



The production of determiners: evidence from French

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Abstract

In numerous languages determiner forms depend not only on semantic information but also on several other kinds of information, such as the grammatical gender of the controlling noun or the phonological properties of the context. In the present research we contrasted two possible accounts of determiner retrieval: one in which every type of required information is bundled into a unitized representation for determiner retrieval and one in which each type of information can individually activate determiner forms. These alternative hypotheses were investigated in three experiments in which native speakers of French named pictures with simple [determiner + noun] or complex [determiner + adjective + noun] noun phrases. In the experiments, the properties of the contextual cues that drive the retrieval of the determiner were manipulated – for example, we manipulated the number of determiner forms that are compatible with a given grammatical gender and the number of grammatical genders that a given determiner form can be used with. Neither hypothesis can fully account for the results of the three experiments. However, a hybrid hypothesis that combines the principal features of the two hypotheses provides a good account of the data. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Speaking involves the retrieval of different types of lexical items, and their organization into well formed utterances. Descriptively, two categories of lexical

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items are distinguished: the closed class and the open class. Closed-class items are the bound and the freestanding grammatical morphemes (suffixes, prepositions, determiners, auxiliary verbs, etc.). Open-class items are the content words (nouns, adjectives, verbs, and some adverbs). A distinguishing feature of the closed-class set is that its membership is more or less fixed; speakers cannot freely invent new items for this category. By contrast, new words can be freely added to the open-class set as needed.

Different kinds of information drive the selection of closed-class and open-class items. Generally, open-class words are selected on the basis of the semantic content of the message to be expressed. By contrast, closed-class words are selected on the basis of more diverse types of information, including the linguistic properties of their phrasal context. Moreover, the information that drives the selection of closed-class words varies from one language to another. In English, for example, the definite and the indefinite article have different forms. Moreover, the form of the indefinite article depends systematically on the phonology of the word that follows it: if the word starts with a consonant, the determiner form is *a*, while if the word starts with a vowel the article is *an* (see examples in (1a)). In Dutch the form of the definite article depends on the gender of the noun: for “common” gender nouns the article form is *de*, while for “neuter” gender nouns the article form is *het* (see examples in (1b)). There are also languages in which the form of the article depends on both the gender *and* the phonology of the context. For instance, in Italian, the definite article is always *la* with singular feminine nouns, but for singular masculine nouns there are two possible forms: *il* and *lo*.¹ Which of the two masculine forms is used depends on the phonological properties of the word that follows the determiner (see examples in (1c)).

(1a) English: *the*_{definite} pear; *a*_{indefinite} pear; *an*_{indefinite} angel

(1b) Dutch: *de* stoel_{common} [the chair]; *het* bed_{neuter} [the bed]

(1c) Italian: *la* matita_{fem} [the pencil]; *il* tavolo_{masc} [the table]; *lo* sgabello_{masc} [the stool]

These examples show that the selection of closed-class words can involve the combination of different sources of information (semantic, grammatical, phonological, etc.),² which are generally thought to become available at different points in the course of preparing phrasal utterances (see below). Such properties surely impose constraints on how these lexical items can be retrieved. A complete account of closed-class word production, then, requires a specific description of how the various sources of information described above might jointly lead to the selection of determiners and other items with similar properties.

In order to gain some insight into these processes and to identify some of the parameters relevant to determiner selection, we investigated certain characteristics of determiner production in a language (French) in which several types of informa-

¹ A further property is that in front of vowels the forms *la* and *lo* can be reduced to *l'*.

² Another type of information that is important for determiner selection in these languages is the number (singular or plural) of the noun. For simplicity, we only consider singular NPs in this study. A discussion of the status of the feature “number” can be found in Bock, Nicol, and Cutting (1999) or Eberhard (1997).

tion are required for determiner selection. We conducted three picture-naming experiments in which participants named pictures using simple noun phrases (NPs) containing either a determiner and a noun (Det + N) or a determiner, an adjective and a noun (Det + Adj + N). In these experiments, various contextual cues that influence determiner selection were manipulated. Before presenting the experimental study and discussing its implications for models of speech production, we first review recent evidence that bears on the temporal aspects of the production of closed-class words, and discuss possible mechanisms of determiner selection.

1.1. Temporal aspects of determiner selection: the late selection hypothesis

A variant of the picture–word interference paradigm has recently been used to investigate aspects of determiner selection. In one version of this paradigm, participants are asked to name a picture while ignoring a superimposed word that may be related in any of several ways to the name of the picture. When participants name the pictures with nouns (e.g. “table”), shorter naming latencies are standardly observed when the target and the distractor word are phonologically related, compared with longer naming latencies when the two words are semantically related (Briggs & Underwood, 1982; Lupker, 1979, 1982). Similar effects are observed when participants name the pictures with simple NPs (e.g. “the table” or “the green table”; Meyer, 1996; Miozzo & Caramazza, 1999; Schriefers & Teruel, 1999; see also Costa & Caramazza, in press).

Schriefers (1993) extended the kind of information considered in this paradigm. He asked Dutch participants to name colored pictures with NPs like “de groene stoel” [the green chair] or “het groene bed” [the green bed] while manipulating the gender of the distractor word written on the picture. Naming latencies were longer when the word and the name of the picture had different grammatical genders than when they were of the same gender, an effect Schriefers attributed to “competition between the gender information carried by the target and the gender information carried by the noun on the level of syntactic processing”.

Evidence from the production of plural NPs, however, suggests a slightly different interpretation of the effect. In Dutch and German there is only one determiner form for plural NPs (in Dutch, *de* stoels_{common} [the chairs] and *de* bedden_{neuter} [the beds]; in German, *die* Wände_{fem} [the walls], *die* Tische_{masc} [the tables] and *die* Bücher_{neuter} [the books]).³ Schiller and Caramazza (2001) reasoned that if the effect of the distractor word were located at the level of selection of the feature “grammatical gender”, longer naming latencies in the gender incongruent condition should be observed, even when the determiner form for the two genders is the same (i.e. with plural NPs). However, if the effect were to occur at the level of determiner form selection, it should only be found when the distractor word and the name of the picture require different determiner forms (that is, only with singular NPs). These authors conducted various experiments with Dutch and German speakers and found a gender

³ In the singular nominative case, the German determiners are respectively ‘die’, ‘der’, and ‘das’ (as in *die*_{fem} Wand_{fem} [the wall], *der*_{masc} Tisch_{masc} [the table] and *das*_{neuter} Buch_{neuter} [the book]).

congruity effect only for singular NPs and not for plural NPs. This result suggests that the effect observed for singular NPs is attributable to the process of *determiner form selection* and not *gender feature selection* (see Schiller & Caramazza, 2001, for details).

The effect of the properties of the distractor word on determiner selection has been further characterized in studies using the same paradigm in several languages. This research revealed an important cross-linguistic difference. The reported determiner incongruency effect is robust when it is observed (studies by La Heij, Mak, Sander, & Willeboordse, 1998; Schiller & Caramazza, 2001; Schriefers, 1993; van Berkum, 1997), but it seems to be present only for languages in which determiner form depends solely on the grammatical gender of the noun (as in Dutch and German singular NPs). The effect of the gender of the distractor word has consistently *not* been observed for languages in which the specification of grammatical gender is not sufficient to retrieve the determiner form (when the phonology is also needed). This is the case for Romance languages like Italian, Spanish or Catalan (Costa, Sebastián-Gallés, Miozzo, & Caramazza, 1999; Miozzo & Caramazza, 1999). For example, as was previously shown in (1c), in Italian the form of the definite masculine article is /lo/ in some phonological contexts (when the article is used before the clusters /gn/ or /s/+consonant or before affricate consonants). The form of this article is /il/ in other phonological contexts.

Caramazza and collaborators have proposed that the effect that is observed in Dutch and German is not found in Romance languages because in these languages determiner selection is *delayed* until the phonological properties of the context are available. As a consequence, by the time that determiner selection takes place, any activation produced by the distractor word would be too weak to interfere with the target noun's determiner. Miozzo and Caramazza (1999) referred to this proposal as the *late selection hypothesis*. The main thrust of this account is that in some languages determiner selection occurs relatively early during the encoding of the NP, while in others selection is postponed until the relevant phonological information is available. Note that this is a statement about a general property of the production system, not a specific description of the actual mechanism of determiner form selection. It is possible to formulate various hypotheses about how the different kinds of information involved in determiner selection contribute to the process. Testing the validity of potential solutions requires identifying linguistic situations in which the constraint imposed by each type of information (grammatical, phonological, etc.) can be manipulated. The determiners of French provide a suitable testing ground for specific hypotheses about the mechanism of determiner selection.

1.2. Determiners in French

In French, as in other Romance languages, determiner forms often depend on both the grammatical gender (masculine or feminine) of the noun and the phonological properties (consonant-initial or vowel-initial) of the following word (which is often, but not always, the noun). For instance, as is shown in (2), the French definite article has a different form for each grammatical gender when used before a consonant-

initial word: it is *le* (/lə/) for masculine nouns and *la* (/la/) for feminine nouns. However, if the word following the article begins with a vowel, the form of the article is modified to /l/, as in (3).⁴

(2) *le sifflet*_{masc} [the whistle]; *la table*_{fem} [the table]

(3) *l'oignon*_{masc} [the onion]; *l'ampoule*_{fem} [the light bulb]

Furthermore, the forms of other closed-class words like possessives or demonstratives also depend on the phonology of the context. When used before a consonant-initial word, the first person singular possessive adjective takes one of two forms, depending on the grammatical gender of the possessed noun (4): it is /mɔ̃/ for masculine nouns and /ma/, for feminine nouns.⁵ If the word following the possessive adjective begins with a vowel, however, only one form is used – /mɔ̃/ – irrespective of gender (5).

(4) *mon sifflet*_{masc} [my whistle]; *ma table*_{fem} [my table]

(5) *mon oignon*_{masc} [my onion]; *mon ampoule*_{fem} [my light bulb]

Demonstrative adjectives have parallel agreement properties. If used before consonant-initial nouns, demonstrative adjectives take one of two forms in agreement with the gender of the noun, /sə/ and /set/ before masculine and feminine nouns, respectively (6). Before vowel-initial nouns, only one form is used, /set/, which is phonetically identical to the “*feminine*” form used before consonant-initial nouns (7).

(6) *ce sifflet*_{masc} [this whistle]; *cette table*_{fem} [this table]

(7) *cet oignon*_{masc} [this onion]; *cette ampoule*_{fem} [this light bulb]⁶

A schematic representation of the properties of French determiners discussed here is provided in Fig. 1.

1.3. Potential mechanisms of determiner selection

The above examples (as well as the examples provided earlier for other Romance languages) show that several types of information are required in the process of determiner selection. The selection process relies on semantic information: for example, does the message concern an object possessed by the speaker or an object pointed-out by the speaker? The process also relies on lexical-grammatical information (is the word that refers to the object masculine or feminine?), and on phonological information (does the word begin with a vowel or with a consonant?).

All current models of speech production agree that the first type of information to become available in the system is semantic information (Caramazza, 1997; Dell, 1986; Levelt, Roelofs, & Meyer, 1999). Only later do the linguistic properties of the

⁴ In French there are many nouns that start with a vowel. In a type count, about 21% of the nouns begin with a vowel. If the frequency of occurrence of each noun is taken into account (token count), the percentage becomes 27% (approximate figures based on the BRULEX database: Content, Mousty, & Radeau, 1990).

⁵ In English, the third person singular possessive adjective agrees with the gender and animate status of the *possessor* (e.g. *his/hers/its* color).

⁶ In spite of their orthographic difference, *cet* and *cette* are phonologically identical: in front of a vowel, the phonological form of the demonstrative adjective is always /set/.

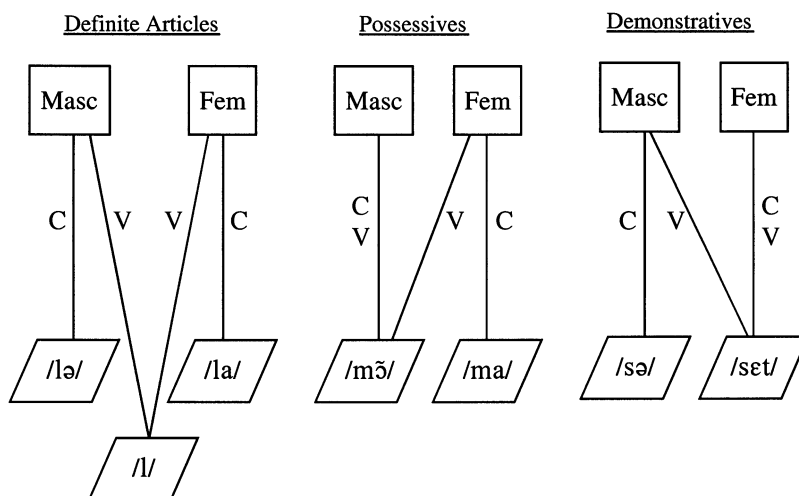


Fig. 1. Schematic representation of the properties of the determiners used in this study. The lines indicate the relation between a grammatical gender (upper boxes) and a determiner form (lower boxes) in a given phonological context (C, consonant; V, vowel). The representation does not imply processing claims.

words that convey the message become available. Among these linguistic properties, the retrieval of grammatical information (e.g. gender) and the retrieval of phonological information are known to be independent of each other. Studies of the performance of brain-damaged patients (Badecker, Miozzo, & Zanuttini, 1995; Henaff-Gonon, Bruckert, & Michel, 1989) and of normal participants in the tip-of-the tongue state (Caramazza & Miozzo, 1997; Miozzo & Caramazza, 1997; Vigliocco, Antonini, & Garrett, 1997; Vigliocco, Vinson, Martin, & Garrett, 1999) have shown that one type of information can be available while the other is not. Furthermore, there is some evidence to suggest that grammatical gender can be accessed more quickly than phonological information in the process of lexical retrieval (van Turrenout, Hagoort, & Brown, 1998). In summary, then, the retrieval of determiners depends on different sources of information that are made available at different points during the process of constructing the NP.

