this study, we take a different perspective. That is, our aim is no more that of directly testing the double-competition model, but rather to explore whether gender effects in bare noun production may be modulated by a parameter different from morphological decomposition. This parameter refers to the different degree of correlation between the noun phonology and its gender. In Experiments 4-6 we explored this issue in three different languages: French, German, Ducth.

In French, German, and Dutch, the grammatical gender of nouns denoting entities without natural gender is to a large extent arbitrary. The grammatical gender and phonological form of the nouns in these languages show different degrees of relationship. In French, nouns are either masculine or feminine. When this language is considered in its entirety, there appears to be no clear mapping between phonology and gender (Tucker et al. 1977). A moderate correlation, however, exists between surface form and grammatical gender. Certain word-endings are strongly associated with a given gender, whereas others are less gender-transparent (Desrochers et al.; Desrochers & Paivio 1990). German has three grammatical genders: masculine, feminine, and neuter. German is like French in that the principle of morphological decomposition of gender-marked suffixes does not apply to it. Similarly, the gender class to which a given noun belongs generally cannot be inferred from the noun's semantic or phonological properties. A number of phonological rules have been identified that associate grammatical genders with phonological features (see especially Köpcke & Zubin 1983, 1984). These phonological regularities in gender assignment do not provide strict rules (i.e. there are exceptions), yet German speakers appear to be sensitive to pho-

nological gender marking (e.g., Schiller et al. 2003; Schwichtenberg & Schiller 2004). Finally, in Dutch there is no clear systematic association between grammatical gender and phonology (Deutsch & Wijnen 1985). We are aware that this statement for Dutch may be simply due to the fact that Dutch has never been investigated as intensively with regard to gender cues as German has, but, to the extent that we did not make any effort to exploit possible gender regularities in the Dutch experiment, we take this language hierarchy as reasonable at least when applied to the experimental materials selected for this study. We made use of these different properties to test whether or not the gender transparency of the target or the distractor affected the outcome of the gender congruency manipulation. Note that we did not conduct an exhaustive manipulation of these variables in the three languages. Rather our objective was to shed some light on the role of gender transparency on the basis of representative experimental conditions.

It is also important to stress once again that, in the measure that the double-competition hypothesis does not make any prediction on the role of gender transparency, our results have to be considered irrelevant as test for the reliability and generalizability of that hypothesis.

Experiment 4 was conducted in French, a Romance language that has been shown to pattern with Italian and Spanish in experiments of noun phrase production involving gender agreement (see Introduction and Caramazza et al. 2001). In what follows, we report a second series of experiments. We test the grammatical gender congruency effect in languages in which the relationship between gender and phonology is not as straightforward as in Italian or Spanish.

4.4. Experiment 4: Naming French nouns

Participants

Twenty-four native speakers of French, students at the University of Provence, participated in the experiment.

Materials

Sixteen pictures with high name agreement were selected (Alario & Ferrand 1999).[7] Half of these nouns were masculine, and the other half were feminine. Three sets of sixteen nouns were selected to be used as distractors, again half masculine and half feminine (all the materials are reported in Appendix 4). The first two sets differed in the statistical association probability between their grammatical

gender and their surface form.[8] Due to the fact that the distractors were to be presented visually, the calculations were based on the orthographic properties of the words (more specifically, their final bigrams and trigrams). To assess gender transparency, we computed the proportion (weighted by lexical frequency) of masculine and feminine words associated with any bigram or trigram ending in French. Bigrams or trigrams that were associated with a high proportion of words of a given gender were considered to be predictive of that gender, and the materials were selected accordingly.

The first set of distractors included words whose final bigram and trigram are associated with their gender on an average proportion of 90% in the token frequency count of French nouns (Lexique database; New et al. 2004). The second set included words whose final bigram and trigram were associated with the opposite gender on an average proportion of 68% in the token frequency count of French nouns. As done before, the gender-congruent and incongruent conditions were created by pairing and then re-pairing target pictures with distractors of the same or different gender. The target-distractor pairs were otherwise unrelated. The third and final set of words was selected to create phonologically related and unrelated target distractor pairs. These words shared their first syllable and their grammatical gender with the picture noun they were associated with. The unrelated condition was constructed by re-assigning the distractors such that the phonology was no longer shared, but the common gender was preserved. We also selected eight pictures (and 16 distractor words) from the same sources to be used as training and warm-up trials.

Design

Contrary to the Spanish experiments, the theoretically motivated gender congruency manipulation and the phonological control manipulation were assessed together. Two factors were considered: The factor Type of Distractor had three levels, i.e. gender transparent, gender unpredictive, and phonological. The factor Congruency between target and distractor had two levels: congruent vs. incongruent. Congruent and incongruent referred to grammatical gender in the case of the two gender conditions, and to phonological relatedness in the case of phonological distractors. All participants saw all pictures in all six conditions. The procedure followed in constructing the experimental lists was slightly different from that of the previous experiments. The order of presentation of the trials was pseudorandom with the following constraints: (a) pictures of the same object

were at least 10 trials apart, (b) two successive pictures were never from the same semantic category, (c) two successive pictures were never phonologically related, (d) there were never more than three pictures of the same gender in a row, and (e) there were never more than three trials from a given type of distractor or relatedness in a row. We created eight lists of experimental stimuli. The lists were divided into three blocks of 32 experimental trials. Each block began with two warm-up trials.

