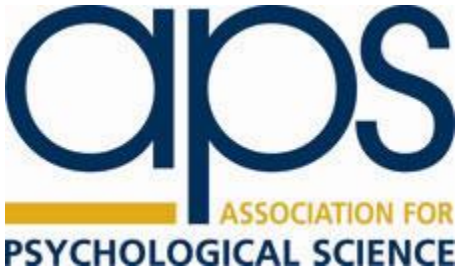

Research Report

GRAMMATICAL GENDER IS ON THE TIP OF ITALIAN TONGUES

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Abstract—*To correctly produce words, speakers must have access to three broad classes of information: lexical semantics, syntax, and sound structure. The relevant information must be organized in ways that permit rapid and accurate retrieval of specific lexical targets. Current models of language production do this by a two-stage process: The first stage incorporates lexical meanings and syntax, and the second, sound structure. We used studies of the* tip-of-the-tongue *phenomenon (i.e., the condition in which a speaker cannot produce a well-known word) to evaluate this organization, and in so doing, we provide the first clear experimental evidence for a lexical stage that includes syntax and is distinct from both sound structure and the conceptual correlates of syntactic features.*

The fluent recall of words for language production is a basic skill central to language use. Our research addresses questions of whether and how syntactic information about words is stored in the mental lexicon. This is a central issue because to produce syntactically well-formed sentences, speakers must store and use language-specific syntactic information. To address this issue, we examined a classic case—familiar to every language user—in which the normal lexical retrieval process breaks down: the tip-of-the-tongue (TOT) phenomenon. The TOT state reflects the failure to recall a word for which one has well-established knowledge. Evidence of this knowledge may be an ultimately successful recall or the availability of detailed meaning information but also of certain form-related dimensions of the target word (such as number of syllables and first phoneme) (A.S. Brown, 1991; R. Brown & McNeill, 1966; Burke, McKay, Worthley, & Wade, 1991; Koriat & Lieblich, 1974).

To say a word, a speaker must access stored lexical representations that provide (a) lexical semantic and syntactic features of the word and (b) its sound form. According to most current models of language production (Butterworth, 1989; Dell, 1986; Garrett, 1976, Levelt, 1989), this information is stored in the mental lexicon, in two separate representations as depicted in Figure 1.

During sentence production, it is assumed, the speaker sequentially accesses these distinct lexical representations. The first is an *abstract* representation of the word (also referred to as *lemma;* Kempen & Huijbers, 1983) that provides semantic and syntactic features. According to a number of authors (cf. Garrett, 1992; Levelt, 1989), the syntactic features include the grammatical category of the word (i.e., noun, verb, adjective, etc.), its grammatical function (i.e., subject, object, etc.), the kinds of syntactic structures it can be part of (i.e., noun phrase, verb phrase, etc.), and language-specific syntactic features, such as grammatical gender. It is also assumed that this abstract representation contains a *linking address* (Garrett, 1984), which allows the retrieval of a second representation (the *lexeme*) that specifies the phonological structure of the word. In order to univocally locate the phonological representation of the desired word, the address contains some key information such as number of syllables, main stress, and first phoneme. Abstract representations of words are retrieved during a stage referred to as *grammatical encoding* (Levelt, 1989), in which a syntactic frame for a to-be-uttered sentence is worked out on the basis of the speaker's communicative intention (the "message" in Fig. 1). A subsequent *phonological-encoding* stage determines the sound structure and the pronunciation codes for the sentence. Word forms are retrieved during this second step.

The assumption of two accessing steps (instead of one for the whole word) is supported by evidence including observations from slips of the tongue (cf. Dell, 1986; Fay & Cutler, 1977; Garrett, 1976) and experiments on the time course of the lexical retrieval process that indicate that semantic activation indeed precedes form activation (Levelt et al., 1991). Consider, for example, errors in which one word substitutes for a target word during spontaneous speech. These errors show relations between the target and the intruding word. Two major types can be found: substitutions in which the target and the intruder words have some meaning relation, as in Sentence 1, and substitutions in which the two elements have some phonological similarity, as in Sentence 2:

1. All I want is something for my *shoulders* [intended: elbows] (from Garrett, 1976, p. 244)
2. I've got whipped cream on my *mushroom* [intended: mustache] (from Garrett, 1976, p. 245)

It is important to note, however, that this work does not allow one to distinguish semantic activation at a conceptual level from that at a specifically lexical level. Therefore, the existence of an abstract lexical representation, separate from the conceptual record, is not guaranteed on the basis of these findings.

