A Crosslinguistic Investigation of Determiner Production

Alfonso Caramazza, Michele Miozzo, Albert Costa, Niels Schiller, and F.-Xavier Alario

Research by Jacques Mehler and his collaborators (e.g., Cutler et al., 1989, 1992; Mehler et al., 1993, 1996) has shown that the processing routines (prelexical segmentation, word segmentation, etc.) that are engaged in speech perception are not identical from one language to the other, but are finely tuned to the specific properties of the native language. In contrast, current models of speech production have emphasized the language-universal aspects of the process; that is, the details of the processing routines (processing levels, units, time course of the computations) are always thought to be identical across languages. Is speech production special in that it uses exclusively language-universal procedures, or is there as much language-specific tuning in speech production as has been found in speech perception? Here, we argue that the crosslinguistic investigation of noun phrase (NP) production reveals language-specific differences in the procedures used to select determiners and other closed-class words.

There is a clear difference in the kind of information that is used to select open- and closed-class words in language production. The selection of open-class words, such as nouns and verbs, depends primarily on their individual meanings. For example, in sentence 1a, the selection of "rose" depends only on its meaning (to fulfill the speaker's intention to communicate the proposition: is on rose, table). Quite a different process seems to be at play in the selection of closed-class words, such as determiners and pronouns. The selection of the latter types of words depends largely on properties of other words in the sentence. This is clearly illustrated in sentences 1b–d for determiners and in sentences 1e–g for demonstratives and possessives.
1a. The rose is on the table/The roses are on the table
1b. La fem rosa è sul tavolo/Le fem rose sono sul tavolo [Italian, The rose is on the table/The roses are on the table]
1c. Il masc tulipano è nel vaso/I masc tulipani sono nel vaso [Italian, The tulip is in the vase/The tulips are in the vase]
1d. La fem tulipe est dans le vase/Les fem tulipes sont dans le vase [French, The tulip is in the vase/The tulips are in the vase]
1e. My rose is in the vase/My tulip is in the vase
1f. Esta fem rosa está en el jarrón/Este masc tulipán está en el jarrón [Spanish, The rose is in the vase/This tulip is in the vase]
1g. Ma fem rose est dans le vase/Mon masc chapeau est sur la table [French, My rose is in the vase/My hat is on the table]

In sentence 1b, the Italian (definite) determiner *la* is used because the noun “rosa” is feminine and singular; in sentence 1c, the determiner *il* is used with the masculine, singular noun “fiore.” The masculine and feminine plural determiner forms are, respectively, *i* and *le*, as shown in sentences 1b and 1c. These examples illustrate that the selection of determiners depends on a property of the nouns they are associated with: their grammatical gender. Similarly, the selection of the French possessive adjectives *mon* and *ma* in sentence 1g depends on the gender of the head noun of the phrase. A similar process can be seen in the case of the Spanish demonstratives *esta* and *este*. What implications follow from these facts for the process of NP production? One obvious implication is that the selection of a determiner (or demonstrative pronoun or possessive adjective) can only take place after the head noun of the NP has been selected and its gender feature becomes available to guide the selection of the proper form of the determiner. This much is obvious. What is not clear is how the selection takes place. In fact, the broader question of how closed-class words are selected remains controversial. Are the principles that govern the selection of closed-class words the same as those for open-class words (e.g., Dell, 1990; Stemberger, 1984), or are closed-class words selected by a special set of processes (e.g., Garrett, 1980)?

The issue of whether or not the selection of closed-class words involves special processes has received much attention in the literature. There is little doubt that in certain conditions closed-class words behave differently from open-class words. For example, speech errors seem to be dis-
tributed differently for open- and closed-class words (Garrett, 1992). And there is the well-known phenomenon of disproportionate difficulty in the production of closed-class words relative to open-class words in certain types of brain-damaged patients (e.g., Berndt and Caramazza, 1980; Kean, 1977). However, it has proved rather difficult to demonstrate that the observed differences between word classes is due to their categorical status as closed- and open-class words as opposed to some other characteristic (e.g., frequency, concreteness, etc.) that distinguishes between them. It is not our intention here to attempt to resolve this complex issue. Rather, we have the more modest goal of trying to ascertain how determiner selection might differ from open-class word selection across languages. Any insight we might gain into such differences could help us formulate both general and language-specific principles in the selection of closed- and open-class words in language production.