Procedure

The procedure was identical to that used in Experiment 3.

Analysis

Responses that started with extraneous noise, recording errors and naming latencies below 350 ms were considered as errors and excluded from the analysis (100 trials overall; 4.3% of the 2,304 data points). Reaction times were considered as outliers and excluded from further analysis when they were above the naming deadline of 2,000 ms, or when they deviated more than three standard deviations from a participant's overall mean RT (35 outliers; 1.5% of the data). Finally, trials in which participants produced the expected determiner or noun incorrectly were considered as errors (87 errors, 4.0% of the remaining 2,169 data points). We conducted ANOVAs on the naming latencies and the error rates with participants (F1) and items (F2) as random factors.

Results

A summary of the data for this experiment is shown in Table 5. In the naming latencies, there was a main effect of Type of Distractor ($F1\ (2,46) = 12.1$, $p < .01$; $F2\ (2,30) = 3.79$, $p < .05$) and a main effect of Congruency ($F1\ (1,23) = 21.7$, $p < .01$; $F2\ (1,15) = 6.26$, $p < .05$). The interaction between these two factors was also significant ($F1\ (2,46) = 16.1$, $p < .01$; $F2\ (2,30) = 11.2$, $p < .01$). This interaction is clarified by three pair-wise comparisons showing no effect of gender congruency in the gender transparent condition (all $ts < 1.31$, all $ps > .2$), nor in the gender unpredictive condition (all $ts < 1.37$, all $ps > .18$), and a facilitation effect in the phonological condition ($t1\ (23) = 6.90$, $p < .01$; $t2\ (15) = 5.22$, $p < .01$). The only significant effect revealed in the analysis of error rates concerned the factor Type of Distractor ($F1\ (2,46) = 4.61$, $p < .01$; $F2\ (2,30) = 4.93$, $p < .01$).

Table 5. Response latencies (in ms) and error rates for Experiment 4 (French)

	Transparent			Unpredictive			Phonological		
	M	StDev	%Err	M	StDev	%Err	M	StDev	%Err
Related	679	61	2.7	694	70	7.2	641	66	2.8
Unrelated	689	67	3.8	684	58	4.4	691	63	3.9
Difference	-10		-1.1	10		2.8	-50		-1.1
95% Conf. Interv.	-15		-3.1	14		3.7	-15		-3.2

Discussion

We observed a strong phonological facilitation effect, indicating that the distractors were appropriately processed by the participants. By contrast, the gender congruency of the distractor did not affect naming performance in a significant and consistent manner, irrespective of how predictable the gender of the distractor was from its surface properties (i.e. its final bigram and trigram). This result extends the available evidence concerning the gender congruency manipulation in bare noun naming to a new language, i.e. French, where the decomposability of the nouns is not systematic. The absence of a gender congruency effect in this experiment strengthens the view that this effect is not as reliable as the Cubelli et al. (2005) study suggested.

In the next experiment, we investigate the case of German, where a number of phonological rules describe the statistical regularities between the phonology of a noun and its gender. In the experiment reported below, we test whether or not a gender congruency effect can be observed when grammatical gender and phonological form of the target nouns are fully consistent with these rules.

4.5. Experiment 5: Naming German nouns

Participants

Twenty native speakers of German, students at Maastricht University (sixteen female; mean age: 24.7 years), participated in the experiment in exchange for a small financial reward. They all had normal or corrected-to-normal vision.

Materials

Forty pictures (half with masculine and half with feminine gender nouns) were selected as targets. All target nouns obeyed one of the rules for phonological gender marking in German. Their grammatical gender was to some degree predictable from their phonological form.

Importantly, speakers of German, although generally not aware of any phonological gender-marking rules in their native language, are sensitive to these regularities in on-line processing tasks (Schiller et al., 2003). The gender-marking rules were extracted from the work of Köpcke (1982; Köpcke & Zubin 1983, 1984) and are summarized in the appendix of Schiller et al. (2003). For each target picture, four distractor words were selected: two gender-congruent and two gender-incongruent ones. More than 60% of the distractor words were phonologically gender-marked (approximately equally distributed across conditions). The remaining distractor words were not phonologically gender-marked, i.e. they had phonological forms that were not predictive of their gender. Moreover, half of the distractors were semantically related to the targets and half were semantically unrelated. The entire list of the materials can be found in Appendix 5.