In this architecture, the TOT experience can be interpreted as a failure to retrieve the full phonological word form even though the first abstract representation of the word has been successfully selected and retrieved (Butterworth, 1989; Garrett, 1984; Levelt, 1989). Two predictions follow from this hypothesis: First, speakers should be able to correctly report specific syntactic features of words they cannot name (i.e., features not derivable from conceptual records). Second, more strongly, speakers should know such features even when they do not have any phonological information about the target word. Joint success of these two predictions would argue for an abstract level of lexical representation of the kind shown in Figure 1.

We tested both predictions in this study. We examined the availability of information about grammatical gender during TOT experiences in Italian. Grammatical gender provides an ideal vehicle for distinguishing lexical representation from underlying conceptual specification. Every noun in Italian is marked as masculine or feminine, but grammatical gender is assigned to abstract entities and objects' names in an arbitrary fashion (i.e., it is not conceptually based). Therefore, for nouns in these classes, being feminine or masculine is a strictly linguistic property, and has nothing to do with the conceptual properties of the referent. For example, consider synonyms such as

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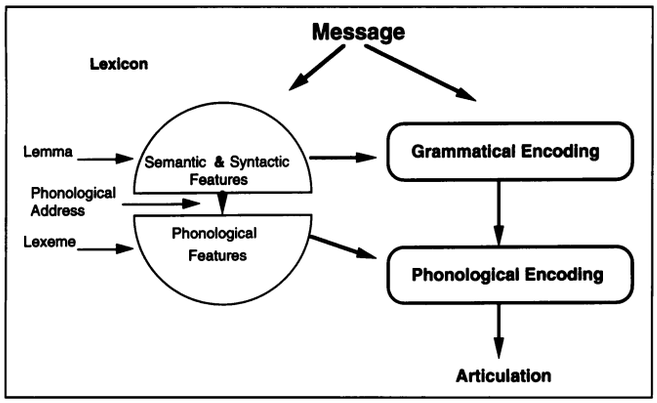

Fig. 1. Different levels of representation within the language production system. To produce a sentence, a speaker would first transform his or her intention (the "message") into a syntactic representation. The construction of this syntactic structure would start with the retrieval of lexical entries (lemmas) whose syntactic features would guide the stage of grammatical encoding. During this stage, words would be assigned their grammatical functions (i.e., subject, object, etc.), and syntactic relations such as agreement would be computed. This syntactically specified representation for the whole sentence would be the input of phonological encoding. During this stage, phonologically specified lexical elements (lexemes) would be retrieved and inserted into a frame to specify intonational contour, syllabic structure, and the sequence of phonemes for the sentence that would be finally articulated.

sasso (masculine) and *pietra* (feminine), which both mean "stone," or *stella* (feminine) and *astro* (masculine), which both mean "star." Assignment of feminine or masculine gender has important syntactic consequences because a speaker must know the gender in order to make the noun agree with determiners, adjectives, and predicates. Grammatical gender and related phenomena are widely represented in the world's languages. In the framework presented here, it is assumed that grammatical gender is part of the abstract representation and not of the phonological representation of the word because it is needed during grammatical encoding (for agreement).[1]

Evidence from language pathology is compatible with these claims. Badecker, Miozzo, and Zanuttini (1995) reported the naming performance of an Italian-speaking aphasic patient with word retrieval difficulties. They found that the patient could correctly report the grammatical gender of the word he could not name even when he could not retrieve any phoneme.

METHOD

Subjects

Sixty undergraduate students from the University of Trieste participated in the experiment.

Materials and Procedure

The basic materials consisted of a series of definitions of words and response sheets.

We chose 54 words, common nouns referring to objects or abstract entities; 27 were feminine, and the remaining 27 were masculine. All were multisyllabic (range: 2–6 syllables; mean = 4.2; median = 4); word length varied between 5 and 14 letters (mean = 9.9; median = 10). For each word, a dictionary-type definition was generated to be presented to the participants.

Participants were presented with a definition and required to provide the corresponding word. Every time they were unable to provide the word for the definition, they were presented with the following questions (in the order shown):

a. Rate how well you feel you know the word (1 = not at all; 5 = it is on the tip of my tongue).
b. Guess the gender of the noun (feminine/masculine).
c. Guess the number of syllables.
d. Guess as many letters as you can and their position.
e. Please report any other word that comes to mind.

After responding to these questions, participants were presented with the target word and asked:

i. Do you know this word? (yes/no)
ii. Is this the word you were thinking of? (yes/no)

Scoring Criteria

Participants' responses were scored as follows: A *correct response* was scored if the participant reported the target word after hearing the definition. A *nontarget response* was scored if the participant gave a word for the definition but this word was not the experimenter's target. A *positive TOT* was scored if the participant could not say the word right away but did provide information (partial or complete) in the questionnaire and did respond "yes" to the recognition questions at the end (i.e., the participant knew the experimental word and it was his or her target). A positive TOT was also scored if the participant found the word while completing the response sheet. A *negative TOT* was scored if the participant did not provide the word, gave information in the questionnaire, but did not affirm the experimental word to be his or her target.