Grammatical Gender and Determiner Selection

One approach that could be used to address the processes that underlie determiner selection is to investigate the time course of determiner production in NPs. A promising experimental paradigm for this purpose is the picture-word interference task, a variant of the classical Stroop task (Klein, 1964; for a review, see McLeod, 1991). This experimental paradigm has been used successfully to address various issues concerning the dynamics of activation at different levels of lexical access (e.g., see Glaser and Glaser, 1989; Schriefers, Meyer, and Levelt, 1990; Starreveld and La Heij, 1996).

In the picture-word interference naming task, subjects are required to name a picture while ignoring a distractor word that is printed on (or near) the picture (see, e.g., Glaser, 1992). The relationship between the distractor word and the picture has been shown to affect the reaction time (RT) to name the picture. For example, two major effects are the semantic interference and the phonological facilitation effect. Picture naming is slower if the distractor word is semantically related to the picture, for example, the word "car" superimposed on the picture of a bus, relative to a baseline condition defined by an unrelated word (e.g., see Lupker, 1979). However, picture naming is faster when the distractor
word and the picture name are phonologically related, for example, the word “bar” superimposed on the picture of a bus (e.g., see Briggs and Underwood, 1982; Lupker, 1982). These interference and facilitation effects are assumed to reflect processes at different levels of lexical access. The semantic interference effect is commonly thought to reflect competition at the level of lexical node selection, and the phonological facilitation effect is thought to reflect priming of the phonological content of the lexical node selected for production. Therefore the investigation of these effects could reveal properties of the lexical access system.

Schriefers (1993) extended the use of the picture-word interference paradigm to investigate the mechanisms that control the selection of a word’s grammatical features. Instead of manipulating the semantic relatedness or the phonological relatedness between distractor word and picture name he varied whether or not the two words were grammatically congruent. Specifically, he varied the gender relatedness between distractor word and picture name: the two words could either have the same or different genders. Schriefers reasoned that if grammatical feature selection functions with principles similar to those involved in the selection of lexical nodes and phonological segments (i.e., graded activation and selection competition), the manipulation of gender relatedness should produce measurable effects. We will refer to effects of gender relatedness as “gender congruency” effects, without commitment to a specific claim about the locus of this effect within the lexical access process.

In a seminal set of experiments, Schriefers asked Dutch speakers to produce NPs (e.g., “the red table”) in response to colored pictures. In Dutch, determiners are marked for gender: *de* is used for common (com) gender nouns (e.g., *de* tafel, the table, com), and *het* is used for neuter (neu) gender nouns (e.g., *het* boek, the book, neu). Thus, speakers would produce either a *de* + Adj + N phrase or a *het* + Adj + N phrase. RTs in naming pictures associated with words of the same gender or different genders were compared. The results showed that naming latencies were longer when targets and distractors had different genders (see also La Heij et al., 1998, and van Berkm, 1997). Schriefers interpreted this gender congruency effect as arising at the level of gender feature selection. He argued that the distractor word activates its gender feature, which interferes with the selection of the target word’s gender feature when there is
a mismatch between the two. On this interpretation, the selection of a
gender feature is a competitive process that is dependent on its relative
level of activation and is not simply an automatic consequence of selecting
a lexical node.

However, the results reported by Schriefers do not unambiguously imply
gender feature competition. They could alternatively reflect competition
between determiners (de vs. het) instead of competition between gender
features. That is, the selection of the target word’s determiner could be
slower when a different determiner is activated by the distractor word.
This outcome would be possible if the determiner of the distractor word
is activated even though the distractor lexical node is not selected for
production.

In a recent series of experiments, Schiller and Caramazza (submitted)
tested these alternative accounts of the gender congruency effect. They
exploited an interesting property of the Dutch and German determiner
systems. In these languages, determiners are gender-marked in the singu-
lar but not in the plural. We have seen that, in Dutch, the determiners
de and het are selected, respectively, for common and neuter singular
nouns. However, plural NPs take the determiner de irrespective of gender
(e.g., de tafel/de tafels; het boek/de boeken). If the gender congruency
effect reflects the selection of the noun’s gender feature, we should ob-
serve interference in the gender incongruent condition in the production
of both singular and plural NPs. However, if the gender congruency effect
reflects competition between determiners, we should find interference
only in the production of singular NPs and not in the production of plural
NPs, since in the latter case the same determiner is produced irrespective
of gender. A similar set of predictions can be made for German NP pro-
duction. In German, different determiners are selected for masculine (m.),
feminine (f.), and neuter (n.) nouns when they are used in the singular
(e.g., in the nominative case, the determiners are, respectively, der, die,
and das, as in der Tisch [“the table,” m.], die Wand [“the wall,” f.], and
das Buch [“the book,” n.]). However, like Dutch, the same determiner
is used for all genders in the plural (in the nominative case it is the deter-
minder die, as in die Tische [“the tables,” m.], die Wände [“the walls,”
f.], die Bücher [“the books,” n.]). Therefore, the same pattern of results
should be observed in German and Dutch. Namely, either the gender
congruency effect is obtained for singular and plural NPs (competition in the selection of the gender feature) in both languages or the effect is only obtained for singular NPs (competition in the selection of the determiner) in both languages.