Procedure

The procedure was similar to that used in Experiment 1. In the familiarization phase, participants were asked to name each picture using the definite article (e.g., *die Taube* 'the pigeon') to ensure that participants used the corresponding noun for each picture and that they knew the correct grammatical gender for each target. The experiment was controlled by the software Presentation (Neurobehavioral Systems, Inc., Albany, CA, USA; http://www.neurobs.com/). The intertrial interval was 2,500 ms.

Design

Two factors with two levels each were manipulated in a 2 x 2 design. The factor Gender Congruency between the target noun and the distractor word had two levels: congruent vs. incongruent. The factor Semantic Relatedness between target noun and distractor had two levels as well: related vs. unrelated. The two factors were manipulated within participants and items.

Analysis

The analysis was similar to the previous experiments. RTs faster than 300 ms or slower than 2,000 ms, i.e. 2.7% of all data points were counted as outliers and discarded. Trials including an incorrect response, stuttering or coughing, and technical RT-recording failures were considered as errors and also removed from the analysis (3.2% of the data). An ANOVA was run with Gender Congruency and Semantic Relatedness as independent variables. Separate analyses were carried out with participants (F1) and items (F2) as random variables.

Results

A summary of the data for this experiment is shown in Table 6. Errors were distributed approximately equally across conditions. In the analysis of naming latencies, the main effect of Semantic Relatedness was significant (F1 (1,19) = 14.09, p = .001; F2 (1,39) = 14.62, p < .001) showing that semantically related distractors (844 ms) yielded 28 ms longer naming latencies than semantically unrelated distractors (816 ms). However, the main effect of Congruency (mean gender-congruent: 831 ms; gender-incongruent: 828 ms; both Fs < 1) and its interaction with Semantic Relatedness (both Fs < 1) were not significant.

Table 6. Response latencies (in ms) and error rates (in %) for Experiment 5 (German)

	Semantic Relatedness	
	Related	Unrelated
Gender Congruency		
Congruent	843 (2.9)	819 (3.3)
Incongruent	844 (4.1)	812 (2.6)

Discussion

We observed a sizeable semantic interference effect, indicating that participants processed the distractors. By contrast, the gender congruency manipulation did not affect naming performance. This observation was made in a language, German, in which the target nouns did not carry a morphologically decomposable gender marker, but where a set of statistical rules links grammatical gender to phonological form.

Note that many of the rules we used to define phonological gender marking in German concerned the whole word rather than its ending. Therefore, leaving aside the results of Experiments 1-5 for the moment, the following argument could be made: Maybe the gender congruency effect was not observed in German because, contrary to the Italian targets used in the experiments reported by Cubelli et al. (2005), the phonological segments that are thought to carry gender-marking information in the target noun are spread over the whole word. If this parameter is relevant and contributes to blur a gender congruency effect in German bare noun naming, then the grammatical gender effect should be observed when the phonological predictability of the target gender coincides with the final part of the word. A *post-hoc* analysis of the data helps clarify this issue. The targets whose phonological marking was concentrated in the final segments of the words were mostly feminine (i.e. words ending in /ur/, /i/, and schwa, etc.). When the target's grammatical gender was included in a

post-hoc analysis, no interaction was found between the factors Target Gender and Congruency (both Fs < 1). This is an indication that no gender congruency effect was present for the feminine (nor masculine) targets considered separately. In short, the German data show that the gender congruency of the distractor does not affect bare noun naming latencies, irrespective of the regularity between the gender and the phonological form of the targets.

The final experiment we report tests whether the gender congruency effect can be observed in Dutch, a language in which the target nouns are not morphologically decomposable and in which phonology does not mark grammatical gender (Deutsch & Wijnen 1985). We are aware of only one gender congruency experiment that has been conducted in Dutch employing bare noun naming. La Heij et al. (1998) reported no difference between the gender congruent and incongruent conditions of an experiment in which Dutch participants produced bare nouns in a picture-word task. The contrast between this result and the results reported by Cubelli et al. (2005) motivated the cross-linguistic account discussed in the Introduction. On this account, the absence of a gender congruency effect in Dutch bare noun production is associated with a specific characteristic of Dutch nouns, i.e. the fact that they are not decomposable into root and ending. In short, that theoretical model, as well as the evidence reported in this manuscript so far, motivates the prediction that no gender congruency effect should be observed in Dutch. Experiment 6 tested this prediction.

4.6. Experiment 6: Naming Dutch nouns

Participants

Twenty native speakers of Dutch, students at Leiden University, participated in the experiment. They all had normal or corrected-to-normal vision and took part in the experiment voluntarily.

Materials

Forty pictures (half with common and half with neuter gender nouns) were selected to be used as targets. In addition, one-hundred-and-sixty words were selected as distractors (see Appendix 6). These distractors had similar properties as the distractors in Experiment 5 (German).

Design, Procedure, and Analysis

These aspects of the methods were identical to those of Experiment

5. Again, participants made very few errors (2.9% of all trials). Furthermore, 2.0% of the data points were counted as outliers because they fell outside the RT range of 300 ms to 2,000 ms and were removed from the analysis.