In this context, we can distinguish between two broad classes of models of determiner selection that differ in their assumptions about the temporal properties of lexical processing. These two classes of models constitute plausible extreme hypotheses about the process of determiner selection and they are used as reference points for conducting the research reported here. Their respective merits will be evaluated in the light of the results that will be observed.

Under one sort of model, determiner selection requires having all the necessary information available before any activation can be sent to the required determiner form. That is, only when the kind of determiner (e.g. *possessive*), the grammatical gender (e.g. *feminine*), and the phonological value of the context (e.g. *vowel*) are all simultaneously active in the system can the appropriate determiner form be activated and selected (/mɔ̃/). This kind of hypothesis might be implemented specifi-

cally by positing, for example, that determiners are represented by means of a “determiner frame” with specific slots which must be filled with feature values before the corresponding phonological form can be activated and retrieved. Crucial to this description is the fact that all three features act together as a single “information chunk” to activate and retrieve the determiner form. In other words, the internal structure of the “bundle of features” that is addressing the retrieval of the determiner does not play any role.

In this type of hypothesis, the determiner interference effect observed in early selection languages such as Dutch and German is explained by assuming that the perception of the distractor word leads to the activation of its corresponding determiner form. When the target determiner is retrieved by the complete determiner frame, its selection is easier if the determiner has been substantially activated by the distractor word (congruent condition) than if it has not been activated (incongruent condition). The late selection hypothesis is implemented in the fact that, in Romance languages, the phonology of the noun must be activated before a determiner form can be retrieved. By the time this information becomes available in the system, allowing determiner selection, the activation produced by the distractor word has dissipated.

We will refer to this type of hypothesis as the “unitized activation hypothesis” because determiner retrieval is driven by a unitized information chunk (see Fig. 2).

Alternatively, a completely different temporal organization of determiner retrieval can be proposed. We can imagine an architecture in which each piece of information (*gender*, etc.) contributes *independently* to the activation of the determiner forms as soon as it becomes available. For example, the determiner forms compa-

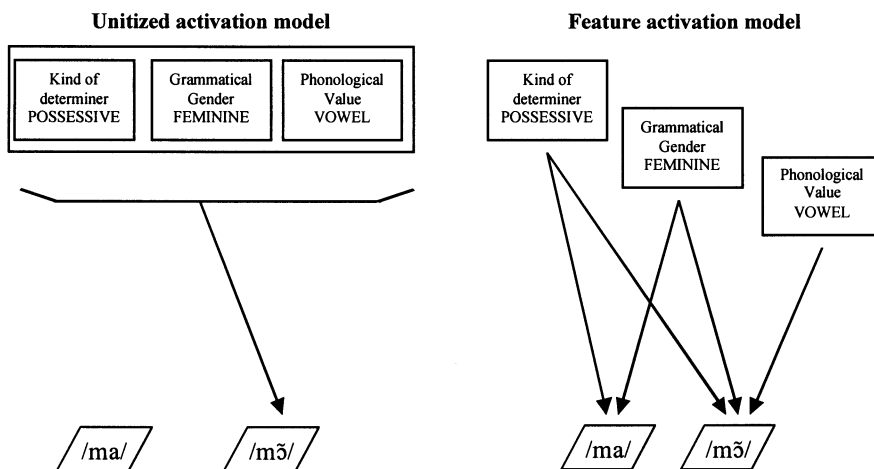


Fig. 2. Schematic representation of the two processing assumptions for determiner selection. On the left is the *unitized activation hypothesis*, where all required information is used together as a bundle to retrieve the determiner. On the right is the *feature activation hypothesis*, where each feature activates determiner forms independently (some of the connections might have different strengths; all connections are not necessarily postulated by the model; see text for details).

tible with the semantic information “first person singular possessive”, namely /ma/ and /mɔ̃/, might be pre-activated to some degree when this information is specified. More generally, each kind of relevant information activates the corresponding phonological form(s). The important difference between this model and the previous one is that here each kind of information can contribute independently to the process of activation. The final process of determiner selection arbitrates among the candidates that have been pre-activated. This process of determiner selection is sensitive to the levels of activation of the different candidates. Note that to allow for the retrieval of the correct determiner form, we posit that selection can only occur after the relevant phonological properties of the context have been activated, in line with the late selection hypothesis. As before, the congruency effect observed in Germanic languages, and its absence in Romance languages, can be explained by the activation of determiner forms produced by the distractor words.

We will refer to this kind of hypothesis as the “independent feature hypothesis” because it is based on the independent pre-activation by different types of information of several possible determiner forms⁷ (see Fig. 2).

1.4. *The present study*

In this article, we report the results of three picture naming experiments that were designed to provide information about the process of determiner form selection. In Experiment 1 we used the picture–word interference paradigm described earlier to evaluate whether the gender of the distractor word affects NP naming latencies. A failure to find such an effect would suggest that the selection of these French determiners does indeed happen relatively late during the encoding of the NP, as is the case in other Romance languages. Such an interpretation is suggested by the contrastive cross-linguistic evidence reported earlier. In Experiments 2 and 3, we tested the validity of the contrasting hypotheses that we have proposed: the unitized activation and the feature activation hypothesis. In these experiments, participants named pictures that did not include distractor words. The determiners that were used were possessives (‘my’, in French either /mɔ̃/ or /ma/) and demonstratives (‘this’, in French /sə/ or /set/). We manipulated two main factors. The first was the number of alternative determiner forms that can correspond to the gender of a given noun, and the second was whether the response involved, for a given gender, the “normal” determiner form or the other determiner form (see below for details). The results place significant constraints on models of determiner production.

⁷ Here we have used the term “feature” to refer to three different types of properties: the kind of determiner (article, possessive, etc.), the grammatical gender (masculine or feminine) and the phonological value of the context (consonant or vowel). By using the word “feature”, we do not wish to make any claim about the nature of the representation of this information in the system. We just acknowledge the fact that this information *has to be represented* in some way if the system is to produce correct determiners.

2. Experiment 1

In this experiment we investigated whether French definite articles (/lə/ and /la/) are selected “late” in the process of NP production. To test this hypothesis, we followed a methodology that matched closely the methodologies of earlier studies (Costa et al., 1999; La Heij et al., 1998; Miozzo & Caramazza, 1999; Schiller & Caramazza, 2001; Schriefers, 1993). Participants named pictures of common objects with definite article NPs (e.g. “la table” [the table]). In the experiment, the names of the pictures always started with a consonant; therefore, the articles were always used in their “complete” form (/lə/ or /la/, as opposed to /l/). To assess the effect of gender, each picture included a distractor word written on it that could be of the same or of a different gender than the name of the pictures. Moreover, because we expected a null result in this comparison, we also included a “control” condition in which the word and the picture shared their initial segments. As we saw earlier, a phonological facilitation effect has consistently been reported in NP production (Costa & Caramazza, in press; Meyer, 1996; Miozzo & Caramazza, 1999; Schriefers & Teruel, 1999). Therefore, we expected to find shorter naming latencies in the phonologically related condition than in the control condition.

2.1. Method

2.1.1. Participants

Twenty-four participants took part in this experiment. All were native speakers of French who were living temporarily in the United States. Most were members of the academic community in the Boston area. They were 28 years old on average (range 23–37 years) and had been in the United States for an average of 13 months (range 0–48 months). These participants also took part in Experiment 2 reported below. They were paid for their participation.

2.1.2. Materials

Thirty-six pictures, 18 with a masculine name and 18 with a feminine name, were selected from the corpus described by Alario and Ferrand (1999). They were chosen from among the group of pictures that had a picture name agreement higher than 80%. We did not include any animals because they have natural gender. All of the pictures had names that started with consonants and therefore for both genders the form of the determiner that was required was always the standard form. The two groups of masculine and feminine names of pictures were matched for written frequency and number of phonemes.

For each picture, three matched distractor words were chosen: (a) one of the same grammatical gender, otherwise unrelated to the name of the picture; (b) one of the opposite gender, otherwise unrelated to the name of the picture; and (c) one phonologically related to the name of the picture. On average, the phonologically related words shared 52% of their segments with the target names, always at the beginning of the words. They were always of the opposite gender to the name of the picture. The three groups of words were matched for written frequency, number of

Table 1
Summary and examples of the materials of Experiment 1^a

	Example	Gender	[English]	Freq.	Ph. Length	Let. Length
TARGET	LA CHEMISE	Fem.	[Shirt]	28	4.3	5.8
DISTRACTORS						
Shared phonology	Cheval	Masc.	[Horse]	23	4.4	5.7
Shared gender	Tomate	Fem.	[Tomato]	24	4.3	6.1
Control	Bassin	Masc.	[Basin]	18	4.3	5.8

^a Half of the picture names were feminine and the other half were masculine. Fem., feminine; Masc., masculine; Freq., frequency in occurrences per million, from Content et al. (1990); Ph. Length, length in phonemes; Let. Length, length in letters.

phonemes, and number of letters (all $F < 1$). We also selected 12 pictures and their corresponding distractor words to be used as training trials. See Table 1 for examples and a summary of the properties of the experimental items, and see Appendix A for a complete list of the materials used.

The pictures appeared as a black outline on a white rectangle in the middle of the computer screen. The size of the rectangle was 245×240 pixels. Superimposed around the middle of the pictures were the distractor words, written in Geneva 20 points font. For each picture, the different distractors were positioned in the same place. The position of the distractors was slightly different for each picture.

2.1.3. Design

The experimental factor was picture–word relatedness, with three levels: shared gender, shared phonology, and control. This factor was manipulated within subjects and within items. To achieve this, three experimental lists were created. We divided the list of pictures into three groups of 12 items. To create the first experimental list, we assigned the pictures of each group to a different condition. To create the two other lists, the assignments were rotated. Therefore, in each list one third of the target pictures was paired with a gender consistent distractor, one third with a control and the other third with a phonologically related distractor. Each single picture was paired with a distractor of a different kind in each of the lists. Participants successively received each of the lists in one of three possible orders, arranged in a Latin square fashion.

2.1.4. Procedure

The experiment was run on a Macintosh G3 PowerPC computer using the software package Psyscope 1.2.2 (Cohen, MacWhinney, & Flatt, 1993). Participants were tested individually. They were given written instructions on the task they would have to perform and on the functioning of the voice key. As a general instruction, they were told that they would see pictures of objects on the screen and they had to name them as fast and as accurately as possible by using a simple article + noun NP such as “la table” (“the table”) or “le sifflet” (the whistle).

Participants were first familiarized with the materials to be used in the experi-

ment. The experimental and training pictures were presented to them in a random order. The pictures appeared with a row of Xs (“XXXXXX”) in the position where the distractor word would later appear during the experiment. Participants were asked to name the pictures. Their response triggered the appearance of the intended name of the picture on the screen. They were further instructed to check their response against that provided by the computer and if the two differed to use only the name provided on the computer in the following experimental part. The experimental part began after a brief pause. Participants were informed that there would now be words written on the pictures, and that they would have to ignore them, while naming the pictures with appropriate NPs as quickly as possible.

Each trial comprised the following events: first a fixation point (+) for 500 ms, then a blank screen for 300 ms and then the picture to be named. The picture remained on the screen until the voice key detected the response or when a deadline of 2500 ms was reached without overt response. The next trial arrived 2 s later. In each block, the order of presentation of the pictures was randomized for each participant. The experimental portion started with a block of 12 training pictures. After that participants received the three experimental lists as separate blocks with a short pause between blocks. The experimenter sat in the same room as the participant in order to check the responses of the participants. The whole experiment lasted about 20 min.

2.2. Results

Before any analysis, the data of one participant were removed because, contrary to the instructions she had received, she reported trying to recognize the written words during the experiment. The data of the remaining 23 subjects were screened for errors and outliers and then analyzed. Trials in which the voice key malfunctioned were removed from the data (62 data points, 2.5%). We then coded as errors and excluded those trials in which participants stuttered, hesitated noisily or gave an incorrect response (124 data points, 5.0%) and those trials in which naming latencies were more than three standard deviations away from the mean of the participant (41 data points, 1.6%). The overall error rate was therefore 6.6%. A summary of the data is provided in Table 2.

Naming latencies were submitted to two ANOVAS, one by subjects ($F1$) and the other by items ($F2$), with picture–word relation as a three levels factor (shared gender, shared phonology or control). There was a significant effect of picture–

Table 2
Mean naming latencies in ms (M), standard deviations (St-dev) and percentage of erroneous responses (% err) for each condition in Experiment 1

	M	St-dev	% err
Shared gender	728	73	6
Control	732	83	7
Shared phonology	713	80	7

word relation ($F(2, 44) = 6.42$, $MSE = 368.1$, $P < 0.01$; $F(2, 70) = 4.32$, $MSE = 1317$, $P = 0.02$). Planned comparisons showed that the shared gender and control conditions did not differ from each other ($F(1, 22) < 1$; $F(1, 35) < 1$). The shared phonology condition was compared to the combination of the control and shared gender conditions. The shared phonology led to significantly faster naming times than the two other conditions ($F(1, 22) = 12.22$, $P < 0.01$; $F(1, 35) = 7.96$, $P < 0.01$).

Similar analyses were conducted on the error rates. No significant effects were found ($F(1, 22) < 1$; $F(1, 35) < 1$).

