Semantic and grammatical interference effects in sentence production

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Introduction

The effects of contextual variables on language production have mostly been explored using picture-word interference studies. Their results suggest that the interference effect of semantic context is confined to category coordinates (Kroll & Stewart 1994; Damian & Als 2005, etc.). Recently, however, the effect referred to as semantic interference has been shown to be irrelevant to the general property of lexical retrieval mechanism (Finkbeiner & Caramazza 2006; Mahon & Caramazza 2009). On this view, the ‘normal’ effect of semantic context on correct lexical selection events should be facilitatory (Mahon & Caramazza 2009).

Likewise, experimental studies of grammatical priming have led to the conclusion that grammatical features of a distractor word such as gender and number have no inhibitory effect on the selection of the grammatical features of a target word (Schiller & Caramazza 2002; Costa et al. 2003; Bordag & Pechmann 2008).

This paper approaches the controversial issue of the interference effects of semantic and grammatical context through an analysis of naturally occurring Russian speech errors (‘slips of the tongue’). Unlike the existing experimental studies that use picture-word interference paradigms to explore the effects of contextual variables on sentence production, evidence from speech errors suggests that both semantic interference and grammatical feature interference are major effects implicit to language production mechanism.

Semantic interference

To explore the interference effect of semantic context, 152 examples of contextual semantic substitutions (cases of lexical retrieval failure when a word semantically related to a distractor word from the current utterance is substituted for the target word) were analyzed both in terms of word
association norms and in terms of co-occurrence frequency of the word pairs involved in contextual semantic substitutions.

Šel utrom, naverno, snežok nebol’soj
Was morning:INS probably snow light (adj)

Šel zimoj, naverno, snežok nebol’soj
Was winter:INS probably snow light (adj)

*It must have been snowing lightly in the morning / in the winter*

To test the hypothesis that contextual semantic substitution errors and verbal associations represent the same kind of lexical relationship, the distractor-target and distractor-error pairs were compared to word association norms from Russian Word Association Thesaurus (a distractor word was regarded as a stimulus and the target and the substitute words, as its associative responses).

Paired t-tests comparing the response frequencies of the target and the substitute reveal that the frequencies tend to be significantly higher for the error words (*t*(144) = 4.12, *p* < .001).

For each distractor-target and distractor-error word pair, the strength of co-occurrence of the two words in the Russian National Corpus was estimated using Mutual information (MI) and T-test (see Stubbs 1995). Fisher’s test shows that the co-occurrence strength of distractor-error pairs is significantly higher than that of distractor-target pairs (*p* < .05).

The comparison with the rates of co-occurrence and with word association norms suggests that contextual semantic substitutions reflect associative rather than semantic relationships between words. Even when the distractor and the error are semantically related, they are also associatively related and (with the likely exception of synonyms) tend to co-occur frequently in speech and texts. Besides, the interference effect is not confined to category coordinates and seems to reflect a general property of lexical retrieval mechanism in natural language production.

**Grammatical interference**

Once a lexical node is selected, there is another process responsible for the selection of the word’s grammatical features. An analysis of 154 contextual
substitutions of a grammatical feature such as case, number, gender and person, resulting from the interference of a grammatical feature of an “interloper” (a distractor word form from the current sentence, either preceding or following the target word), reveals that a word’s grammatical feature can be overwritten by the similar feature of a distractor word within the current utterance.

\[
\text{Im} \quad \text{by } \text{menja} \quad \text{v pomošč}
\]
\[
\text{they:3PL.DAT would 1SG.Gen in help}
\]

\[
\text{Im} \quad \text{by } \text{mne} \quad \text{v pomošč}
\]
\[
\text{they:3PL.DAT would 1SG.DAT in help}
\]

*I wish I were there to help them*

(The target genitive case form of the pronoun ‘I’, *menja*, is replaced by the dative case form *mne* due to the interference of the dative case form *im* of the pronoun ‘they’).

Speech error data suggest that the selection of grammatical features is generally a competitive process and that grammatical features, like lexical nodes, can spread activation to other words within the current sentence (see spreading activation theories of semantic memory, e.g. Collins & Loftus 1975; Dell 1986).

This conclusion runs counter to most theories of lexical retrieval, which claim that although the selection of lexical nodes may be competitive, the selection of their grammatical properties is an automatic consequence of lexical selection (Caramazza et al. 2001; Schiller & Caramazza 2002; Costa et al. 2003). Contrary to this view and in line with Schriefers (1993), evidence from Russian speech errors points to competitive nature of grammatical feature selection. Moreover, unlike picture-word interference studies which focus on the interference effect exerted by the gender or number feature of a distractor word, contextual grammatical feature substitutions show that the list of interfering grammatical features is not confined to gender and number.

**Conclusion**

In conclusion, unlike the experimental studies of semantic and grammatical priming, Russian speech error data suggest pervasive within-speaker
interference of both word meanings and grammatical features throughout the sentence production process. The interference effects can be accommodated by assuming that while a lemma activates its associative field, a lexeme seems to activate a field of its grammatical features, spreading activation to other words within the current sentence.

References