Results

The mean naming latencies and error rates are summarized in Table 7. Error analyses revealed no significant main effects of Semantic Relatedness or Congruency (all Fs < 1). The interaction between these two factors was significant by items ($F1\ (1,27) = 2.96$, $p < .10$; $F2\ (1,39) = 4.94$, $p < .05$). Analyses of naming latencies revealed a significant main effect of Semantic Relatedness ($F1\ (1,19) = 13.28$, $p < .01$; $F2\ (1,38) = 4.22$, $p < .05$). Semantically related distractors (763 ms) slowed down naming by 16 ms relative to semantically unrelated distractors (747 ms). However, neither the main effect of Congruency (both Fs < 1) nor the interaction between the two factors (both Fs < 1) was significant.

Table 7. Response latencies (in ms) and error rates (in %) for Experiment 6 (Dutch)

	Semantic Relatedness	
	Related	Unrelated
Gender Congruency		
Congruent	761 (6.3)	746 (5.4)
Incongruent	765 (7.1)	748 (6.1)

Discussion

We observed a marginally significant effect of semantic relatedness, suggesting that the distractor words were appropriately processed. By contrast, gender congruency did not affect naming performance. The latter result replicates the findings reported in La Heij et al. (1998). It contributes to generalizing the absence of congruency effect in bare noun naming to a language in which there is no systematic relationship between grammatical gender and phonological form. Overall, the gender of the distractor words failed to affect naming performance in French, German, and Dutch when a variety of properties of the relationship between grammatical gender and the form of the target or the distractor words were manipulated. Although we have not tested every possible combination of these factors, the results of this second series of experiments strongly suggest that grammatical gender does not affect production latencies in bare noun naming.

5. General discussion

We report a thorough investigation of the gender congruency effect previously reported by Cubelli et al. (2005) in bare noun naming and further replicated in both Italian and Spanish (Paolieri et al. 2010 a, b). These authors observed that Italian (and Spanish) speakers were slower at producing bare nouns in the presence of same-gender distractors than in the presence of different-gender distractors. This finding is not only unpredicted by current models of lexical access in language production, but also contrasts with previous results observed in Dutch. In order to explain the gender congruency effect in Italian, Cubelli et al. appealed to a double competition mechanism. According to this account, the congruency effect is produced by competition between the gender nodes that govern the selection of the bound morphemes associated with a particular noun. Furthermore, the authors argue that since Dutch nouns are not morphologically decomposable into stem and gender-suffix (unlike Italian), such an effect should be absent in this language.

The cross-linguistic data we report do not provide evidence for a grammatical gender congruency effect, thus replicating O'Rourke (2007) for Spanish. We conducted experiments in Italian and Spanish (languages with very similar relevant characteristics for which an effect has been reported by Cubelli and collaborators but not by O'Rourke 2007), but also in French, German, and Dutch, three languages with variable degrees of regularity between gender and phonology. and we consistently failed to observe the effect in any of the contrast tested. The immediate question that arises concerns the possible reasons for the contrasting results reported in our study and in Cubelli et al.'s studies.

At this point, we can only offer tentative explanations of why the three bare naming experiments reported in Cubelli et al. (2005) showed a gender interference effect, while the Italian and Spanish experiments reported in this study (exps. 1-3; and the experiment in O'Rourke, 2007) did not.

An explanation in terms of differential experimental power can be excluded. In the original study, there were 28 participants per experiment. Here there were 24, 28, and 30 participants (note that there were only 16 participants in O'Rourke 2007). Their Experiments 1 and 2 had 16 target items, whereas their Experiment 4 had 12 items from which 2 were excluded. Here there were 16, 20, and 20 items (in O'Rourke 2007, there were 30). Most importantly, the absence of a gender interference

effect was always observed in the presence of a marker effect signaling appropriate processing of the distractors (distractor lexical frequency or phonological facilitation). An alternative explanation could be sought in the details of the experimental set-up that surrounded the grammatical gender manipulation. It is possible that a gender interference effect is systematically observed only when certain conditions are met. We consider four experimental features that differ between our experiments and those of the original report, and that may (or may not) turn out be important. We then summarize suggestions for future investigations of this effect.

(a) We did not include a semantic manipulation in our experiments. However, O'Rourke's (2007) experiment, where no gender interference was present, included asemantic manipulation. Also, gender congruency and semantic relationship never interacted in Cubelli et al. (2005). For these reasons, the presence of a semantic manipulation does not seem to be crucial. Moreover, were the semantic manipulation crucial, the conclusions that may be drawn from the findings would certainly be different from those proposed by Cubelli et al. (2005). This is because they would need to take into considerations circumstantial experimental parameters, which may prevent drawing broad claims about lexical processing.