The results of several experiments were clear-cut: a gender congruency effect was observed in the production of singular NPs with both Dutch and German speakers (see also Schriefers and Teruel, 2000) but not in the production of plural NPs. This interaction of gender congruency by number (plural vs. singular) was robust across different stimulus onset asynchronies (SOAs) for the distractor word in relation to the picture (see figure 12.1). Furthermore, the absence of a gender congruency effect for plural NPs was observed in the context of strong and reliable semantic interference and phonological facilitation effects, signature effects of target-distractor interaction at early and late stages of processing, respectively. The latter pattern of results cannot be dismissed as the consequence of an inability to reveal effects at early or late stages of selection in lexical

![Figure 12.1](image)

Figure 12.1
Picture naming latencies obtained in German and Dutch for singular and plural noun phrases. Picture word-pairs were of the same gender (congruent) or of different gender (incongruent). Data from Schiller and Caramazza (submitted).
access. Thus, the results with plural NPs in Dutch and German indicate that the gender congruency effect is actually a determiner interference effect, and therefore we can conclude that the selection of grammatical features of words is a noncompetitive, automatic consequence of the selection of a lexical node.

The hypothesis that the gender congruency effect reflects interference between competing determiners receives further support from the results of picture-word interference experiments in which subjects are required to produce only nouns (without determiners). If the gender congruency effect were the result of competition for selection between determiners as opposed to competition for selection between gender features, we should not observe interference when the noun alone is produced (since there is no selection process for determiners in this case). As mentioned earlier, La Heij et al. (1998) found a gender congruency effect in Dutch when participants were required to produce singular, determiner-NPs. However, they failed to find a congruency effect when subjects were required to name nouns without a determiner. The latter result has also been obtained with Italian speakers (Miozzo and Caramazza, unpublished): a strong semantic interference effect was observed but there was no trace of a gender congruency effect (see figure 12.2). In other words, gender incongruency does not result in interference in the picture-word naming task unless determiners must be produced along with the pictures’ names. These results are consistent with the determiner interference hypothesis and problematic for the gender feature interference hypothesis.²

The results of NP production with the picture-word naming task that we have reviewed thus far suggest that determiners are selected in roughly the same fashion as nouns. The process could work as follows: a bundle of features (e.g., definite, singular, masculine) activates all determiners that are associated with that bundle of features (e.g., all definite determiners, all singular determiners, all masculine determiners), and the determiner node with the highest activation level is selected for further processing.³ Of course, determiner selection differs from noun selection in that some of the features (e.g., gender) used to activate determiners are provided by other lexical items in a sentence (indirect election). However, the dynamics of activation and the process of selection appear to be the same across word classes (e.g., see Dell, 1990; Stemberger, 1984).
Another implication that could be drawn from the results reviewed thus far is that determiner selection happens independently of phonological processes. That is, conceptual information that leads to the selection of the feature [+/- definite] and information from the head noun that specifies the features [number] and [gender] jointly comprise the “lemma” for a determiner, which then activates a specific determiner form (Levelt, 1989). This process is not informed by considerations of the phonological properties of other words in the NP. However, these conclusions, which we have derived from research with Dutch and German speakers, are not consistent with the facts of NP production in other languages.

The selection of determiners in Italian is more complex than in Dutch or German. Consider the following Italian NPs:

2a. \( l_{\text{masc}} \) treno/\( i_{\text{masc}} \) treni [the train/the trains]
2b. \( L_{\text{masc}} \) sgabello/\( gli_{\text{masc}} \) sgabelli [the stool/the stools]
2c. \( L_{\text{fem}} \) forchetta/\( le_{\text{fem}} \) forchette [the fork/the forks]
2d. \(l_{\text{masc}}\) piccolo treno [the small train]
2e. \(l_{\text{masc}}\) piccolo sgabello [the small stool]
2f. \(l_{\text{fem}}\) piccola forchetta [the small fork]
2g. \(l_{\text{masc}}\) treno piccolo [literally, the train small]
2h. \(l_{\text{masc}}\) sgabello piccolo [literally, the stool small]
2i. \(l_{\text{fem}}\) forchetta piccola [literally, the fork small]