2.3. Discussion

The results of this experiment demonstrate that naming latencies of article + noun NPs in French are not affected by the gender of a distractor word that is written on the target picture. The lack of effect of the grammatical gender of the distractor word is observed in the presence of a phonological effect – namely, shorter naming latencies for pictures with phonologically related distractor words than for unrelated ones. Therefore, the absence of a gender effect cannot be readily attributed to a lack of processing of the distractors by the subjects or to a general lack of sensitivity of the experimental paradigm. This result extends previous findings in other Romance languages (Italian, Catalan, and Spanish; Costa et al., 1999; Miozzo & Caramazza, 1999) for which no gender distractor effect was observed. The results of the Romance languages stand in contrast with the data obtained for the production of singular NPs in Dutch (La Heij et al., 1998; Schiller & Caramazza, 2001; Schriefers, 1993; van Berkum, 1997) and German (Schiller & Caramazza, 2001; Schriefers & Teruel, 2000), where a gender incongruity effect has been observed. Such a cross-linguistic contrast suggests that determiners in French are selected “relatively late” during the construction of the NP, in line with the late selection hypothesis (Miozzo & Caramazza, 1999).

The late selection hypothesis argues that determiner forms in French are only selected at the point where the phonological content of the NP is specified – a level of processing later than the point at which the semantic and grammatical features necessary for determiner selection are specified. But how are semantic, grammatical and phonological information integrated in determiner selection? Does each type of information independently activate the determiner forms with which it is compatible – the independent feature hypothesis – or do they act in unison as a single bundle of information – the unitized activation hypothesis?

In Experiments 2 and 3 we test these two hypotheses by manipulating the properties that drive determiner form selection in French NPs using possessives (‘my’, in French /mɔ̃/ or /ma/) and demonstratives (‘this’, in French /sə/ or /set/). As can be seen by inspecting Fig. 1, for a given determiner several forms can correspond to a single gender. Also, some determiner forms can be used with nouns of the two genders. The following definitions are an attempt to provide unambiguous descriptions of these possible situations.

Consider first the fact that in the case of possessives, the phonology affects the

selection of determiner form *only* in the case of feminine nouns. With masculine nouns there is no uncertainty as to which determiner form should be used: it is always /m^h/. This notion of uncertainty is clarified in the following definitions.

a. *Fully specified combination*: we will use the term “fully specified combination” to refer to any combination of the values of the features “kind of determiner” and “grammatical gender” that specify a single form for the determiner, irrespective of the phonological properties of the context.

b. *Partially specified combination*: we will use the term “partially specified combination” to refer to the situation where the combination of features “kind of determiner” and “grammatical gender” do not suffice to specify unambiguously the form of the determiner.

For example, the combination “possessive” and “masculine gender” is fully specified because only one form is compatible with these features, namely /m^h/ (as in “*mon sifflet*” and “*mon oignon*”). On the other hand, the combination “possessive” and “feminine gender” is compatible with /ma/ (if the following word in the NP is consonant-initial, as in “*ma table_{fem}*”) and with /m^h/ (if the following word is vowel-initial, as in “*mon ampoule_{fem}*”), and thus it is only a partially specified combination. Demonstratives have symmetrical properties to those of possessives, with reversed roles for masculine and feminine gender. The combination “demonstrative” and “feminine gender” is fully specified because only one form is compatible with these features, namely /set/ (as in “*cette table_{fem}*” and “*cette ampoule_{fem}*”). By contrast, the combination “possessive” and “masculine gender” is compatible with both /sə/ (if the following word in the NP is consonant-initial, as in “*ce sifflet_{masc}*”) and /set/ (if the following word is vowel-initial, as in “*cet oignon_{masc}*”), and thus it is only partially specified.

The dependency of determiner form on the phonology of the context indicates another dimension on which the forms of possessives and demonstratives can be distinguished.

c. *Standard form*: for a given gender, we will use the expression “standard form” to refer to the form of the determiner that is used with consonant-initial words of that gender.⁸

d. *Non-standard form*: for a given gender, we will use “non-standard form” to refer to the form of the determiner that is used with the vowel-initial words, *when this form is different from the standard form for that gender*.

For example, /m^h/ is the standard masculine form of the possessive adjective and /ma/ is its feminine standard form. With masculine vowel-initial nouns, the masculine standard form is used, as in “*mon oignon_{masc}*” [my onion]. With feminine vowel-initial nouns, a non-standard feminine form of the determiner is used, as in “*mon ampoule_{fem}*” [my light bulb]. Again, demonstratives show a pattern that is symmetrical to that of possessives, with reversed roles for masculine and feminine gender: /se/ is the standard masculine form of the demonstrative adjective, whereas /set/ is its standard feminine form. With *feminine* vowel-initial nouns, the standard form is

⁸ The motivation for the name “standard” is the fact that, in French, nouns and adjectives are more often consonant-initial than vowel-initial (see earlier footnote).

	<u>Fully specified</u>	<u>Partially specified</u>
<u>Standard</u>	Cell A (can happen with consonant- and vowel-initial)	Cell B (happens only with consonant-initial)
<u>Non-standard</u>	Impossible	Cell C (happens only with vowel-initial)

Fig. 3. Schematic representation of the relation between the dimension “standardness” and the dimension “degree of specification”.

used, as in “*cette ampoule_{fem}*” [this light bulb]. With *masculine* vowel-initial nouns, a non-standard masculine form is used, as in “*cet oignon_{masc}*” [this onion].

It is important to note that the dimensions of “degree of specification” and “standardness” are not orthogonal: a combination of features that leads to a non-standard form is necessarily partially specified, because the existence of the non-standard form implies the existence of a standard form. Also, if a combination of features is fully specified then the corresponding determiner form is necessarily standard, because only one determiner form can correspond to that combination of features. A schematic representation of this relation is presented in Fig. 3.

2.4. Predictions of the working hypotheses

What predictions do the manipulation of each of these dimensions allow in the context of the two hypotheses sketched earlier?

The *unitized activation hypothesis* states that a unitized information chunk that includes all required properties drives determiner retrieval. This hypothesis predicts that, everything else being equal, whether the combination of the features “kind of determiner” and “gender” is partially or fully specified will not modulate the ease of determiner form retrieval. This is because the determiner form is activated and retrieved on the basis of an unambiguous bundle of information that includes the necessary and sufficient features for determiner form selection. This unambiguous bundle does not leave room for alternative possibilities. By contrast, the assumptions of the *independent feature hypothesis* are that each type of information can pre-activate determiner forms and that determiner retrieval is achieved by a selection mechanism based on the level of activation of the different candidates. In the case of partially specified combinations, the activation sent by the different features to the determiner forms is directed to more candidates than in the case of fully specified combinations. This implies the presence of other highly activated alternate candidates in the former case. Because the selection mechanism in the independent feature hypothesis is based on the level of activation of the different candidates, this hypothesis predicts that partially specified combinations will be more difficult to process than fully specified ones.

In summary then, the unitized activation hypothesis predicts no effect of the factor

specification whereas the feature activation hypothesis predicts an effect of this factor.

The predictions made for the other dimension (standard vs. non-standard) by the two hypotheses can be assessed by comparing the properties of the units that activate the determiner forms. In the unitized activation hypothesis, bundled sets of features lead to the retrieval of determiners. Therefore, the question is whether there are any systematic differences between the combinations of features leading to a standard determiner form (e.g. [*poss.* + *masc.* + *vow.*] leading to /m^h/ or [*dem.* + *fem.* + *vow.*] leading to /sɛt/) and the combinations leading to a non-standard determiner form (e.g. [*poss.* + *fem.* + *vow.*] leading to /m^h/ or [*dem.* + *masc.* + *vow.*] leading to /sɛt/). Compare, for example, the bundled set [*poss.* + *masc.* + *vow.*] – standard, leading to /m^h/ – with [*poss.* + *fem.* + *vow.*] – non-standard, also leading to /m^h/ . There is nothing in the phonological information *vowel-initial* that should make it more compatible with the masculine than with the feminine gender in French. For example, the frequency of use of these two combinations is roughly similar, as is indicated by the fact that in a token count, 51% of vowel-initial nouns are feminine and 49% are masculine (figures based on the BRULEX database; Content et al., 1990). More generally, when considered as unitized sets, the features needed for determiner selection do not present systematic differences. Therefore, under the unitized activation hypothesis, producing the standard form of a determiner should not be easier than producing the non-standard form.

Under the feature activation hypothesis, what has to be compared is the pre-activation produced independently by *each type of feature* in the standard and the non-standard conditions. For a given gender (e.g. *feminine*) the non-standard determiner form (e.g. /m^h/) is used in the less frequently occurring vowel contexts (approximately 27% of occurrences). If we assume that frequency of association determines the strength of activation, we can expect that the activation of the standard form produced by *the feature gender* will be larger than the activation of the non-standard form produced by that same feature. In these circumstances, the target determiner form would receive more activation in the standard than in the non-standard condition and we would expect a faster selection in the standard condition. Therefore, the feature activation hypothesis predicts an effect of the dimension of “standardness”.

In the light of these predictions, Experiments 2 and 3 were designed to provide answers to two questions. (1) Is there a cost in selecting a determiner form when the form is non-standard? (2) Is there a cost in selecting a determiner form when the combination of semantic and grammatical features only partially specifies the determiner form?

3. Experiment 2

3.1. Test of the effect of the “degree of specification” of the combination of features

We tested a possible effect of the “degree of specification” by comparing naming

Table 3
 Example of the materials used in Experiment 2^a

Determiner status	French materials	Determiner	English translation
<i>Consonant-initial picture names</i>			
Fully specified (cell A)	Cette table _{fem}	/set/	[This table]
	Mon sifflet _{masc}	/mɔ̃/	[My whistle]
Partially specified (cell B)	Ma table _{fem}	/ma/	[My table]
	Ce sifflet _{masc}	/sə/	[This whistle]
<i>Vowel-initial picture names</i>			
Standard (cell A)	Cette ampoule _{fem}	/set/	[This light bulb]
	Mon oignon _{masc}	/mɔ̃/	[My onion]
Non-standard (cell C)	Mon ampoule _{fem}	/mɔ̃/	[My light bulb]
	Cet oignon _{masc}	/set/	[This onion]

^a Note that each of the conditions collapses picture names of the two genders and that the relevant comparisons (across rows) are conducted within items. fem, feminine; masc, masculine; the cells refer to those represented in Fig. 3.

latencies of pictures with consonant-initial names in two experimental conditions. The relevant comparison is that of cells A and B in Fig. 3. In the first condition, pictures are named in a fully specified context and in the second condition *the same pictures* are named in a partially specified context. Such symmetry is achieved as follows (see also Fig. 1). In the first condition, namely *fully specified*, pictures with masculine names are named with possessives (/mɔ̃/, e.g. “mon sifflet_{masc}”) and pictures with feminine names are named with demonstratives (/set/, e.g. “cette table_{fem}”). This condition is fully specified because only the form /mɔ̃/ is possible for the masculine possessive and only the form /set/ is possible for the feminine demonstrative. In the second condition, namely *partially specified*, the same pictures are named but the assignments of the kind of determiner are reversed. Now masculine nouns are named with demonstratives (/sə/, e.g. “ce sifflet_{masc}”) and feminine nouns are named with the possessive (/ma/, e.g. “ma table_{fem}”). This condition is partially specified because /sə/ and /set/ are possible forms for the masculine demonstrative and /mɔ̃/ and /ma/ are possible forms for the feminine possessive. A summary of the conditions is provided in the upper part of Table 3.⁹

3.2. Test of the effect of the “standardness” of determiner form

We tested a possible effect of the dimension “standardness” by comparing naming latencies in cells A and C of Fig. 3. We chose to compare cells A and C (rather than comparing cells B and C) because in this way the comparison involved the same pictures (with vowel-initial names) and the same determiner forms (/mɔ̃/ and /set/) in the two experimental conditions. The comparison of cells B and C would have

⁹ Note that here all determiner forms used in the partially and fully specified conditions are standard forms.

involved either different pictures (consonant- and vowel-initial) or different determiner forms (e.g. /ma/ vs. /mɑ̃/) in the different experimental conditions.

The experimental conditions were organized as follows. In the first condition, namely *standard determiner form* (cell A), pictures with masculine names are named with possessives (/mɑ̃/, e.g. “mon oignon_{masc}”, standard) and pictures with feminine names are named with demonstratives (/set/, e.g. “cette ampoule_{fem}”, standard). In the second condition, namely the *non-standard determiner form* (cell C), the same pictures are named but the assignments of the kind of determiner are reversed. Now pictures with masculine names are named with demonstratives (/set/, e.g. “cet oignon_{masc}”, non-standard) and pictures with feminine names are named with the possessive (/mɑ̃/, e.g. “mon ampoule_{fem}”, non-standard). In this way, the same pictures are named once with a standard and once with a non-standard determiner form. A summary of these conditions is provided in the lower part of Table 3.

Of course, because the dimensions of standardness and degree of specification of determiner forms are not orthogonal (the non-standard condition is necessarily only partially specified, see Fig. 3), the interpretation of the results of this second comparison is dependent on the results of the previous comparison (fully vs. partially specified).

3.3. Method

3.3.1. Participants

The participants were those that had taken part in Experiment 1. After completing Experiment 1, they had a short pause and then started Experiment 2. The two experiments were presented to the participants as a single study on the processing of language. The same participants were used in Experiment 1 and 2 because the number of native speakers of French that could be recruited in the Boston area was limited.

3.3.2. Materials

The sets of materials of Experiments 1 and 2 were strictly non-overlapping.

Fifty-two pictures from the same database as the previous experiment served as experimental material in this experiment. Half of the pictures had a consonant-initial name and half had a vowel-initial name. In each of the groups, half of the pictures had a masculine name and half had a feminine name. Pictures of animals were avoided, with the sole exception of “araignée” (spider) in the vowel-initial feminine group. We also selected 52 other pictures with consonant-initial names to be used as fillers. See Appendices B and C for a complete list of the materials.