(b) There are differences between the experiments in how the materials were matched Cubelli et al. (2005) carefully matched various lexical properties of the targets and associated distractors, whereas we did not do so in such details across experiments. It could be that for the double competition to become visible, the ease of target and distractor processing must be equated (or sufficiently close); a distractor processed too fast or too slow compared to the target word may not be efficient at inducing an interference effect.

(c) Also with respect to material selection, in the original experiments the congruent and incongruent conditions involved different sets of distractors. These were carefully matched, yet matching procedures cannot be perfect. The outcome of the experiments could have been affected by some non-controlled variation in the materials, or by the unavoidable approximations present in the available estimates for the matched variables. The replication of the effect with two different sets of distractors (Experiment 1, and Experiments 3 and 4, rexpectively) provides some control over these issues. However, we preferred using the very same distractors in the two conditions, as is often done in the picture-

word paradigm (notice that this implies presenting each distractor twice, see below).

(d) In the original experiments, outliers were defined as responses lying two standard deviations below or above each participant's mean, a rather restrictive condition. These outliers, and the three other trials involving the same target, were replaced by the corresponding boundary value. The same replacement procedure was employed for targets with one or more erroneous responses. Extreme value replacement tends to reduce differences in central tendency measures, and would work against observing differences, but it also reduces (somewhat artificially) the variance in the dataset. This data processing procedure may have contributed to the outcome of the analysis.

Finally, another possible explanation is that the gender interference effect is a rather ephemeral phenomenon, and its instability cannot be traced down to specific experimental conditions. The gender interference may not be observable as reliably as – for example – the semantic interference effect. This would of course prevent drawing strong theoretical conclusions from the findings.

In what follows we will look for converging evidence from other studies that have made use of related paradigms.

One set of relevant data comes from the blocked picture naming paradigm mentioned in the Introduction. In these experiments, participants produce determiner-noun phrases in response to picture targets. The picture nouns within a block can have the same or different determiners, and involve the same or different genders (homogeneous vs. heterogeneous conditions; Vigliocco et al. 2002; Perdijk et al. 2007). On the assumption that gender contributes to the overall activation level of lexical competitors, then, all things being equal, the level of activation of gender-congruent competitors should be higher in homogeneous blocks than in heterogeneous blocks. In other words, the natural prediction of the "double-competition" hypothesis is that the homogeneous condition should be slower than the heterogeneous condition. The evidence in favor of a gender-effect in this paradigm is inconclusive, especially because gender homogeneity has been confounded with response-set size (this is the case in Vigliocco et al. 2002; see Perdijk et al. 2007 for discussion, see also Costa & Caramazza 2003 and Finocchiaro & Caramazza 2006). However, to the extent that it is possible to obtain gender effects in this paradigm, the results go in the opposite direction with respect to the predictions of the "double-competition" view. In fact, if anything, the condition of gender-homogeneity leads to faster RTs than the condition of gender-heterogeneity.

6. Conclusions

Our cross-linguistic study questions the reliability of the gender-interference effect previously reported in bare noun production with the picture-word paradigm. The pattern of results we report fits well with evidence from other picture-word experiments as well as other paradigms that show no interference effects between grammatical features. These findings are problematic for a double competition hypothesis of lexical selection. On the other hand, they are compatible with the view that grammatical features do not compete in the course of bare noun selection.

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Notes

[1] The chapters relevant to the topic are chapters 30-32 by Greville Corbett (ch. 30, *Number of Genders;* ch. 31, *Sex-based and Non-sex-based Gender Systems;* ch. 32, *Systems of Gender Assignment*).

[2] The definition of gender transparency does not need to be related to morphology, as the relevant phonological portion that may cue a given gender may not correspond to a morpheme.

[3] The fact phonemes have to be selected is a standard hypothesis in many models of language production, motivated among others by speech errors where phonemes appear to be mis-selected (e.g., nife light for night life).

[4] All Appendices: are available on-line at: http://linguistica.sns.it/RdL/23.2/finocchiaro's_paper_appendices.pdf

[5] The analysis we report here differs from that used by Cubelli et al. (2005) in how we dealt with outliers. They established a cut-off point equal to 2.0 SDs from a participant's mean. Furthermore, when a data point was missing from one cell, the data for that participant and target in the other three experimental conditions were also excluded from the analyses. We conducted different analyses because this procedure led to an unusually high rate of trial exclusion. When our data were analyzed according to Cubelli et al. (2005) procedure, average performance and statistical tests changed, but the overall pattern was preserved.

[6] We thank Paolieri et al. (2010 a, b) for providing us with the experimental and filler materials of one of their experiments.

[7] Picture corpora usually contain pictures controlled for a number of parameters. Name agreement is one of these parameters and refers to the agreement percentage of the sample population in naming a given picture with the same noun. The more the agreement in using the same noun for a given picture, the clearer is the picture.

[8] The relation between the grammatical gender and the phonological ending of the target noun was not systematically controlled for; see the experiments in German and Dutch reported below.

Bibliographical References

ALARCOS LLORACH Emilio 1999. *Gramática de la Lengua Española*. Madrid: Espasa Calpe, S. A.