Several facts are immediately apparent from a consideration of the determiner forms (and adjectives) used in the phrases 2a–i. Determiners and adjectives are marked for number and gender. Feminine nouns take the definite article \(l_{a}\) (plural: \(l_{e}\)), while masculine nouns take either \(i_{l}\) or \(l_{o}\) (plural: \(i\) and \(g_{li}\), respectively). A crucial fact for present purposes is that the selection of the masculine article is dictated by phonological characteristics of the onset of the word that immediately follows it: the determiners \(l_{o}\) and \(g_{li}\) are selected if the next word starts with a vowel, with a consonant cluster of the form “s + consonant” or “gn,” or with an affricate; the determiners \(i_{l}\) and \(i\) are selected for all the remaining cases. Note also that since Italian allows adjectives to occupy both prenominal and postnominal NP positions, the relevant phonological context for determiner selection is not specified until the major constituents of the phrase are ordered. It is only at this point that the phonological context relevant to determiner selection (the onset of the noun or adjective) becomes available. In other words, in order to produce the proper determiner, Italian speakers must access not only grammatical information (e.g., the gender of the noun) but also phonological information about the onset of the word that follows it (compare \(l_{o}\) sgabello/\(i_{l}\) piccolo sgabello/\(l_{o}\) sgabello piccolo). This fact has two related implications for determiner production. One implication is that the selection of a determiner form is based on a mixture of phrasal (number), lexical (gender), and phonological features. The other implication is that determiner selection occurs very late in the process of NP production: the point at which the phonological forms of the noun and adjectives are ordered and inserted into a phonological phrase. Miozzo and Caramazza (1999) refer to languages with these properties as late selection languages. These properties of the structure of gender in Italian have specific consequences for the gender congruency effect in the picture-word naming paradigm.
We have argued that the gender congruency effects observed with Dutch and German speakers reflect determiner-selection interference. The interference is caused by the involuntary activation of the determiner of the distractor word which competes for selection with the determiner of the target word. However, if our analysis of the determiner-selection process in Italian is correct, we should not expect a gender congruency effect in this language. This absence is due to the fact that in Italian determiners are selected so late in the production process that the activation of potentially competing information has long dissipated and hence cannot interfere with the selection of the target determiner (see Miozzo and Caramazza, 1999, for a more detailed explanation). In various tests of this hypothesis we repeatedly failed to observe a gender congruency effect despite the fact that we obtained strong and reliable semantic interference and phonological facilitation effects in the same experiments (see figure 12.3).

![Graph showing naming latencies](image)

**Figure 12.3**
Picture naming latencies obtained in Catalan, Spanish, French, and Italian for singular noun phrases. Picture word-pairs were of the same gender (congruent) or of different gender (incongruent). Data from Costa et al. (1999), Alario and Caramazza (submitted), Miozzo and Caramazza (1999).
The effects observed in Italian generalize to other Romance languages with qualitatively similar gender systems: Catalan, French, and Spanish. In Catalan, for example, the form of masculine determiners depends on the phonological properties of the word that follows it. Thus, the determiner *el* is used when the following word begins with a consonant (*el* got, the glass; *el meu ull*, (literally) the my eye, but *l*’ is used when the following word begins with a vowel (*l*’ull, the eye). Similarly, in Spanish, feminine singular nouns take the determiner *la* except when followed by a word beginning with a stressed /a/ (about 0.5 percent occurrence overall), where the determiner *el* is used instead (*el agua*, the water). Similar rules apply in French. Thus, for these languages the determiner form is specified by a complex interaction between grammatical and phonological properties. In various tests of the gender congruency effect with Spanish and Catalan speakers (Costa et al., 1999) and French speakers (Alario and Caramazza, submitted), we systematically failed to find a congruency effect (see figure 12.3). Furthermore, the absence of a gender congruency effect in Italian and Spanish is also observed when distractors are presented at different SOAs (Miozzo, Costa, and Caramazza, submitted). Thus we can conclude that the gender congruency effect is not observed in late-selection languages.