3.3.3. Design

For consonant-initial nouns, one experimental factor was manipulated: whether the combination of kind of determiner and gender was fully or partially specified. The manipulation of the factor was within subjects and within items.

For vowel-initial nouns, one experimental factor was manipulated: whether the

form of determiner used in the utterance was standard or not. The manipulation of the factor was within subjects and within items.

There were three blocks in which subjects produced NPs. In each of the blocks, they used either the definite article, or the possessive adjective or the demonstrative adjective. In each block they saw all 52 experimental pictures and 26 consonant-initial fillers. In each of the blocks, specific filler items ensured that there was an equal number of responses with each of the two determiner forms. If the same number of feminine and masculine nouns had been used, the determiner that is used with vowel-initial names ($/m\tilde{ɔ}/$ or $/sɛt/$) would have been over-represented in the response set.

3.3.4. Procedure

Participants were first familiarized with both the experimental and the filler pictures. The familiarization procedure was similar to that used in Experiment 1, except that now the pictures were presented without distractors. After that, in a first phase, participants named the pictures as quickly as possible with their names and without any determiner. In the experimental phase, they named the pictures with three kinds of NPs: definite article NPs (e.g. “la table”, [the table]), demonstrative adjective NPs (“cette table”, [this table]), and possessive adjectives NPs (“ma table”, [my table]). Participants named the pictures with each of these NPs in different blocks. Before each block a small practice block of six pictures was included. The order of the blocks was counterbalanced in a Latin square fashion. In each block, the pictures were presented in a random order.

The experimental naming procedure was similar to that of Experiment 1: participants were asked to name the pictures as quickly and as accurately as possible with the corresponding NP. Each trial comprised the following events: first a fixation point (+) for 500 ms, then a blank screen for 300 ms and then the picture stimulus. The picture remained on the screen until the voice key detected the response or when a deadline of 2500 ms was reached without overt response. The next trial began 2 s later.

3.4. Results

The data of the 24 participants were screened for errors and outliers and then analyzed. We excluded from further analysis the 25 trials where the voice key malfunctioned (1.0% of the data points). As in Experiment 1, we coded as errors and excluded those trials in which participants stuttered, hesitated noisily, or gave an incorrect response (82 data points, 3.3%) and those trials in which naming latencies were more than three standard deviations away from the mean of the participant (42 data points, 1.7%). The overall error rate was therefore 5.0%. A summary of the data is provided in Table 4.

For consonant-initial nouns, we observed that partially specified combinations were named *faster* than fully specified ones (naming latencies: $F1(1, 23) = 8.45$, $MSE = 594.2$, $P < 0.01$; $F2(1, 25) = 12.4$, $MSE = 404.0$, $P < 0.01$; error rates: $F1(1, 23) < 1$; $F2(1, 25) = 1.2$).

Table 4

Mean naming latencies in ms (M), standard deviations (St-dev) and percentage of erroneous responses (% err) for each condition in Experiment 2

	M	St-dev	% err
<i>Consonant-initial picture names</i>			
Fully specified	686	76	4
Partially specified	666	66	5
<i>Difference</i>	– 20		– 1
<i>Vowel-initial picture names</i>			
Standard	670	64	5
Non-standard	691	73	7
<i>Difference</i>	21		2

For vowel-initial nouns, we observed significantly faster responses in the standard than in the non-standard condition ($F1(1, 23) = 18.8$, $MSE = 272.2$, $P < 0.01$; $F2(1, 25) = 8.56$, $MSE = 596.2$, $P < 0.01$). The corresponding difference in the analysis of the error rates was only marginally significant by items ($F1(1, 23) = 2.77$, $MSE = 0.002$, $P = 0.11$; $F2(1, 25) = 3.41$, $MSE = 0.001$, $P = 0.076$).

3.5. Discussion

Two points must be highlighted from the results of Experiment 2. First, in the comparison of the partially and fully specified conditions, we observed a difference that was in the unexpected direction. Namely, responses arising from fully specified combinations of features (e.g. “mon sifflet”, “cette table”) led to longer naming latencies than responses arising from partially specified combinations (e.g. “ce sifflet”, “ma table”). As we saw earlier, the unitized activation hypothesis predicts no

Table 5

Detailed results (mean naming latencies in ms) of Experiment 2, broken down by gender and determiner type^a

	Masc.	Fem.	Difference
<i>Consonant-initial picture names</i>			
Possessive	687*	651	+ 36
Demonstrative	680	686*	– 6
<i>Vowel-initial picture names</i>			
Possessive	666*	689	– 23
Demonstrative	694	675*	+ 19

^a For consonant-initial names, possessive-masculine and demonstrative-feminine are Fully Specified (with *); possessive-feminine and demonstrative-masculine are Partially Specified (without *). For vowel-initial names, possessive-masculine and demonstrative-feminine are Standard (with *); possessive-feminine and demonstrative-masculine are Non-standard (without *). Masc., masculine; Fem., feminine.

effect in this comparison and the feature activation hypothesis predicts faster responses for the fully specified than for the partially specified condition. In fact, neither hypothesis predicted the combination of results observed in this experiment.

The origin of these effects in Experiment 2 can be seen in Table 5, which presents the results broken down by type of determiner and grammatical gender. As can be seen in the upper panel of the table, the faster responses in the partially specified condition are solely due to faster responses for the feminine possessive condition. We do not have an explanation for this result, and we defer its discussion until after we test the effect of this factor again in Experiment 3.

The other relevant contrast concerns the comparison of the standard and the non-standard conditions. For pictures with vowel-initial names, responses were faster when the determiner was used in its standard form (e.g. “*mon oignon_{masc}*”, “*cette ampoule_{fem}*”) than when it was used in the non-standard form (e.g. “*mon ampoule_{fem}*”, “*cet oignon_{masc}*”). Note that, as was pointed out earlier, the standard condition is a fully specified one whereas the non-standard is partially specified. However, because in the previous comparison we did not observe slower responses in the partially specified condition, we can attribute the effect observed with vowel-initial nouns to the standard status of determiner forms. Note also that, as can be seen in Table 5 (lower panel), the effect of standardness is visible for both types of determiner (and for both grammatical genders). When participants used possessive NPs, responses were faster for pictures with masculine names than for pictures with feminine names. The opposite pattern was observed when participants used demonstrative NPs.

The *unitized activation hypothesis* predicts null effects for both the Standard vs. Non-standard and the Fully vs. Partially specified comparisons. Together, the reported results suggest that the activation mechanism postulated by this working hypothesis is not a good description of the process under study. The *independent feature hypothesis* predicts effects of specification (fully specified faster than partially specified) and of standardness (standard faster than non-standard); therefore, it is also at odds with the results of the experiment. Before discussing in more detail the implications of these results for the validity of the hypotheses under discussion, we report a third experiment where we tried to replicate the observations of Experiment 2 with different NPs.

3.6. NPs with pre-nominal adjectives

In French, adjectives used in NPs are generally placed after the noun they refer to, although some adjectives are normally used before the noun. In the cases where the structure of the NP is determiner + adjective + noun, the variation of the form of the determiner is not governed by the phonology of the noun but by the phonology of the following word in the NP. This can be seen in the following examples. In (8), the /m^h/ form of the possessive is used with a feminine noun because the first phoneme of the noun is a vowel. However, if a pre-nominal adjective is used, as in (9) and (10), then it is the phonology of the adjective that is relevant in choosing the form of the modifier. As a consequence, the standard /ma/ form is used in (9a) and (9b)

because the pre-nominal adjective starts with a consonant, but the non-standard /m̃/ form is used in (10a) and (10b) because the pre-nominal adjective starts with a vowel. Note that the same rule applies to all determiners.¹⁰

(8) *mon* ampoule_{fem} [my light bulb]

(9a) *ma* nouvelle ampoule_{fem} [my new light bulb]

(9b) *ma* nouvelle table_{fem} [my new table]

(10a) *mon* ancienne ampoule_{fem} [my old light bulb]

(10b) *mon* ancienne table_{fem} [my old table]

In Experiment 3, participants named the pictures with determiner + adjective + noun NPs. The determiners were again possessives and demonstratives. The pre-nominal adjectives were “ancien_{masc}”/“ancienne_{fem}” [old] or “nouveau¹¹_{masc}”/“nouvelle_{fem}” [new]. Because these adjectives were used pre-nominally,¹² it is *their* phonology (and not the phonology of the noun) that imposes the final form of the determiner. As a consequence, parallel to Experiment 2, responses with the consonant-initial adjective “nouveau” either comprised a partially specified or a fully specified combination of features (comparison of cells A and B in Fig. 3). Responses with the vowel-initial adjective “ancien” either comprised a standard or a non-standard determiner form (comparison of cells A and C in Fig. 3).

Note that the properties of the phonological agreement we have described suggest that the elements composing the NP have to be phonologically processed *and ordered* before determiner form selection can be completed. This is because it is the ordering of the elements in the NP that fixes which phonological value (the initial phoneme of the adjective or that of the noun) imposes a constraint on determiner form. Miozzo and Caramazza (1999) found that the phonological properties of the *noun* influence the naming times of determiner + adjective + noun NPs in Italian. In their Experiment 5, these authors asked Italian participants to name pictures by using determiner + adjective + noun NPs (e.g. “*il* grande tavolo” [the big table]). As we saw in Section 1, the form of the Italian masculine definite article varies according to the phonological properties of the context of utterance (e.g. *il* tavolo_{masc} [the table]; *lo* sgabello_{masc} [the stool]). In the experiment, the adjective was always “grande”, requiring the determiner form *il*; the critical comparison was between the nouns that have a phonology that would require the determiner form *il* when used without an adjective (e.g. “*il* tavolo”) and the nouns that would require *lo* (e.g. “*lo* sgabello”). Miozzo and Caramazza observed slower reaction times for the “inconsistent phonology” condition (“*il* grande sgabello”) than for the “consistent phonology” one (“*il* grande tavolo”).

The inconsistent phonology effect in NP production obtained by Miozzo and

¹⁰ The phonology of a post-nominal adjective does not influence the form of the determiner (“mon ampoule orange” = my orange light bulb, “mon ampoule rouge” = my red light bulb).

¹¹ In front of a vowel, the masculine form of the adjective “new” is *nouvel* (e.g. “un nouvel oignon”, a new onion). This alternation was not studied in the present research. In the following experiment, conditions were arranged so as to be symmetric in relation to this variation (all experimental conditions comprised a similar number of masculine and feminine picture names).

¹² These two adjectives can also be used in French in post-nominal position with a slightly different meaning.

Caramazza suggests that *both* the phonological values of the adjective and of the noun contribute to the process of determiner form selection. There are at least two possible interpretations of this effect. One is that the presence of two sources of phonological information (the adjective and the noun) produces a delay due to potential uncertainty as to which source should be considered in the determiner retrieval process. On this account, we would expect to observe a phonological inconsistency effect irrespective of the determiner that is used. Another interpretation of the inconsistent phonology effect is that both phonological values contribute to the process of determiner selection. On this account, we could expect to observe the phonological consistency effect only in the case where phonology is crucial to the selection of determiner form: namely, in partially specified conditions. Note that the latter interpretation of the inconsistent phonology effect can only be instantiated within the independent feature hypothesis of determiner selection. This is because only this hypothesis allows for the independent contribution of each feature (including the phonological context) to the process of determiner selection.

Thus, the investigation of phonological context effects on determiner selection can elucidate the nature of the determiner selection mechanism. For this reason, in Experiment 3 we also manipulated the phonological value of the nouns that composed the NPs: half of the nouns we used started with a vowel and the other half started with a consonant.

4. Experiment 3

In Experiment 3 participants named pictures with determiner + adjective + noun NPs. There were two adjectives: a vowel-initial adjective (“ancien”) and consonant-initial adjective (“nouveau”). Manipulations parallel to those of Experiment 2 allowed the comparison of the production of fully and partially specified conditions (with consonant-initial adjectives) and the comparison of the production of standard and non-standard determiner forms (with vowel-initial adjectives).

With consonant-initial adjectives, the two proposed hypotheses would predict either no effect of the factor specification (unitized activation hypothesis) or faster responses for the fully specified than for the partially specified conditions (independent feature hypothesis). However, the results of Experiment 2 unexpectedly showed faster responses for the partially specified condition. The evaluation of the effect of specification provides a test for the reliability of this unexpected observation.

On the basis of the results of Experiment 2 we expected that with vowel-initial-adjectives responses should be faster with standard (e.g. “mon ancien sifflet_{masc}” [my old whistle]) than with non-standard determiner forms (e.g. “mon ancienne table_{fem}” [my old table]).

As a secondary hypothesis, the observations reported by Miozzo and Caramazza (1999) allowed the prediction that NPs with consistent phonology (noun and adjective starting both with a vowel or a consonant) should produce shorter naming

latencies than NPs with inconsistent phonology (noun and adjective of different phonological values).

4.1. Method

4.1.1. Participants

Twenty participants volunteered for this experiment. As in the previous experiments they were native speakers of French that lived temporarily in the United States. They were 25 years old on average (range 19–32 years), and had been in the United States for an average of 8 months (range 1–36 months). None had participated in the previous experiments. They were paid for their participation.

4.1.2. Materials

We selected the pictures of 40 objects to be used as experimental items. The pictures were either taken from the same sources as those of the previous experiments or created by editing materials from a commercial collection of pictures (ArtExplosion, 1998). Half of the pictures had consonant-initial names and half had vowel-initial names. Among these two groups half were masculine and half were feminine.