ALARIO F.-Xavier & Ludovic FERRAND 1999. A set of 400 pictures standardized for French: Norms for name agreement, image agreement, familiarity, visual complexity, image variability, and age of acquisition. *Behavior Research Methods, Instruments, & Computers* 31.3. 531-552.

ALARIO F.-Xavier & Alfonso CARAMAZZA 2002. The production of determiners: Evidence from French. *Cognition* 82. 179-223.

ALARIO F.-Xavier, Rafael E. MATOS & Juan SEGUI 2004. Gender congruency effects in picture naming. *Acta Psychologica* 117. 185-204.

ALLEN Mark & William BADECKER 1999. Stem homograph inhibition and stem allomorphy: Representing and processing inflected forms in a multilevel lexical system. *Journal of Memory and Language* 41. 105-123.

BADECKER William. & Mark ALLEN 2002. Morphological parsing and the perception of lexical identity: A masked priming study of stem homographs. *Journal of Memory and Language* 47. 125-144.

BARCA Laura, Cristina BURANI & Lisa S. ARDUINO 2002. Word naming times and psycholinguistic norms for Italian nouns. *Behavior Research Methods, Instruments & Computers* 34. 424-434.

BATES Elizabeth, Antonella DEVESCOVI, Arturo HERNANDEZ & Luigi PIZZAMIGLIO 1996. Gender priming in Italian. *Perception & Psychophysics* 58. 992-1004.

BORDAG Denisa & Thomas PECHMANN 2008. Grammatical gender in speech production: Evidence from Czech. Journal of Psycholinguistic Research 37. 69-85.

CARAMAZZA Alfonso, Michele MIOZZO, Albert COSTA, Niels O. SCHILLER & ALARIO, F.-Xavier 2001. Lexical selection: A cross-language investigation of deter-

miner production. In DUPOUX Emmanuel (ed.). *Language, brain, and cognitive development: Essays in honor of Jacques Mehler.* Cambridge, MA: MIT Press. 209-226.

COHEN Jonathan, Brian MACWHINNEY, Matthew FLATT & Jefferson PROVOST 1993. Psyscope: An interactive graphical system for designing and controlling experiments in the Psychology laboratory using Macintosh computers. *Behavioral Research Methods, Instrumentation, and Computation* 25. 257-271.

COLZATO Lorenza S., Maria Teresa Bajo, Wery Van der Wildenberg, Daniela Paolieri, Sander Nieuwenhuis, Wido La Heij & Bernhard Hommel 2008. *How does bilingualism improve executive control? A comparison of active and reactive inhibition mechanisms*. Journal of Experimental Psychology: Learning, Memory, and Cognition 34. 302-312.

CORBETT Greville 1991. *Gender*. Cambridge, UK: Cambridge University Press.

COSTA Albert, F.-Xavier ALARIO & Alfonso CARAMAZZA 2005. On the categorical nature of the semantic interference effect in the picture–word interference paradigm. *Psychonomic Bulletin and Review* 12. 125-131.

COSTA Albert, Damir KOVACIC, Evelina FEDORENKO & Alfonso CARAMAZZA 2003. The gender congruency effect and the selection of freestanding and bound morphemes: Evidence from Croatian. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 29. 1270-1282.

COSTA Albert, Nuria SEBASTIAN-GALLES, Michele MIOZZO & Alfonso CARAMAZZA 1999. The gender congruity effect: evidence from Spanish and Catalan. *Language and Cognitive Processes* 14. 381-391.

COSTIN D. 1988. MacLab: A Macintosh system for psychology labs. *Behavior Research, Methods, Instruments & Computers* 20. 197-200.

CUBELLI Roberto, Lorella LOTTO, Massimo GIRELLI, Daniela PAOLIERI & Remo JOB 2005. Grammatical gender is selected in bare noun production: Evidence from the picture-word interference paradigm. *Journal of Memory and Language* 53. 42-59.

DAMIAN Markus F. & Randi C. MARTIN 1999. Semantic and phonological codes interact in single word production. *Journal of Experimental Psychology: Learning, Memory, & Cognition* 25. 345-361.

DESROCHERS Alain & Allan PAIVIO 1990. Le phonème initial des noms inanimés et son effet sur l'identification du genre grammatical. *Revue Canadienne de Psychologie* 44. 44-57.

DESROCHERS Alain, Allan PAIVIO & Sylvie DESROCHERS 1989. L'effet de la fréquence d'usage des noms inanimés et de la valeur prédictive de leur terminasion sur l'identification du genre grammatical. *Revue Canadienne de Psychologie* 43. 62-73.

DEUTSCH Werner & Frank WIJNEN 1985. The article's noun and the noun's article: Explorations
into the representation and access of linguistic gender in Dutch. *Linguistics* 23. 793-810.

EBERHARD Kathleen M., John C. CUTTING & Kathryn BOCK 2005. Making syntax of sense: Number agreement in sentence production. *Psychological Review* 112. 531-559.