RESULTS

Application of the scoring criteria yielded 1,654 (51%) correct responses, 677 (21%) nontarget responses, 297 (9%) positive TOTs, and 612 (19%) negative TOTs. Analyses were performed to test the two predictions, that speakers should be able to correctly report grammatical gender when in a TOT state and, more strongly, that they should know the gender even when they do not know the number of syllables or any phonemes.

In Table 1 and Figure 2, we report the numbers and proportions of

Table 1. *Numbers of correct and incorrect gender guesses for positive and negative tip-of-the-tongue (TOT) states (general distribution)*

	Positive TOTs		Negative TOTs	
Guess	Masculine target	Feminine target	Masculine target	Feminine target
Masculine	107	16	183	141
Feminine	27	117	145	143

1. Note also that Bock and Eberhard (1993) reported evidence showing that subject-verb agreement is computed during grammatical and not phonological encoding.

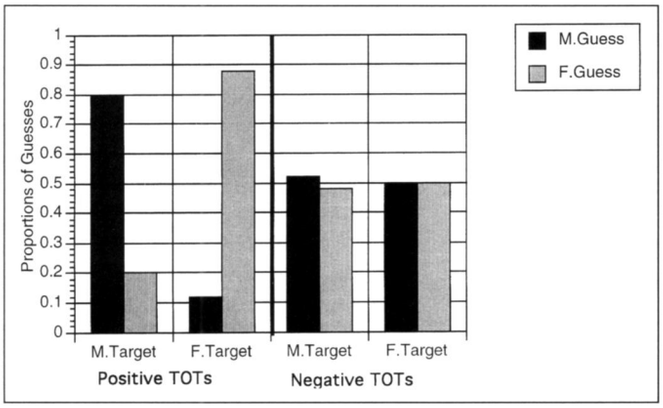

Fig. 2. Overall distribution of masculine (M.Guess) and feminine (F.Guess) gender guesses for masculine (M.Target) and feminine (F.Target) targets for positive and negative tip-of-the-tongue (TOT) states.

correct and incorrect gender guesses for positive and negative TOTs. Gender was reported correctly 84% of the time when the participants were in a positive TOT state (and had, by hypothesis, retrieved a lexical representation of the word). In contrast, gender guesses were at chance level when the speakers were in a negative TOT state (53% correct). Statistical tests contrasted correct and incorrect responses for feminine and masculine targets for positive TOTs (i.e., trials in which the experimental word matched the subject's target) versus negative TOTs (i.e., trials in which the experimental word and the subject's target differed). Nonparametric comparisons by subjects and by items showed that for positive TOTs, correct gender guesses were significantly more common than incorrect guesses ($z = 6.3, p < .0001$, in the subjects analysis; $z = 5.8, p < .0001$, in the items analysis); correct and incorrect gender guesses were equally common for negative TOTs ($z = 1.5, p = .12$, in the subjects analysis; $z = 0.16, p = .87$, in the items analysis). A comparison between the distribution of positive and negative TOTs also was significant, $t(1, 57) = 7.6, p < .0001$.

A critique that can be raised at this point concerns the fact that even if the speakers did not report any letters or phonemes in the word, they might have known how the word ended, and because there is a high correlation between word ending and grammatical gender, they might have based their guesses on this knowledge. If this were the case, then we should find that for words with irregular endings (i.e., cases in which knowing the word ending cannot help to make a gender decision[2]), participants were just guessing. Seventeen words in our list were irregular with respect to ending. For these words, gender was correctly guessed 80% (61/76) of the time for positive TOTs ($z = 2.7, p = .006$) and 49% (112/229) of the time for negative TOTs ($z = 0.15, p = .87$), a pattern that matches the overall outcome closely.

To test the prediction that information about grammatical gender is available in the absence of word form information, we limited the analysis to just those cases in which participants did not report any phonological information, either metrical (i.e., number of syllables) or segmental (i.e., letters, phonemes). Again, speakers in positive TOT states performed well above chance (80% correct), but speakers in negative TOT states did not (52% correct), as shown in Table 2 and Figure 3.

2. For example, a word ending in *e* or *i* can be either masculine (e.g., *sperone,* "spur") or feminine (e.g., *prognosi,* "prognosis").