We selected two adjectives to be used in the NPs. These adjectives had to meet the following criteria: to be used naturally in a pre-nominal position in French and to be easily elicited in a picture-naming task. Moreover, one of the adjectives had to be consonant-initial and the other vowel-initial. The adjectives “nouveau” (new) and “ancien” (old) met these requirements. In order to elicit the two kinds of verbal responses that we desired (e.g. “mon ancien sifflet” = my old whistle or “mon nouveau sifflet” = my new whistle) two versions of each picture were used. The pictures that would elicit “new” responses were the original thin-outline black-on-white pictures. To create the “old” pictures, the outlines of the “new” pictures were carefully blurred with the software Adobe® Photoshop® 5.5. Examples of these stimuli are given in Fig. 4. As shown by pilot testing and by the response accuracy data reported below (overall, 9.8% of errors of different kinds), these edited pictures were notably different from the “new” versions but still clearly depicted the object to be named. By creating a “new” and an “old” version of each of the 40 pictures, we obtained the 80 experimental pictures that were used in the experiment. A complete list of the experimental materials is provided in Appendices D and E.

We also selected 40 pictures from the same sources to be used as training trials and as fillers. Half of these pictures had masculine names and half had feminine names (the rationale for the use of these fillers is described below).

4.1.3. Design

In this experiment, participants named pictures like those presented in Fig. 4 with determiner + adjective + noun NPs. The pictures were named in two blocks. In one of the blocks, participants were instructed to name the pictures with possessive determiners (*mon* and *ma* meaning “my”, e.g. “mon ancien sifflet” or “ma nouvele

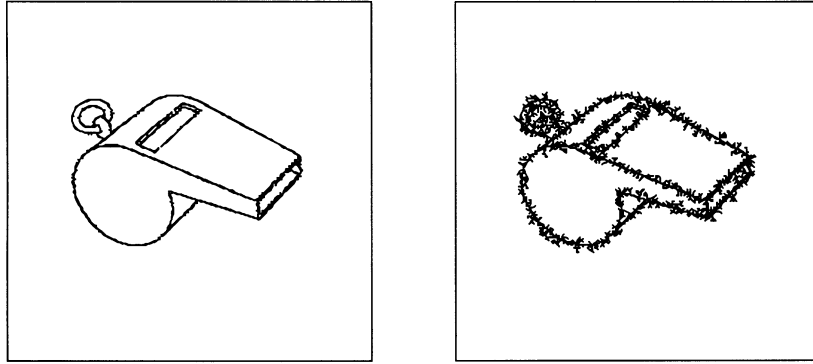


Fig. 4. Two examples of stimuli used in Experiment 3. Participants were instructed to use the adjective “nouveau” (new) to refer to objects with thin outlines, like the one on the left (e.g. “mon nouveau sifflet” = my new whistle), and to use the adjective “ancien” to refer to the objects with blurred outlines, like the one on the right (e.g. “mon ancien sifflet” = my old whistle). During the experiment, each trial included only one picture.

table”). In the other block, the pictures were named with demonstratives (*ce* and *cette* meaning “this”, e.g. “cette ancienne table” or “ce nouveau sifflet”).

Each block (possessive or demonstrative) comprised 80 experimental items and 20 fillers. The experimental items were the “new” and “old” versions of the 40 experimental pictures. As in the previous experiment, if only experimental items had been used, participants would have used one of the forms of the determiner much more often than the other form. This is because with the consonant-initial adjective both standard determiner forms are used ($/m\tilde{d}/$ and $/ma/$ for possessives; $/s\tilde{a}/$ and $/set/$ for demonstratives), but with the vowel-initial adjective only one determiner form is used ($/m\tilde{d}/$ for demonstratives, $/set/$ for possessives). The fillers were all “new” objects with feminine names for the possessive block and with masculine names for the demonstrative block. With this manipulation, each block comprised 60% of “new” items and 40% of “old” items. The possessive adjective block elicited 40% of NPs starting with $/ma/$ and 60% starting with $/m\tilde{d}/$. Similarly, the demonstrative adjective block elicited 40% of NPs starting with $/s\tilde{a}/$ and 60% starting with $/set/$.

In the experiment, participants named the pictures with possessive and demonstrative determiners in two different blocks. The order of presentation of these blocks was counterbalanced across participants. In each block the pictures were presented in a semi-random order. For that purpose, various semi-random experimental lists that included all the items of a block were created. Each participant received one of these lists in the possessive block and another one in the demonstrative block. The order of the pictures in these lists was randomized with the following constraints: (1) the two first trials were filler trials; (2) there were never more than three successive trials for which the same determiner form or adjective form was used; and (3) the names of the objects in two successive trials were

neither semantically nor phonologically related. As each list comprised two instances of each experimental item (one “new” and one “old”) we were careful to separate them: the average lag between two occurrences of the same object was 36 trials.

4.1.4. *Experimental conditions and analyses*

The experimental conditions paralleled those used in Experiment 2, with the addition of the factor phonological consistency. With consonant-initial adjectives (see Table 6 and Appendix D), responses could either be fully specified (possessive masculine or demonstrative feminine) or partially specified (possessive feminine or demonstrative masculine). In addition, responses could be phonologically consistent (when they involved a consonant-initial noun) or phonologically inconsistent (when they involved a vowel-initial noun).

With vowel-initial adjectives (see Table 7 and Appendix E), responses could either be standard (possessive masculine or demonstrative feminine) or non-standard (possessive feminine or demonstrative masculine). Again, responses could also be phonologically consistent (now when they involved a vowel-initial noun) or phonologically inconsistent (when they involved a consonant-initial noun).

Three potential effects are relevant in this experiment: the effect of specification, the effect of standardness, and the effect of phonological consistency. Following the logic used in Experiment 2, to evaluate the effect of specification we will only consider responses with consonant-initial adjectives, and to evaluate the effect of standardness we will only consider responses with vowel-initial adjectives. However, to evaluate the effect of phonological consistency, these two types of responses have to be considered together. As can be seen in Table 6, for example, if we were to compare the Consistent and Inconsistent conditions only on the basis of responses with *consonant-initial adjectives*, this comparison would involve different sets of pictures in the two experimental conditions. The consistent condition would involve pictures with consonant-initial names (e.g. “sifflet” and “table”) whereas the inconsistent condition would involve pictures with vowel-initial names (e.g. “oignon” and “ampoule”). Therefore, any difference between the two conditions might be due to the experimental manipulation or to the specific materials involved in the comparison. To avoid this confound, the analysis of the consistency effect was conducted on the basis of responses involving consonant- *and* vowel-initial adjectives. The Consistent condition involves the pictures with consonant-initial names (e.g. “sifflet” and “table”) named with the consonant-initial adjective “nouveau”, and the pictures with vowel-initial names (e.g. “oignon” and “ampoule”) named with the vowel-initial adjective “ancien”. The same is true for the inconsistent condition with reversed assignments. In this way, the same materials are used in the different experimental conditions.

For the sake of clarity we will first report the evaluation of the effects of specification and standardness and then the evaluation of the effect of phonological consistency. For the first analysis, two factors were considered: the phonological value of the adjective (consonant-initial or vowel-initial), and the status of the determiner (fully or partially specified in the context of consonant-initial adjectives and standard or non-

Table 6
 Examples of the materials used in the different conditions of Experiment 3 involving a consonant-initial adjective, along with their English translation^a

Determiner status	Phonological consistency	Consonant-initial adjectives (French materials)	Determiner	English translation
Fully specified (cell A)	Consistent	Cette nouvelle table _{fem} Mon nouveau sifflet _{masc}	/sɛt/ /mɔ̃/	[This new table] [My new whistle]
	Inconsistent	Cette nouvelle ampoule _{fem} Mon nouvel oignon _{masc}	/sɛt/ /mɔ̃/	[This new light bulb] [My new onion]
Partially specified (cell B)	Consistent	Ma nouvelle table _{fem} Ce nouveau sifflet _{masc}	/ma/ /sə/	[My new table] [This new whistle]
		Inconsistent	Ma nouvelle ampoule _{fem} Ce nouvel oignon _{masc}	/ma/ /sə/

^a The experimental conditions collapsed the two grammatical genders. Note that the comparison between the Fully specified and the Partially specified conditions involves the same items. fem, feminine; masc, masculine; the cells refer to those represented in Fig. 3.

Table 7
 Examples of the materials used in the different conditions of Experiment 3 involving a vowel-initial adjective, along with their English translation^a

Determiner status	Phonological consistency	French materials	Determiner	English translation
Standard (cell A)	Consistent	Cette ancienne ampoule _{fem}	/set/	[This old light bulb]
		Mon ancien oignon _{masc}	/mɔ̃/	[My old onion]
Non-standard (cell C)	Inconsistent	Cette ancienne table _{fem}	/set/	[This old table]
		Mon ancien sifflet _{masc}	/mɔ̃/	[My old whistle]
	Consistent	Mon ancienne ampoule _{fem}	/mɔ̃/	[My old light bulb]
		Cet ancien oignon _{masc}	/set/	[This old onion]
	Inconsistent	Mon ancienne table _{fem}	/mɔ̃/	[My old table]
		Cet ancien sifflet _{masc}	/set/	[This old whistle]

^a The experimental conditions collapsed the two grammatical genders. Note that the comparison between the Standard and Non-standard conditions involve the same items and the same determiner forms recombined. fem, feminine; masc, masculine; the cells refer to those represented in Fig. 3.

standard in the context of vowel-initial adjectives).¹³ The second analysis (effect of phonological consistency) was carried out with two factors: the phonological consistency of the NPs (phonologically consistent or inconsistent NPs) and determiner status (fully or partially specified status).¹⁴ Recall that for fully specified determiners, the same determiner form is used irrespective of the phonological context (in front of consonants and vowels). For partially specified determiners, different determiner forms are used in front of consonants and in front of vowels.

4.1.5. Procedure

The general procedure was similar to that of the previous experiments. Participants were first familiarized with the materials in both their “new” and “old” versions. They were asked to name these pictures with indefinite NPs (e.g. “un ancien sifflet” = an old whistle). The written feedback in each of the trials of the familiarization part included both the adjective and the object name.

Participants were then assigned to one of the experimental groups and were given the two experimental blocks (possessives and demonstrative NPs) in turn. The experimental trial was similar to the previous ones except for the fact that now the experiment was self-paced: participants pressed a key after completing each response. This was done because the responses required in this experiment were somewhat more complex than those required in the previous ones.

4.2. Results

The data were screened for errors and outliers and then analyzed. Trials in which the voice key malfunctioned were removed from the data (32 data points, 1.0%). As in the previous experiments, we coded as errors and excluded those trials in which participants stuttered, hesitated noisily, or gave an incorrect response (272 trials, corresponding to 8.5% of the data points)¹⁵ and those trials in which naming latencies were more than three standard deviations away from the mean of the participant (40 data points, 1.3%).

4.2.1. Effects of specification and standardness

The data corresponding to this analysis are presented in Table 8. In this analysis, we observed a trend for an effect of the phonology of the adjective, with faster responses to the NPs with consonant-initial adjectives than to the NPs with vowel-initial ones ($F(1, 19) = 3.76$, $MSE = 1129$, $P = 0.067$; $F(1, 39) = 1.51$,

¹³ Notice that the phonological value of the noun is not considered in this analysis. Importantly, in each of the conditions that are defined for this first analysis there is an equal number of vowel- and consonant-initial nouns. The phonological value of the noun is considered in the following analysis of the phonological consistency.

¹⁴ For responses involving vowel-initial adjectives, the fully specified condition is the one where the standard determiner form is used. The partially specified condition is the one where the non-standard form is used (see Fig. 3).

¹⁵ These erroneous trials involved errors on the determiner (40 data points, 1.3%), on the adjective (101 data points, 3.2%), on the noun (54 data points, 1.7%) or dysfluencies of several kinds including hesitations before or during response articulation (76 data points, 2.4%).

Table 8
Analysis of the effects of specification and standardness in Experiment 3^a

Consonant-initial adjective (“nouveau”)				Vowel-initial adjective (“ancien”)			
Determiner status	M	St-dev	% err	Determiner status	M	St-dev	% err
Fully specified	766	135	11	Standard	768	125	8
Partially specified	769	132	9	Non-standard	796	128	11
<i>Effect</i>	3		– 2	<i>Effect</i>	28		3

^a M, mean naming latencies in ms; St-dev, standard deviations; % err, percentage of erroneous responses.

$MSE = 3558$, $P = 0.23$); also there was an effect of determiner status ($F(1, 19) = 3.69$, $MSE = 1328$, $P = 0.070$; $F(1, 39) = 11.7$, $MSE = 764.5$, $P < 0.01$). Importantly for our purposes, there was a two-way interaction between determiner status and phonology of the adjective ($F(1, 19) = 6.01$, $MSE = 518.8$, $P = 0.02$; $F(1, 39) = 3.02$, $MSE = 1483$, $P = 0.09$). This interaction indicates that the effects of determiner status were different for vowel-initial and consonant-initial adjectives. For the consonant-initial adjectives, the difference between fully and partially specified determiners (cell A vs. cell B: 3 ms) was not significant ($F(1, 19) < 1$; $F(1, 39) < 1$). However, for vowel-initial adjectives, the difference between standard and non-standard determiners (cell A vs. cell C: 28 ms) was significant ($F(1, 19) = 15.3$, $P < 0.01$; $F(1, 39) = 8.80$, $P < 0.01$).

A similar analysis was conducted on the error rates. We observed no effect of adjective phonology and no effect of determiner status (both $F < 1$). The interaction between the two factors was significant ($F(1, 19) = 11.1$, $MSE = 0.001$, $P < 0.01$; $F(1, 39) = 4.94$, $MSE = 0.005$, $P = 0.03$). As in the RT analysis, planned comparisons showed no effect of specification ($F(1, 19) = 2.70$, $P = 0.12$; $F(1, 39) < 1$), but an effect of standardness, with more accurate responses in the standard than in the non-standard condition ($F(1, 19) = 9.40$, $P < 0.01$; $F(1, 39) = 3.86$, $P = 0.06$).