FINOCCHIARO Chiara & Alfonso CARAMAZZA 2006. The production of pronominal clitics: Implications for theories of lexical access. *Language and Cognitive Processes* 21. 141-180.

FORSTER Kenneth I. & Jonathan C. FORSTER 2003. DMDX: A windows display program with millisecond accuracy. *Behavioral Research Methods, Instruments, and Computers, 35,* 116-124.

GLASER Whilelm R. & Magrit O. GLASER 1989. Context effect in stroop-like word and picture processing. *Journal of Experimental Psychology: General* 118. 13-42.

HASPELMATH Martin, Matthew DRYER, David GIL & Bernard COMRIE 2005. *The World Atlas of Language Structures (WALS).* Oxford: Oxford University Press.

JACOBSEN Thomas 1999. Effects of grammatical gender on picture and word naming: evidence from German. *Journal of Psycholinguistic Research* 28. 499-514.

JANSSEN Niels & Alfonso CARAMAZZA 2003. The selection of closed-class words in noun phrase production: the case of Dutch determiners. *Journal of Memory and Language* 48. 635-652.

JANSSEN Niels, Walter SCHIRM, Bradford Z. MAHON & Alfonso CARAMAZZA 2007. Semantic interference in a delayed naming task: Evidence for the response exclusion hypothesis. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 34. 249-256.

JESCHENIAK Jörg D. 1999. Gender priming in picture naming: modality and baseline effects. *Journal of Psycholinguistic Research* 28. 729-737.

JESCHENIAK Jörg D. & Willem J.M. LEVELT 1994. Word frequency effects in speech production: Retrieval of syntactic information and of phonological form. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 20. 824-843.

JESCHENIAK Jörg D. & Herbert SCHRIEFERS 1999. In search of gender recency: evidence from the production of pronouns. *Journal of Psycholinguistic Research* 28. 739-745.

KÖPCKE Klaus-Michael 1982. *Untersuchungen zum Genussystem der deutschen Gegenwartssprache.* Tübingen: Niemeyer.

KÖPCKE Klaus-Michael & David A. ZUBIN, D.A. 1983. Die kognitive Organisation der Genuszuweisung zu den einsilbigen Nomen der deutschen Gegenwartssprache. *Zeitschrift für Germanistische Linguistik* 11. 166-182.

KÖPCKE Klaus-Michael & David A. ZUBIN 1984. Sechs Prinzipien für die Genuszuweisung im Deutschen: Ein Beitrag zur natürlichen Klassifikation. *Linguistische Berichte* 93. 26-50.

LA HEIJ Wido, Pim MAK, Jörg SANDER & Elsabé WILLEBOORSDE 1998. The gender-congruency effect in picture word tasks. *Psychological Research* 61. 209-219.

LA HEIJ Wido, A.H.C. VAN DER HEIJDEN & Robert SCHREUDER 1985. Semantic priming and Stroop-like interference in word-naming tasks. *Journal of Experimental Psychology: Human Perception and Performance* 11. 62-80.

LEMHÖFER Kristin, Herbert SCHRIEFERS & Jorg D. JESCHENIAK 2006. The processing of free and bound gender-marked morphemes in speech production: evidence from Dutch. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 32. 437-442.

LEVELT Willem J.M., Ardi ROELOFS, & Antje S. MEYER 1999. A theory of lexical access in speech production. *Behavioral and Brain Sciences* 22. 1-75.

LOTTO Lorella, Roberto DELL'ACQUA & Remo JOB 2001. Le Figure PD/DPSS. Misure di accordo sul nome, tipicità, familiarità, età di acquisizione e tempi di denominazione per 266 figure. *Giornale Italiano di Psicologia* 28. 231-245.

LUPKER Stephen J. 1982. The role of phonetic and orthographic similarity in picture-word interference. *Canadian Journal of Psychology* 36. 349-367.

MAHON Bradford Z., Albert COSTA, Robin PETERSON, Kimberly A. VARGAS & Alfonso CARAMAZZA 2007. Lexical selection is not by competition: A reinterpretation of semantic interference and facilitation effects in the picture-word interference paradigm. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 33. 503-535.

MEYER Antje S. & Herbert SCHRIEFERS 1991. Phonological facilitation in picture-word interference experiments: Effects of stimulus onset asynchrony and types of interfering stimuli. *Journal of Experimental Psychology : Learning, Memory and Cognition* 17. 1146-1160.

MIOZZO Michele & Alfonso CARAMAZZA 1999. The selection of determiners in noun phrase production. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 25. 907-922.

MIOZZO Michele & Alfonso CARAMAZZA 2003. When more is less: A counterintuitive effect of distractor frequency in the picture-word interference paradigm. *Journal of Experimental Psychology: General,* 132, 228-252.