Table 2. *Numbers of correct and incorrect gender guesses for positive and negative tip-of-the-tongue (TOT) states (cases in which speakers did not report any metrical or segmental information)*

	Positive TOTs		Negative TOTs	
Guess	Masculine target	Feminine target	Masculine target	Feminine target
Masculine	35	4	115	98
Feminine	13	35	90	90

Statistical tests showed that for positive TOTs, correct gender guesses were significantly more common than incorrect guesses ($z = 4.8, p < .0001$, in the subjects analysis; $z = 5.5, p < .0001$, in the items analysis). Correct and incorrect gender guesses were equally common for negative TOTs ($z = 1.2, p = .29$, in the subjects analysis; $z = 1.06, p = .29$, in the items analysis). A comparison between the distribution of positive and negative TOTs also was significant, $t(1, 51) = 7.1, p < .0001$). For irregular words, gender was correctly reported 81% (22/27) of the time for positive TOTs ($z = 1.9, p = .05$) and 49% (68/139) of the time for negative TOTs ($z = 0.21, p = .83$).

DISCUSSION

The results reported here indicate that speakers in a positive TOT state do have access to syntactic features of words for which they cannot yet generate a pronunciation code. Two points deserve emphasis. The first is the dissociation of grammatical gender and conceptual or natural gender provided by the materials chosen for this test in Italian. This dissociation allows us to distinguish representation of lexical information from the conceptual correlates of gender and to associate the experimental results with aspects of the language-processing system.[3] The second point is the dissociation of gender information from phonological representation. The experimental results show that gender is accessible when speakers can adduce no phonological information (metrical or segmental) about the target, and that gender information given by speakers in those trials closely matches that for the trials in which partial phonological information typical of TOT states was available. The fit between these experimental results with normal language users and the findings reported by Badecker et al. (1995) for an Italian aphasic patient reinforces this point. This outcome comports well with language production models of the sort outlined in Figure 1.

Grammatical gender is, of course, only a single aspect of the information that is required for the control of syntactic processes that build phrasal structures during sentence production. It does, however, affect sentence form significantly. In fact, grammatical gender in Ital-

3. It might be argued that grammatical gender is indeed an idiosyncratic conceptual feature. Note, however, that different languages mark with different genders words that refer to the same entity. For example, "milk" is masculine in Italian but feminine in Spanish. Therefore, if this feature were represented at a conceptual level, then speakers of different languages would have different conceptual representations for the same entities. More generally, such an argument would lead to a model in which conceptual and syntactic structures are not separate.

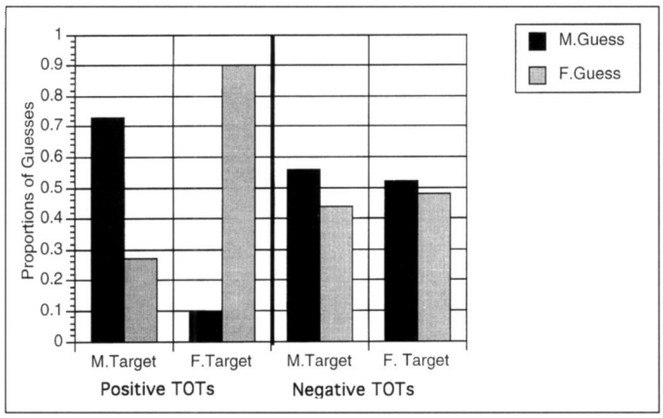

Fig. 3. Distribution of masculine (M.Guess) and feminine (F.Guess) gender guesses for masculine (M.Target) and feminine (F.Target) targets for positive and negative tip-of-the-tongue (TOT) states. The figure reports gender guesses for those cases in which the participant did not correctly report the number of syllables or letters in the word (i.e., we excluded all cases in which the participant correctly reported any letter or phoneme and all cases in which the participant reported other words that shared either the same number of syllables with the target or any letter or phoneme at the beginning, center, or end positions in the word).

ian (and in other languages with a grammatical gender system, such as Spanish, French, German, Dutch, and Russian) would be used by the grammatical encoder (Bock & Levelt, 1994) to compute agreement between nouns and determiners (e.g., *la penna* ["the pen," feminine] vs. *il libro* ["the book," masculine]), nouns and adjectives (e.g., *la penna colorata* ["the pen colorful," feminine] vs. *il libro colorato* ["the book colorful," masculine]), and nouns and predicates, as well as to establish co-reference between nouns and pronouns. The output of the grammatical-encoding stage (a syntactically organized sentential frame) would be sent to the phonological encoder (Bock & Levelt, 1994) for assignment of metrical and segmental codes to the to-be-uttered sentence. During this second stage, the lexemes would be retrieved.

Further research with other gender-marking languages is in progress to extend the Italian results. It will also be important to pursue experimental studies that address related agreement phenomena in order to more fully explore the implications of this picture of the language-encoding process.

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