4.2.2. Effect of phonological consistency

The effect of phonological consistency observed by Miozzo and Caramazza (1999) is the observation of slower naming latencies for NPs where the phonological

Table 9
Analysis of the effect of phonological consistency in Experiment 3^a

Fully specified determiner				Partially specified determiner			
Type of NP	M	St-dev	% err	Type of NP	M	St-dev	% err
Phon. consistent	762	125	9	Phon. consistent	766	116	10
Phon. inconsistent	771	131	10	Phon. inconsistent	800	143	12
<i>Effect</i>	9		1	<i>Effect</i>	34		2

^a M, mean naming latencies in ms; St-dev, standard deviations; % err, percentage of erroneous responses.

value of the adjective and the noun are different than in NPs where these phonological values are similar. We assessed this effect with two factors: the phonological consistency of the NPs (phonologically consistent or inconsistent NPs) and determiner status (fully or partially specified status). The data relevant for this analysis are presented in Table 9.

We observed an effect of phonological consistency of the NP ($F(1, 19) = 12.0$, $MSE = 773.9$, $P < 0.01$; $F(1, 39) = 9.38$, $MSE = 2979$, $P < 0.01$), with longer naming latencies for inconsistent NPs than for consistent NPs. There was also an effect of determiner status ($F(1, 19) = 3.73$, $MSE = 1327$, $P = 0.07$; $F(1, 39) = 11.7$, $MSE = 764.5$, $P < 0.01$). However, these effects were modulated by a significant interaction between phonological consistency and determiner status ($F(1, 19) = 6.69$, $MSE = 452.6$, $P = 0.02$; $F(1, 39) = 5.97$, $MSE = 1386$, $P = 0.02$). This interaction indicates that the effects of phonological consistency were different for the fully and the partially specified determiner forms. For fully specified determiners, where the determiner form does not vary with phonology, the difference between phonologically consistent and inconsistent NPs (9 ms) was not significant ($F(1, 19) = 1.88$, $P = 0.19$; $F(1, 39) = 2.1$, $P = 0.16$). For partially specified determiners, where a different determiner form is used in front of a vowel or in front of a consonant, the difference between phonologically consistent and inconsistent NPs (34 ms) was clearly significant ($F(1, 19) = 25.3$, $P < 0.01$; $F(1, 39) = 24.1$, $P < 0.01$).

In the analysis of the error rates, no significant effect was found: phonological consistency ($F(1, 19) = 1.89$, NS; $F(1, 39) = 2.67$, NS), degree of specification (both $F < 1$) and their interaction ($F(1, 19) = 2.00$, NS; $F(1, 39) = 1.3$, NS).

4.3. Discussion

Experiment 3 yielded the following results. Naming latencies were shorter when participants used a standard determiner form than when they used a non-standard determiner form (with vowel-initial adjectives). This result replicates the result observed in Experiment 2. By contrast, naming latencies were not different in the fully and the partially specified conditions (with consonant-initial adjectives). This means that the unexpected effect of specification observed in Experiment 2 is not replicated here. Finally, we observed an effect of the phonological consistency of the NPs that was restricted to partially specified determiner forms. This last result replicates and extends the similar result reported by Miozzo and Caramazza (1999, Experiment 5).

In summary then, the results of Experiment 3 confirm that the standardness of a determiner form is an important variable affecting determiner form selection and that the phonological consistency of the NP only affects the retrieval of determiners when determiner status is partially specified.

5. General discussion

In the research reported in this article we set out to study some of the character-

istics of determiner production. We tackled this question by conducting three picture-naming experiments in which participants named pictures with determiner + noun NPs or determiner + adjective + noun NPs in French. The first experiment demonstrated that picture naming latencies were not affected by the gender of a distractor word written on the picture. The second experiment showed that NP naming latencies were influenced by the standardness of the determiner form: naming latencies were longer for non-standard determiner forms than for standard determiner forms. This effect of standardness was replicated in Experiment 3, where participants named the pictures with determiner + adjective + noun NPs. The degree of specification of the determiner affected performance in Experiment 2, where naming latencies were faster for partially specified than for fully specified determiners. This was an unexpected outcome; however, the effect of specification was clearly not replicated in Experiment 3 where participants named the pictures with adjectival NPs. In our discussion of the results, we will assume that the degree of specification does not affect naming latencies in a systematic manner.

Finally, Experiment 3 also showed that phonologically inconsistent NPs were responded to slower than phonologically consistent NPs. In other words, responses were longer to NPs where the noun and the adjective had different phonological values than for NPs where the noun and the adjective both started with either a vowel or a consonant (an effect that was also observed by Miozzo & Caramazza, 1999). The consistency effect was only observed when the information “kind of determiner” and “grammatical gender” was partially specified (i.e. this information was compatible with two determiner forms).

What are the implications of these results for our understanding of the system of determiner production?

5.1. Late selection of determiner forms and phonological adaptation rules

In Experiment 1 we observed that in French, as in other Romance languages tested to date (Catalan, Italian, and Spanish), producing NPs in the presence of a distractor word is not influenced by the grammatical gender of the distractor. This absence of effect contrasts with the effect that has been reported in similar experiments conducted in other languages such as Dutch and German. A general interpretation that has been proposed for this observation is that in languages where determiner form depends on the phonological properties of the context, determiner selection happens late during NP construction (Miozzo & Caramazza, 1999). It is argued that such a delay occurs because in a number of cases the phonological properties of the following word are required to perform the selection. In this context, our result suggests that in French definite determiners are selected “late” during the encoding of the NP.

Can we specify what forms are being selected at this late stage of speech production? It could be the case that when the phonological context is a consonant, the standard determiner forms (/lə/ and /la/) are selected and that when the context is a vowel, the non-standard determiner form (/l/) is selected. Alternatively, it could be that standard determiner forms (/lə/ and /la/) are always selected and that a later post-

selection adaptation rule, solely defined in phonological terms, transforms /lə/ and /la/ into /l/ if they are used in front of a vowel. This is a possibility because the nature of the phonological variations of the definite article (/lə/ or /la/ in front of a consonant; /l/ in front of a vowel) could be implemented by a simple phonological rule.¹⁶

Note, however, that not all determiner form variations in French are as straightforward as that undergone by the definite article.¹⁷ A putative phonological rule that transforms the sequence /ma/+vowel into the sequence /m[̃]/+vowel¹⁸ would stand in contrast with the rule that would transform /la/+vowel into /l/+vowel. Similarly, a rule that transforms /lə/+vowel into /l/+vowel might stand in contrast with a rule that transforms /sə/+vowel into /sɛ/+vowel. Furthermore, note that any such set of rules could not be specified in strictly phonological terms. This is clearly illustrated by considering the case of *ce* (/sə/, e.g. “*ce sifflet*”, [this whistle]) which is homophonous with the reflexive *se* (/sə/, e.g. “*il se lave*”, literally *[he himself washes]). When these two items are used in front of a vowel they undergo different transformations, even in the presence of the same phonological environment. For the demonstrative, the correct form is /sɛ/ (as in “*cet arrêt_{masc}*” [this stop]) but for the reflexive the correct form is /s/ (“*il s’arrête*” [he stops], and not **“il se arrête”* or **“il cet arrête”*). This example shows that phonology alone is not sufficient to distinguish between these two kinds of sequences.

More generally, what these examples demonstrate is that if all variations of determiner form due to the phonological context are implemented as phonological rules, then these rules are not going to have a general character. Note also that this view would fail to explain why gender congruity effects are not found in Romance languages but are found in Dutch and German. If determiner selection were carried out solely on the basis of grammatical gender (and kind of determiner and number) it could be accomplished early (as is hypothesized to be the case in Dutch and German). Therefore, we would expect an effect of the grammatical gender of distractor words in French and other Romance languages, contrary to the results reported here and in other recent studies with Italian, Spanish, and Catalan.

Thus, this discussion indicates that in a language like French the phonological value (consonant or vowel) of the context is directly involved in the process of determiner *selection*. In the remainder, we discuss the nature of the mechanism of determiner selection in the context of the contrasting hypotheses that were proposed in Section 1.

¹⁶ Such a rule could work in several cases. For example, the definite determiner *la* (fem) in Catalan is reduced to /l/ when followed by a vowel-initial word.

¹⁷ This is also true for other languages. For example, in Italian the singular masculine definite determiner can either be *il*, *lo*, or *l* depending on the phonological properties of the following word (see examples given in Section 1). In the plural, the forms of the masculine definite determiner are *gli* and *i*. It is not obvious that a simple phonological rule could account for the relation between the different determiner forms used in different phonological contexts.

¹⁸ Such a rule would also apply to the two other singular possessive determiners: the second person (/t[̃]/ and /ta/) and the third person (/s[̃]/ and /sa/).

5.2. *Toward a mechanism of determiner selection*

How then do the different types of information that are relevant to determiner retrieval contribute to that process? In the two working models proposed in Section 1 (the *unitized activation hypothesis* and the *feature activation hypothesis*) the role of the features that participate in determiner selection is implemented differently.

In the unitized activation hypothesis, an undifferentiated information chunk drives the production of determiners. On this hypothesis, all the required information (including “kind of determiner”, “grammatical gender”, “phonological value of the context of production”) acts as a single informational chunk to activate its associated determiner form. Moreover, the internal characteristics of the chunk (its constituent features) do not contribute individually to the process of determiner retrieval. In other words, determiner retrieval is only influenced by the characteristics of the chunk as a whole and not by the properties of its constituent features. This working model of determiner selection predicts that the factor “degree of specification”, which captures whether a single or multiple determiner forms are compatible with a given combination of “kind of determiner” and “gender”, does not influence performance in determiner retrieval. This is because determiner activation presumably only takes place once all the necessary features for unambiguous selection are inserted in a determiner frame, and therefore it makes no difference whether one or more than one determiner form is compatible with the semantic/syntactic and lexical features that drive determiner selection. Compatible with this prediction, we observed no reliable effect of the factor “degree of specification”.

This working model also predicts no effect of the standardness of the determiner form (i.e. whether or not the form that is used is the “usual” form for that gender). This is because, when considered as unitized chunks, the combinations of the features “kind of determiner”, “grammatical gender”, and “phonological value of the context of production” present no intrinsic differences with respect to the type of determiner – standard or non-standard – that is ultimately selected. Contrary to this prediction, in two experiments we consistently observed a reliable effect of the standard status of determiner form. This model’s failure to predict the observed standardness effect is due to the fact that standardness is a property defined in terms of the relation between *individual features* and *determiner forms* (e.g. *mon* is non-standard only when used with a feminine noun). The unitized activation hypothesis precludes a role for individual features in determiner selection. Still, is it possible to provide some modification of the unitized activation hypothesis that would predict the effect of standardness? Recall that the unitized activation hypothesis (as well as the independent feature hypothesis) was formulated in the most extreme form possible. Here we will examine possible modifications of the hypothesis that try to accommodate the effect of standardness while keeping its core assumption of unitized activation.

First, it could be proposed that some individual features may be easier to retrieve than others, so that the activation of all the information required to trigger determi-

ner retrieval – the “completion” of the frame – would take longer in some conditions (e.g. non-standard) than in others (e.g. standard). Under our definitions the standard condition involves the bundled sets [*poss.* + *masc.* + *vow.*] and [*det.* + *fem.* + *vow.*] whereas the non-standard condition involves the sets [*poss.* + *fem.* + *vow.*] and [*det.* + *masc.* + *vow.*]. As can be seen, exactly *the same individual features* are present in the two experimental conditions. Any specific variation in the retrieval time of a given feature would affect equally the responses in the standard and non-standard conditions. Therefore, although the assumption about the way features are retrieved might be true – and lead to visible effects in other conditions of determiner production – it would not help in predicting the effect of standardness observed in the experiments we report.

Alternatively, we could propose that there are certain interactions between the features during their retrieval that make some combinations of features easier to retrieve than others. For instance, it could be proposed that the retrieval of a given feature primes the retrieval of *other features* in the standard condition more than in the non-standard condition. Under an assumption of this type, the standard condition would lead to faster responses if it was the case that, for example, *poss.* + *masc.* and *dem.* + *fem.* are processed faster than *poss.* + *fem.* and *dem.* + *masc.* or that *masc.* + *vow.* together facilitate the retrieval of *poss.* while slowing the retrieval of *det.* but that *fem.* + *vow.* facilitate the retrieval of *det.* while slowing the retrieval of *poss.* However, it is difficult to provide a principled motivation for the type of assumptions that one would have to make in order to account for the standardness effect. Moreover, these assumptions are so specific that they are barely more than a restatement of the data that was observed. As before, although the hypothesis of priming between features might be true, in the context of the unitized activation hypothesis this assumption does not provide a satisfactory and plausible account of the effect of standardness.

Finally, it could be postulated that once all relevant features have been retrieved – at the same speed in the standard and the non-standard conditions – the activation and retrieval of the determiner is easier in one condition than in the other. For example, it is plausible to think that the more frequent feature combinations could be processed faster or that the more frequent determiner forms could be retrieved faster. Note, however, first that the determiner forms are the same in the standard and non-standard conditions (either /m̃/ or /set/) so that the ease of retrieval of the determiner forms cannot account for the difference observed between these two conditions.

In summary then, we have tried to adapt the unitized activation hypothesis while keeping its core assumption (namely, that unitized chunks drive determiner retrieval). None of the modifications examined here fare better in explaining the standardness results than the original version of the hypothesis. This is mainly due to the fact that standardness is a variable defined in terms of the relation between individual features and determiner forms and that the unitized activation hypothesis cannot account for effects that depend on the contribution of individual features.