MIOZZO Michele, Albert COSTA, & Alfonso CARAMAZZA 2002. The absence of a gender congruency effect in Romance languages: a matter of stimulus onset asynchrony? *Journal of Experimental Psychology: Learning, Memory, and Cognition* 28. 388-391.

NEW Boris, Cristophe PALLIER, Marc BRYSBAERT & Ludovic FERRAND 2004. Lexique 2: A new French lexical database. *Behavior Research Methods, Instruments, & Computers* 36. 516-524.

O'ROURKE Polly (2007). The gender congruency effect in bare noun production in Spanish. In BREWER Jordan, Polly O'ROURKE & Peter RICHTSMEIER (eds.). *Coyote Papers: Working Papers in Linguistics*. Vol. 15. University of Arizona Linguistics Circle. 66-89.

PAOLIERI Daniela, Lorella LOTTO, Luis MORALES, Teresa BAJO, Roberto CUBELLI & Remo JOB 2010a. Grammatical gender processing in romance languages: Evidence from bare noun production in Italian and Spanish. *European Journal of Cognitive Psychology* 22. 335-347.

PAOLIERI Daniela, Lorella LOTTO, Debora LEONCINI, Roberto CUBELLI & Remo JOB 2010b. Differential effects of grammatical gender and gender inflection in bare noun production. *British Journal of Psychology* 102. 19-36.

PERDIJK Kors, Katharina SPALEK & Herbert SCHRIEFERS 2007. Syntactic and strategic forces in picture naming: gender retrieval in blocked priming experiments. *Language and Cognitive Processes* 22. 501-526.

POSNANSKY Carla J. & Keith RAYNER 1977. Visual-feature and response components in a picture-word interference task with beginning and skilled readers. *Journal of Experimental Child Psychology* 24. 440-460.

RAYNER Keith & Carla J. SPRINGER 1986. Graphemic and semantic similarity effects in the picture-word interference task. *British Journal of Psychology* 77. 207-222.

SCALISE Sergio (1994). *Morfologia.* Bologna: il Mulino.

SCHILLER Niels O. & Alfonso CARAMAZZA 2003. Grammatical feature selection in noun phrase production: Evidence from German and Dutch. *Journal of Memory and Language* 48. 169-194.

SCHILLER Niels O. & Alfonso CARAMAZZA 2006. Grammatical gender selection and the representation of morphemes: The production of Dutch diminutives. *Language and Cognitive Processes* 21. 945-973.

SCHILLER Niels O. & Albert COSTA 2006. Different selection principles of free-standing and bound morphemes. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 32. 1201-1207.

SCHILLER Niels O., Thomas MÜNTE, Iemke HOREMANS & Bernadette M. JANSMA 2003. The influence of semantic and phonological factors on syntactic decisions: An event-related brain potential study. *Psychophysiology* 40. 869-877.

SCHNEIDER Walter, Amy ESCHMAN & Anthony ZUCCOLOTTO 2002. *E-Prime user's guide*. Pittsburgh, PA: Psychology Software Tools.

SCHRIEFERS Herbert (1993). Syntactic processes in the production of noun phrases. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 19. 841-850.

SCHRIEFERS Herbert, Jörg D. JESCHENIAK & Ansgar HANTSCH 2002. Determiner selection in noun phrase production. *Journal of Experimental Psychology: Learning, Memory and Cognition* 28. 941-950.

SCHRIEFERS Herbert, Jörg D. JESCHENIAK & Ansgar HANTSCH 2005. Selection of gender marked morphemes in speech production. *Journal of Experimental Psychology: Learning, Memory and Cognition* 31. 159-168.

SCHRIEFERS Herbert & Encarna TERUEL 2000. Grammatical gender in noun phrase production: The gender interference effect in German. *Journal of Experimental Psychology: Learning, Memory and Cognition* 26. 1368-1377.

SCHWICHTENBERG Beate & Niels O. SCHILLER 2004. Semantic gender assignment regularities in German. *Brain and Language* 90. 326-337.

STARREVELD Peter A. & Wido LA HEIJ 1995. Semantic interference, orthographic facilitation and their interaction in naming tasks. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 21. 686-698.

STARREVELD Peter A. & Wido LA HEIJ 1996. Time-course analysis of Semantic and orthographic context effects in picture naming. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 22. 896-918

TUCKER G. Richard, Wallace E. LAMBERT & André RIGAULT 1977. *The French speaker's skill with grammatical gender: An example of rule-governed behavior.* The Hague: Mouton.

VAN BERKUM Jos J.A. (1997). Syntactic processes in speech production. The retrieval of grammatical gender. *Cognition* 64. 115-152.

VIGLIOCCO Gabriella & Julie FRANCK 1999. When sex and syntax go hand in hand: Gender agreement in language production. *Journal of Memory and Language* 40. 455-478.

VIGLIOCCO Gabriella, Marcus LAUER, Markus F. DAMIAN & Willem J.M. LEVELT 2002. Semantic and syntactic forces in noun phrase production. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 28. 46-58.