It is also possible to test directly whether we can observe determiner interference independently of gender congruency. This test is possible because some languages have multiple determiners for a given gender (e.g., the Italian masculine determiners *il* and *lo*). We can investigate therefore whether a mismatch between same-gender determiners for the target and the distractor word leads to production interference. For example, is the production of “il tavolo” (the table, m.) slower when paired with the word “struzzo” (ostrich, m.), which takes the determiner *lo*, than when paired with the word “nastro” (ribbon, m.), which takes the determiner *il*? In an experiment designed to answer this question, we found no trace of determiner interference (Miozzo and Caramazza, 1999). This result further strengthens our conclusion that the selection of determiners occurs so late in the process of NP production that potentially conflicting information from the distractor word that is relevant to determiner selection has already dissipated.5
Is Determiner Selection Special?

Languages differ in the degree to which the syntactic and phonological levels in sentence processing interact in determining the selection of closed-class words. For example, the determiner systems in Dutch and German are such that once the gender and number (and case) of the head noun of a phrase are selected, the phonological form of the determiner is fully specified and can be selected for production. These languages exemplify the possibility of a clear separation between syntactic and phonological processes in the selection of closed-class words. In contrast, the form of determiners in Italian, Spanish, Catalan, and French depends not only on grammatical features of the head noun of the NP but also on local phonological context (the onset of the word that immediately follows the determiner). Because of this property of the determiner system, the selection of determiners can only take place very late in the process of NP production. In these languages we do not have a clear separation between syntactic and phonological information in the process of determiner selection. This is also true for other closed-class words such as, for example, demonstrative pronouns and possessives in French (ce chapeau, cet arbre [this hat, this tree, both masculine] or ma bicyclette, mon étoile [my bike, my star, both feminine]). Instead it appears that grammatical and phonological information interact in selecting closed-class words, suggesting a close link between grammatical and phonological information during lexical access (Caramazza, 1997).

We have reviewed research that explored the implications of these cross-language differences for the process of determiner selection in NP production. This research has generated the following facts.

a. In picture-word naming experiments with Dutch and German speakers there is a reliable effect of gender congruency in the production of singular NPs.

b. Dutch and German speakers do not show a gender congruency effect in producing plural NPs; nor is there a gender congruency effect in the production of bare nouns by Dutch speakers.

c. No gender or determiner congruency effects are obtained in NP production with Italian, Spanish, Catalan, or French speakers.
We have argued that facts (a) and (b) jointly show that the gender congruency effect reflects selection competition between determiners and not between gender features (contra Schriefers, 1993). This is an important conclusion because it establishes that the selection of a word’s syntactic features is not a competitive process like the selection of lexical nodes but instead appears to be an automatic, discrete process: the selection of a word’s lexical node automatically makes available that word’s syntactic features.

We have also argued that fact (c) shows that determiner competition is a property of only those languages in which determiners can be selected so early in the process of NP production that activation from distractor words is still strong enough to interfere with selection of the target’s determiner. A corollary of this conclusion is that for languages such as Italian, determiner selection is a very late process, occurring at the point where the phonological form of an NP is assembled. This implies that, although we do not expect determiner interference in these languages, we do expect effects of phonological interference on determiner selection. That is, since the selection of a determiner involves “inspecting” the onset of the word that follows it, any uncertainty about that phonological parameter could interfere with the selection decision. This expectation can be tested by manipulating the phonological context for determiner production.

Consider the pairs of phrases “il treno/il piccolo treno” (the train/the small train) and “lo sgabello/lo piccolo sgabello” (the stool/the small stool). In the phrase “il piccolo treno,” both the adjective’s and the noun’s onsets are consistent with the selection of the determiner il. However, for the phrase “il piccolo sgabello,” the onsets of the adjective and noun provide conflicting information for the selection of the determiner: the adjective’s onset requires the determiner il, whereas the noun’s onset requires the determiner lo. The conflicting phonological information within the NP could interfere with the selection of the determiner. We tested this possibility by comparing RTs to produce phonologically consistent (il piccolo treno) and phonologically inconsistent (il piccolo sgabello) NPs, relative to their respective baseline phrases (il treno and lo sgabello). The results showed that phonologically inconsistent NPs are named more slowly than phonologically consistent NPs (Miozzo and Caramazza,
Figure 12.4

Naming latencies in a task in which Italian speakers produced noun phrases formed by determiner + noun or determiner + adjective + noun. Targets (picture names) were lo-nouns (masculine nouns, determiner lo), il-nouns (masculine nouns, determiner ili) or la-nouns (feminine nouns, determiner la). Data from Miozzo and Caramazza (1999).