Further evidence against the unitized activation hypothesis comes from the

phonological consistency effect in complex NP (Det + Adj + N) production (see also Miozzo & Caramazza, 1999). In Experiment 3 we observed that phonologically consistent NPs lead to faster responses than phonologically inconsistent NPs and that this difference only holds for the partially specified condition (i.e. for those cases where phonological context contributes to the form of the determiner). The fact that a phonological consistency effect is observed at all suggests that the phonological value of the noun in Det + Adj + N NPs influences the process of determiner selection, even though such a value is structurally irrelevant for the form of the determiner in this type of NP constructions (see Costa & Caramazza, in press, for a detailed discussion on the activation of phonological representations during NP production). Moreover, since the phonological consistency effect is limited to the partially specified condition (where phonological context affects determiner forms) we can infer that the effect is directly due to the role of phonological features in activating determiner forms and not to uncertainty about which phonological value (from the noun or from the adjective) should be retained for selecting the determiner. This interpretation argues against the unitized activation hypothesis because in that model individual features do not contribute to determiner form activation. Therefore, the phonological consistency effect provides a further argument against the hypothesis that determiner retrieval is solely guided by a unitized chunk of information comprising all the required features for determiner form selection.

Unlike the unitized activation hypothesis, the feature activation hypothesis assumes that the retrieval of determiner forms is driven by independent activation from each of the features that define the choice of specific determiners. A selection mechanism, sensitive to the levels of activation of candidate determiner forms, selects the determiner form with the highest level of activation. Does the feature activation hypothesis provide a better account of the reported observations? Consider for example the combination [*poss.*] + [*asc.*] + [*vow.*] compared to the combination [*poss.*] + [*fem.*] + [*vow.*], both leading to /mɔ̃/, but where the first corresponds to the standard and the second to the non-standard use of that possessive (see Fig. 5). Because in this model each of the relevant features contributes independently to the process of determiner retrieval, a difference between the standard and the non-standard conditions can be explained by a difference in the roles played by the individual features in activating determiner forms. More specifically, in this example with possessives, the connection between the gender feature *masculine* and the corresponding standard form could be stronger than the connection between the gender feature *feminine* and the corresponding non-standard form.¹⁹ A faster accumulation of activation in the case of a standard form might then lead to faster retrieval (and shorter naming latencies) in this condition than in the non-standard condition. That is, faster naming of the standard form is expected because in the feature activation hypothesis we are assuming that the activation

¹⁹ The same would be true in the case of demonstratives if we compared the combination [demonstrative]-[feminine]-[vowel] to the combination [demonstrative]-[masculine]-[vowel] (both leading to /set/, the first standard and the second non-standard).

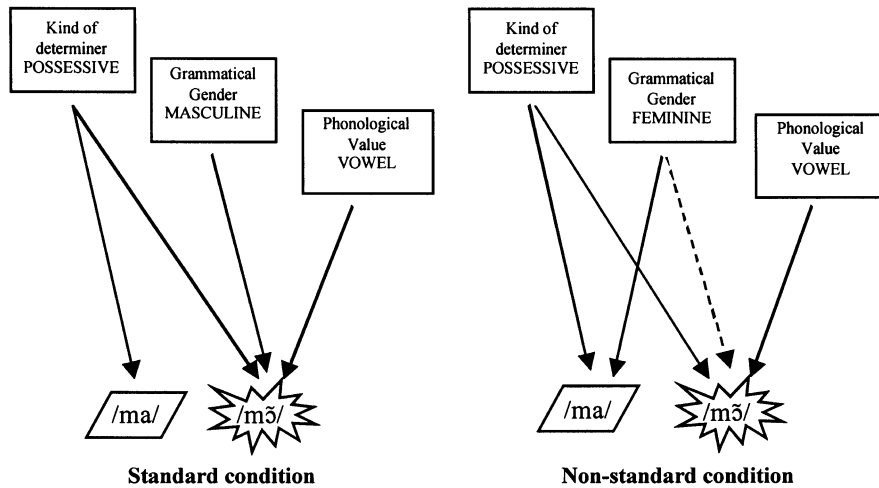


Fig. 5. Schematic representation of the conditions standard and non-standard in the *feature activation hypothesis*. The highlighted determiner form is the one that will be produced. The dotted arrow indicates a weaker link between the feature and the non-standard determiner form (some of the connections might have different strengths; all connections are not necessarily postulated by the model; see text for details).

levels of competing forms contribute to the ease with which the target determiner form is selected. As can be seen in Fig. 5, the activation level of the competing form /ma/ in the standard condition (receiving activation only from the feature “kind of determiner”) is expected to be lower than in the non-standard condition (receiving activation both from “kind of determiner” and “feminine gender”).

However, if the feature activation hypothesis is to provide a better account of the data than the unitized activation hypothesis, it has to explain why the dimension “degree of specification” did not produce an effect in our experiments. Recall that the feature activation hypothesis predicts slower reaction times for the partially specified condition because of the assumption that this condition is one in which the target determiner form receives stiffer competition from potential alternatives (see Fig. 6, where, as indicated by the number of arrows connecting features to determiner forms, the difference in activation level of /ma/ relative to the target /m̃/ in the fully specified condition is smaller than that of /m̃/ relative to the target /ma/ in the partially specified condition). There are several ways in which the feature activation hypothesis could be amended in order to account for why “degree of specification” did not affect reaction times in NP production. For example, we could assume that in the fully specified and the partially specified conditions the activation levels of potential competitors do not differ appreciably. Therefore, they do not provide the opportunity to reveal an effect of competition. Alternatively, we could assume that there is no connection between the feature “feminine” and the determiner form /m̃/. This would have the consequence of equalizing the activation levels of the competitors in the two conditions (see Fig. 6, and imagine the activation levels of the determiners if the dotted line connecting

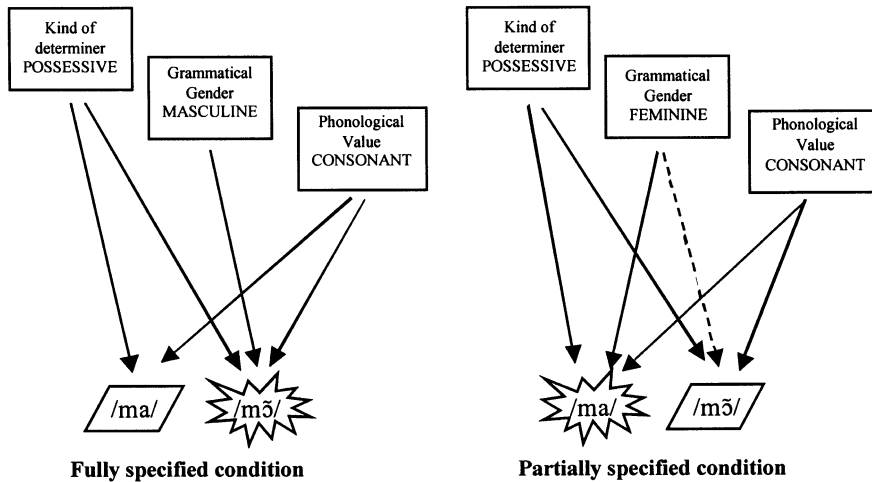


Fig. 6. Schematic representation of the fully specified and partially specified conditions in the *feature activation hypothesis*. The highlighted determiner form is the one that will be produced. The dotted arrow indicates a weaker link between the feature and the determiner form (some of the connections might have different strengths; all connections are not necessarily postulated by the model; see text for details).

“feminine” to/ $m\tilde{\text{ɔ}}$ / were deleted). However, such a move would complicate the selection process for determiners in vowel contexts (see Fig. 5). Now, the selection of the non-standard form / $m\tilde{\text{ɔ}}$ / would be impossible, as it would be receiving the same amount of activation as the form / ma /. Consequently a further modification would have to be introduced: the connection strength from the feature “vowel” to the determiner form / $m\tilde{\text{ɔ}}$ / would have to be especially strong to force the selection of / $m\tilde{\text{ɔ}}$ / over its competitor / ma / in the feminine case. This is not necessarily a bad move. However, neither of these proposals invoked to save the feature activation hypothesis has independent motivation: they are *ad hoc* modifications to account for an unexpected effect. Therefore, if we are to retain this hypothesis we will need to have independent theoretical and/or empirical motivation for the *ad hoc* assumptions introduced here.

Since neither the unitized activation hypothesis nor the feature activation hypothesis offer a complete account of the facts established by our research, we may want to consider a hybrid hypothesis that combines the better features of the two hypotheses discussed here. Let us suppose that the selection process operates as assumed by the unitized activation hypothesis. That is, let us suppose that selection of a determiner form is carried out on the basis of a one-to-one mapping between a filled determiner frame and a determiner form. Let us also assume that the individual features that are candidates for insertion into a determiner frame send some activation to the determiner forms with which they are associated. A consequence of this assumption is that determiner forms will be *primed* prior to being selected on the basis of strong activation from the filled determiner frame. We will call the hypoth-

Primed unitized activation model

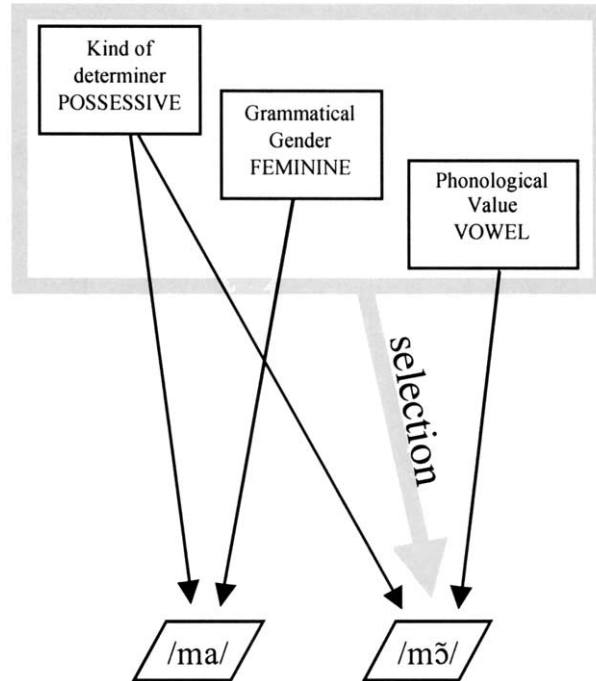


Fig. 7. Schematic representation of the *primed unitized activation hypothesis*. Each relevant feature can have an independent contribution to determiner form activation (thin black arrows). The selection of the correct determiner form is accomplished by a one-to-one mapping between a filled determiner frame (thick gray frame) and the corresponding determiner form. The figure does not represent the temporal aspects of the process. See text for details.

esis that implements the unitized activation and priming assumptions the “primed unitized activation hypothesis” (see Fig. 7). It can be noted that this hypothesis relies on a distinction between the processes of activation (independent activation) and the process of selection (unitized selection). Such a distinction can be found in several existing theories of speech production such as those of Dell, Burger, and Svec (1997), and MacKay (1987), or Roelofs (1997).

This proposal provides a straightforward explanation for the four facts about determiner processing discussed here. The fact that French is a late selection language is captured by the assumption that selection of determiner forms only takes place once the determiner frame has been filled – a late process since the context phonology slot in the frame has to be filled before a determiner can be selected. The phonological consistency effect follows from the priming assumption. Since phonological features that are candidates for insertion into the determiner frame prime their associated determiner forms, phonologically inconsistent contexts will prime competing determiner forms, slowing down the selection process. A

similar explanation can be given for the standardness effect. Here, the assumption is that in the standard condition /m̃/ receives priming from the features kind of determiner, gender and phonology, whereas in the non-standard condition /m̃/ receives priming only from the features grammatical gender and phonology. To visualize this priming see Fig. 7. Finally, the null result obtained for the dimension “degree of specificity” follows from the fact that the /m̃/ in the fully specified condition and the /ma/ in the partially specified condition receive an equivalent amount of priming. This is because they are each connected to their respective gender feature (to visualize this priming see Fig. 6 with the dotted arrow deleted).

In short, from the evidence we have presented here, it is safe to conclude that the predictions of the unitized activation model are not supported by the results of the experiments but that with appropriate modifications the feature activation model might be able to account for these results. A hybrid model incorporating the positive features of the two hypotheses seems to fare best in accounting for the available facts. And although the modifications proposed for the feature activation hypothesis and the new hybrid hypothesis – the primed unitized activation hypothesis – are clearly *ad hoc*, they incorporate a crucial property: it seems necessary to postulate that individual features play a role in the retrieval of determiner forms. The data we report for French show that different sources of information independently contribute to the process of determiner activation. The data are also in line with the hypothesis that determiner selection is delayed until all required information is made available in the system (the late selection hypothesis). These facts jointly *suggest* a mechanism where semantic/syntactic, lexical, and phonological features relevant to determiner selection pre-activate alternative determiner forms but where the selection of the correct form is delayed until all features are available.

