Interference and Facilitation in Spoken Word Production: Effects of Morphologically and Semantically Related Context Stimuli on Picture Naming

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Abstract We report two picture–word interference experiments investigating conceptual and lexical activation, and response selection, in speaking. We varied stimulus onset asynchrony to investigate potential fine-grained activation and competition effects. Morphologically related existing and pseudoword adjectives, as well as associatively related adjectives, served as context stimuli in Experiment 1. In Experiment 2, we focused on semantic interference by using morphologically related and unrelated subordinates of the target concept as context stimuli. Morphologically complex pseudowords were also included as context stimuli. Pseudowords should not interfere, given that they have no lexical or conceptual representation. We consistently obtained facilitation with all morphologically related context stimuli, irrespective of their lexical status. We argue that effects originate at the word-form level, and discuss how our results may help decide among the many explanations of semantic interference in picture naming.

Keywords Word production · Picture-word interference · Morphology · Facilitation · Interference · Lexical selection

Speaking is an activity that human beings perform eagerly and without much effort. Interest in the cognitive underpinnings of this complex human ability has been on the rise in recent decades. Hotly debated topics concern the access to and nature of long-term-memory information for words used in speaking. Psycholinguists usually refer to this long-term memory storage as the ‘mental lexicon’, for which quite detailed proposals exist (see Caramazza 1997; Dell 1986; Levelt et al. 1999).

One characteristic of words is their complexity in terms of morphemes. A morphologically complex word consists of at least two morphemes, the smallest meaningful parts of a language. However, longer and more complex forms, such as high voltage electricity grid systems supervisor or antidisestablishmentarianism are possible and native English speakers
easily parse them into their constituent morphemes (Aronoff and Fudeman 2005, p. 106; Baayen and Schreuder 1996, p. 166, respectively). Admittedly, most morphologically complex words are shorter than the examples above. However, morphological complexity and its implementation during speaking are fundamental research topics. Many words in many languages are morphologically complex, because they are inflected, derived or compounded. For that reason, prominent speech-production models specify how morphologically complex words are represented, despite the fact that empirical support for these models derives almost exclusively from research using morphologically simple words as stimuli.

Compared to the number of studies investigating the effects of morphological complexity in comprehension, few studies investigate such effects in speaking (see below). In particular, little is known about the interplay between processes concerned with the mapping of conceptual information to linguistic information and response selection on the one hand, and morphological complexity on the other. Do mapping and selection processes involve morphological word structure? Does the morphological complexity of words matter for their status in the conceptual-semantic network, and for their participation in selection processes? Morphological processing effects have been reported using experimentally-induced speech errors (Ashenfelter and Eberhard 2007; Ferreira and Humphreys 2001; Melinger 2003; Pillon 1998). Given that we use the picture-word interference paradigm to address morphological processing, the present paper focuses on studies that use this paradigm.

In the picture-word interference paradigm, the semantic relation between context stimulus1 and target object drives a well-known effect in speech production research. Semantically related context stimuli, such as words from the same category as the pictured object (e.g., mouse—RAT, strawberry—APPLE)2 interfere with picture naming (Costa et al. 2005; Schriefers et al. 1990; Starreveld and La Heij 1995; see below for several explanations of this interference effect). As shown by Lupker (1978), context stimuli that are associatively related (such as mouse—CHEESE, shirt—BUTTON, or sleep—BED) do not reveal such interference; effects are either absent or facilitatory (see Alario et al. 2000, for an overview).

The fundamental issue is what type of relation applies to context words that are morphologically related to the target, and thus most often semantically close to the target word. Whereas the relation between milk bottle and MILK seems associative, the relation between buttermilk and MILK is more categorical. Surprisingly, we consistently observed facilitation with both types of morphologically related context words (Dohmes et al. 2004; Zwitserlood et al. 2000, 2002). Finally, we also demonstrated that morphological effects are different from those due to mere form overlap (as in mandrill—MAN, or corner—CORN; Dohmes et al. 2004). Given that these categorically related context words produce no interference, the processes of selecting the picture’s conceptual and/or lexical entry seem sensitive to the morphological overlap between activated entries. This poses a problem for some models of speech production, as we argue below.

A related issue concerns the fact that the temporal persistence of morphological effects seems to be different from that of other effects in picture-word interference. The facilitation due to morphologically related context words survives the separation of context word and target picture by as many as 10 intervening items, and thus lasts much longer than the more

1 Schriefers (1992) used the term distractor to name stimuli that accompany picture presentation. According to him “These distractors were selected to slow down or speed up access to either the noun or the adjective” (Schriefers 1992, p. 36). These stimuli are called distractors because they distract the attention from the picture. We use the term context word or context stimulus, because unlike the term distractor, it does not imply a specific effect or an effect direction.

2 Throughout the text, we use upper case letters to indicate the names of target pictures, and italics for context stimulus examples.