1999). In other words, there is a substantial interference effect induced by conflicting phonological information at the level of noun-adjective ordering within an NP (see figure 12.4). We have recently replicated this result in French (Alario and Caramazza, submitted). These results confirm that determiner selection is sensitive to phonological context, defined by the lexical items in an NP.

Finally, the pattern of results across languages allows us to address the principles that determine the point at which closed-class words are selected for production. Miozzo and Caramazza (1999) speculated that the point at which determiners are selected in a language is defined by a "temporal optimization" principle: prepare phonological material for production at the earliest possible stage of processing. However, the results from Spanish are inconsistent with this principle. In Spanish, the feminine (definite) determiners depend on the phonological context of production,
but the masculine (definite) determiners el and los are fully specified once number and gender are selected. If the temporal optimization principle were to define the point at which determiners are selected, we would be forced to conclude that Spanish masculine determiners are selected early, as appears to be the case for Dutch and German. We would then expect to observe a gender congruency effect in the production of masculine NPs. However, as already noted, there was no trace of gender congruency effects in the production of NPs (Costa et al., 1999) by Spanish speakers, either for feminine or for masculine determiners. This finding implies that it is not the “temporal optimization” principle that determines the point at which closed-class words are selected, but something more like a “maximum consistency” or “highest common denominator” principle. The procedure that is adopted maximizes consistency of the selection process across words (morphemes) of a particular type. Thus, for example, determiner selection in a given language occurs at the same point for all determiners, even though some of them could be selected earlier. In the case of Spanish, even though masculine determiners could be selected early, they are nevertheless selected at the same late point as feminine determiners.

Our cross-language investigation of NP production has shown that determiner selection is special, at least in some respects and for some languages. For languages such as Italian, Catalan, Spanish, and French, determiner selection involves a highly interactive process across types of information. Grammatical and phonological information (but perhaps also conceptual information, depending on how we construe such features as [+definite]) interact in specifying the form of determiners and other closed-class words. This process is clearly different from the procedure involved in the selection of open-class words, where only semantic (and perhaps grammatical) factors are considered. The process of determiner selection is also special in that, unlike open-class word selection, it can vary across languages. Languages vary in the degree of interactivity between the types of information (conceptual, grammatical, and phonological) that are necessary for the selection of determiners and other closed-class words. Variation along this dimension determines the point in the process of NP production where closed-class words can be selected.
Our research has shown that this point is defined by the “maximum consistency” principle.

Acknowledgments

The work reported here was supported in part by NIH grant DC 04542 to Alfonso Caramazza. Albert Costa was supported by a postdoctoral fellowship from the Spanish government (Fulbright program). F.-Xavier Alario was supported by a postdoctoral fellowship from the Fyssen foundation. We thank Kimiko Domoto-Reilly for editorial assistance.

Notes

1. Levelt (1989) has called the process of determiner selection “indirect election” because it depends on the features of other lexical items in the sentence.

2. Theories that assume the existence of competition in the selection of grammatical features could account for the bare noun results if they assumed that the selection of the gender feature only occurs when this information is required for the utterance (e.g., see Levelt, Roelofs, and Meyer, 1999). Accounts of this type would have to invoke some mechanism that decides which features of a word are to be selected. No explicit proposal of such a mechanism has been offered.

3. If it were assumed that the set of grammatical features directly activates a phonological lexical node (as opposed to a determiner lemma node), we would then also have to assume that this process operates via the principle of cascaded activation. This assumption would be necessary since, by hypothesis, the lexical nodes of distractor words are not selected and therefore would not send activation down to the next level of processing.

4. For a discussion of the processes involved in the selection of the feature [number], see Bock, Nicol, and Cooper Cutting (1999) and Eberhard (1997).

5. An interesting case that seems to lie between the early-selection and the late-selection languages is that of English. In English, the form of some closed-class words also varies as a function of the phonological context of the utterance. For instance, the form of the indefinite article depends on the phonology of the word that follows it (if the word starts with a consonant, the determiner is a [e.g., “a pear”]; otherwise, it is an [e.g., an angel]). In principle, the application of this rule could be implemented as a two-step process: early selection of determiner form (a) followed by a very late output process that modifies this form if needed. This modification rule would be defined solely in phonological terms and would leave English an early-selection language. On the other hand, one may argue that the processes of selection of this determiner form in English parallel those postulated for “late-selection languages.” That is, determiner form selection is not car-
ried out before the phonological properties of the following word is computed. This remains an empirical question.

References


Schiller, N. O., and Caramazza, A. (submitted). Gender or determiner selection interference? Evidence from noun phrase production in German and Dutch.