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Appendix A. Materials used in Experiment 1

Gender	Target	Shared gender	Gender	Control	Shared phonology
Masculine	Camion [truck]	Bijou [jewel]	Feminine	Selle [saddle]	Cabane [cabin]
	Couteau [knife]	Sifflet [whistle]		Paupière [eyelid]	Courroie [strap]
	Lit [bed]	Cadenas [lock]		Pince [pliers]	Liste [list]
	Collier [necklace]	Ballon [balloon]		Purée [purée]	Comète [comet]
	Peigne [comb]	Béret [beret]		Forêt [forest]	Pêche [peach]

(continued)

Gender	Target	Shared gender	Gender	Control	Shared phonology		
Masculine	Cintre [hanger]	Bracelet [bracelet]	Feminine	Fontaine [fountain]	Sainte [saint]		
	Saxophone	Verre [glass]		Grue [crane]	Saccade [saccade]		
	Pouce [thumb]	Château [castle]		Glacière [ice box]	Poudre [powder]		
	Gant [glove]	Tunnel [tunnel]		Rigole [channel]	Gangue [gangue]		
	Nid [nest]	Ressort [spring]		Tasse [cup]	Nièce [niece]		
	Tournevis [screwdriver]	Pont [bridge]		Pipe [pipe]	Tourelle [turret]		
	Puits [well]	Sofa [couch]		Chapelle [chapel]	Puce [flea]		
	Manteau [coat]	Filet [net]		Gomme [eraser]	Menthe [mint]		
	Cigare [cigar]	Compas [compass]		Veine [vein]	Sirène [siren]		
	Nuage [cloud]	Phare [lighthouse]		Carte [map]	Nuque [nape]		
	Robinet [faucet]	Géranium [geranium]		Fougère [fern]	Romance [ballad]		
	Râteau [rake]	Poing [fist]		Pomme [apple]	Radio [radio]		
	Balai [broom]	Téléphone [phone]		Saucisse [sausage]	Barrière [fence]		
	Feminine	Citrouille [pumpkin]		Baignoire [bathtub]	Masculine	Tapis [carpet]	Cinéma [cinema]
		Corde [rope]		Bière [beer]		Duvet [down]	Cornet [cone]
		Moto [motorcycle]		Courge [gourd]		Four [oven]	Mollet [calf]
Salière [salshaker]		Lune [moon]	Trombone [trombone]	Sapin [fir]			
Plume [feather]		Cerveille [brain]	Carreau [pane]	Plat [dish]			
Banane [banana]		Tuile [tile]	Coussin [cushion]	Bagage [luggage]			
Fleur [flower]		Craie [chalk]	Casque [helmet]	Fleuve [river]			
Seringue [syringe]		Boule [ball]	Piano [piano]	Secret [secret]			
Chemise [shirt]		Tomate [tomato]	Bassin [bowl]	Cheval [horse]			
Luge [sled]		Carotte [carrot]	Carnet [notebook]	Lustre [lustre]			
Couronne [crown]		Dragée [dredge]	Buisson [bush]	Couvert			
Pelle [shovel]		Bouche [mouth]	Tiroir [drawer]	Pôle [pole]			
Guitare [guitar]		Maquette [model]	Galet [pebble]	Guidon [handlebars]			
Niche [doghouse]		Soupe [soup]	Clou [nail]	Niveau [level]			
Cloche [bell]		Scie [saw]	Piolet [iceaxe]	Chlore [chlorine]			
Lampe [lamp]		Residence [residence]	Chiffon [rag]	Landau [pram]			
Bague [ring]		Pioche [pickaxe]	Gilet [vest]	Barde [bard]			
Cage [birdcage]		Benne [tipper]	Stylo [pen]	Cable [cable]			

Appendix B. Materials used in Experiment 2, consonant-initial nouns

Determiner status	Possessive determiner		Demonstrative determiner	
Fully specified	mon bouton _{masc}	my button	cette balance _{fem}	this scale
	mon bureau _{masc}	my desk	cette bouteille _{fem}	this bottle
	mon cactus _{masc}	my cactus	cette casserole _{fem}	this pot
	mon champignon _{masc}	my mushroom	cette ceinture _{fem}	this belt
	mon chapeau _{masc}	my hat	cette chaussette _{fem}	this sock
	mon croissant _{masc}	my French croissant	cette cheminée _{fem}	this chimney
	mon moulin _{masc}	my windmill	cette cravate _{fem}	this tie
	mon palmier _{masc}	my palm tree	cette passoire _{fem}	this colander
	mon pinceau _{masc}	my paintbrush	cette poubelle _{fem}	this garbage can
	mon sandwich _{masc}	my sandwich	cette pyramide _{fem}	this pyramid
	mon tracteur _{masc}	my tractor	cette toupie _{fem}	this top
	mon violon _{masc}	my violin	cette veste _{fem}	this jacket
	mon voilier _{masc}	my saiboat	cette voiture _{fem}	this car

(continued)

Determiner status	Possessive determiner		Demonstrative determiner	
Partially specified	ma balance _{fem}	my scale	ce bouton _{masc}	this button
	ma bouteille _{fem}	my bottle	ce bureau _{masc}	this desk
	ma casserole _{fem}	my pot	ce cactus _{masc}	this cactus
	ma ceinture _{fem}	my belt	ce champignon _{masc}	this mushroom
	ma chaussette _{fem}	my sock	ce chapeau _{masc}	this hat
	ma cheminée _{fem}	my chimney	ce croissant _{masc}	this French croissant
	ma cravate _{fem}	my tie	ce moulin _{masc}	this windmill
	ma passoire _{fem}	my colander	ce palmier _{masc}	this palm tree
	ma poubelle _{fem}	my garbage can	ce pinceau _{masc}	this paintbrush
	ma pyramide _{fem}	my pyramid	ce sandwich _{masc}	this sandwich
	ma toupie _{fem}	my top	ce tracteur _{masc}	this tractor
	ma veste _{fem}	my jacket	ce violon _{masc}	this violin
	ma voiture _{fem}	my car	ce voilier _{masc}	this saiboat

Appendix C. Materials used in Experiment 2, vowel-initial nouns

Determiner status	Possessive determiner		Demonstrative determiner	
Standard	mon accordéon _{masc}	my accordion	cette aiguille _{fem}	this needle
	mon ananas _{masc}	my pineapple	cette ampoule _{fem}	this light bulb
	mon arbre _{masc}	my tree	cette ancre _{fem}	this anchor
	mon arrosoir _{masc}	my watering can	cette araignée _{fem}	this spider
	mon artichaut _{masc}	my artichoke	cette asperge _{fem}	this asparagus
	mon avion _{masc}	my airplane	cette échelle _{fem}	this ladder
	mon avocat _{masc}	my avocado	cette église _{fem}	this church
	mon écrou _{masc}	my nut	cette enclume _{fem}	this anvil
	mon entonnoir _{masc}	my funnel	cette enveloppe _{fem}	this envelope
	mon éventail _{masc}	my fan	cette étoile _{fem}	this star
	mon igloo _{masc}	my igloo	cette hélice _{fem}	this propeller
	mon oeil _{masc}	my eye	cette orange _{fem}	this orange
	mon oignon _{masc}	my onion	cette oreille _{fem}	this ear
	Non-standard	mon aiguille _{fem}	my needle	cet accordéon _{masc}
mon ampoule _{fem}		my light bulb	cet ananas _{masc}	this pineapple
mon ancre _{fem}		my anchor	cet arbre _{masc}	this tree
mon araignée _{fem}		my spider	cet arrosoir _{masc}	this watering can
mon asperge _{fem}		my asparagus	cet artichaut _{masc}	this artichoke
mon échelle _{fem}		my ladder	cet avion _{masc}	this airplane
mon église _{fem}		my church	cet avocat _{masc}	this avocado
mon enclume _{fem}		my anvil	cet écrou _{masc}	this nut
mon enveloppe _{fem}		my envelope	cet entonnoir _{masc}	this funnel
mon étoile _{fem}		my star	cet éventail _{masc}	this fan
mon hélice _{fem}		my propeller	cet igloo _{masc}	this igloo
mon orange _{fem}		my orange	cet oeil _{masc}	this eye
mon oreille _{fem}		my ear	cet oignon _{masc}	this onion

Appendix D. Materials used in Experiment 3, consonant-initial adjectives

Degree of specification	Phonological consistency	Possessive determiner	Demonstrative determiner
Fully specified	Consistent	mon nouveau bouton _{masc}	cette nouvelle bouteille _{fem}
		mon nouveau canapé _{masc}	cette nouvelle ceinture _{fem}
		mon nouveau casque _{masc}	cette nouvelle chaussette _{fem}
		mon nouveau cendrier _{masc}	cette nouvelle clef _{fem}
		mon nouveau drapeau _{masc}	cette nouvelle cloche _{fem}
		mon nouveau gilet _{masc}	cette nouvelle flèche _{fem}
		mon nouveau noeud _{masc}	cette nouvelle guitare _{fem}
		mon nouveau sifflet _{masc}	cette nouvelle lampe _{fem}
		mon nouveau tabouret _{masc}	cette nouvelle niche _{fem}
		mon nouveau tambour _{masc}	cette nouvelle pipe _{fem}
	Inconsistent	mon nouvel aimant _{masc}	cette nouvelle ampoule _{fem}
		mon nouvel arc _{masc}	cette nouvelle ancre _{fem}
		mon nouvel arrosoir _{masc}	cette nouvelle échelle _{fem}
		mon nouvel avion _{masc}	cette nouvelle église _{fem}
		mon nouvel ecrou _{masc}	cette nouvelle enclume _{fem}
		mon nouvel écusson _{masc}	cette nouvelle épée _{fem}
		mon nouvel entonnoir _{masc}	cette nouvelle étagère _{fem}
		mon nouvel éventail _{masc}	cette nouvelle étoile _{fem}
		mon nouvel igloo _{masc}	cette nouvelle hélice _{fem}
		mon nouvel oeuf _{masc}	cette nouvelle usine _{fem}
Partially specified	Consistent	ma nouvelle bouteille _{fem}	ce nouveau bouton _{masc}
		ma nouvelle ceinture _{fem}	ce nouveau canapé _{masc}
		ma nouvelle chaussette _{fem}	ce nouveau casque _{masc}
		ma nouvelle clef _{fem}	ce nouveau cendrier _{masc}
		ma nouvelle cloche _{fem}	ce nouveau drapeau _{masc}
		ma nouvelle flèche _{fem}	ce nouveau gilet _{masc}
		ma nouvelle guitare _{fem}	ce nouveau noeud _{masc}
		ma nouvelle lampe _{fem}	ce nouveau sifflet _{masc}
		ma nouvelle niche _{fem}	ce nouveau tabouret _{masc}
		ma nouvelle pipe _{fem}	ce nouveau tambour _{masc}
	Inconsistent	ma nouvelle ampoule _{fem}	ce nouvel aimant _{masc}
		ma nouvelle ancre _{fem}	ce nouvel arc _{masc}
		ma nouvelle échelle _{fem}	ce nouvel arrosoir _{masc}
		ma nouvelle église _{fem}	ce nouvel avion _{masc}
		ma nouvelle enclume _{fem}	ce nouvel ecrou _{masc}
		ma nouvelle épée _{fem}	ce nouvel écusson _{masc}
		ma nouvelle étagère _{fem}	ce nouvel entonnoir _{masc}
		ma nouvelle étoile _{fem}	ce nouvel éventail _{masc}
		ma nouvelle hélice _{fem}	ce nouvel igloo _{masc}
		ma nouvelle usine _{fem}	ce nouvel oeuf _{masc}

Appendix E. Materials used in Experiment 3, vowel-initial adjectives

Standardness	Phonological consistency	Possessive determiner	Demonstrative determiner
Standard	Consistent	mon ancien aimant _{masc} mon ancien arc _{masc} mon ancien arrosoir _{masc} mon ancien avion _{masc} mon ancien ecrou _{masc} mon ancien écusson _{masc} mon ancien entonnoir _{masc} mon ancien éventail _{masc} mon ancien igloo _{masc} mon ancien oeuf _{masc}	cette ancienne ampoule _{fem} cette ancienne ancre _{fem} cette ancienne échelle _{fem} cette ancienne église _{fem} cette ancienne enclume _{fem} cette ancienne épée _{fem} cette ancienne étagère _{fem} cette ancienne étoile _{fem} cette ancienne hélice _{fem} cette ancienne usine _{fem}
	Inconsistent	mon ancien bouton _{masc} mon ancien canapé _{masc} mon ancien casque _{masc} mon ancien cendrier _{masc} mon ancien drapeau _{masc} mon ancien gilet _{masc} mon ancien noeud _{masc} mon ancien sifflet _{masc} mon ancien tabouret _{masc} mon ancien tambour _{masc}	cette ancienne bouteille _{fem} cette ancienne ceinture _{fem} cette ancienne chaussette _{fem} cette ancienne clef _{fem} cette ancienne cloche _{fem} cette ancienne flèche _{fem} cette ancienne guitare _{fem} cette ancienne lampe _{fem} cette ancienne niche _{fem} cette ancienne pipe _{fem}
Non-standard	Consistent	mon ancienne ampoule _{fem} mon ancienne ancre _{fem} mon ancienne échelle _{fem} mon ancienne église _{fem} mon ancienne enclume _{fem} mon ancienne épée _{fem} mon ancienne étagère _{fem} mon ancienne étoile _{fem} mon ancienne hélice _{fem} mon ancienne usine _{fem}	cet ancien aimant _{masc} cet ancien arc _{masc} cet ancien arrosoir _{masc} cet ancien avion _{masc} cet ancien ecrou _{masc} cet ancien écusson _{masc} cet ancien entonnoir _{masc} cet ancien éventail _{masc} cet ancien igloo _{masc} cet ancien oeuf _{masc}
	Inconsistent	mon ancienne bouteille _{fem} mon ancienne ceinture _{fem} mon ancienne chaussette _{fem} mon ancienne clef _{fem} mon ancienne cloche _{fem} mon ancienne flèche _{fem} mon ancienne guitare _{fem} mon ancienne lampe _{fem} mon ancienne niche _{fem} mon ancienne pipe _{fem}	cet ancien bouton _{masc} cet ancien canapé _{masc} cet ancien casque _{masc} cet ancien cendrier _{masc} cet ancien drapeau _{masc} cet ancien gilet _{masc} cet ancien noeud _{masc} cet ancien sifflet _{masc} cet ancien tabouret _{masc} cet ancien tambour _{masc}

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