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Repetition reduction during word and concept overlap in bilinguals ☆

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ABSTRACT

In natural conversation, speakers often mention the same referents multiple times. While repeated referents are produced with less prominence than non-repeated referents, it is unclear whether prominence reduction is due to repetition of concepts, words, or a combination of the two. In the current study, we dissociate these sources of repetition by examining bilingual speakers, who have more than one word for the same concept across their two languages. Three groups of Korean–English bilinguals (balanced, English-dominant, Korean-dominant) performed an event description task involving repetition of referents within a single language (i.e., repetition of word and concept) or across languages (i.e., repetition of concept only). While balanced bilinguals reduced prominence both within and across languages, unbalanced bilinguals only reduced prominence when repetition occurred within a language. These patterns suggest that the degree to which words and concepts are linked within a speaker's language system determines the source of repetition reduction.

Introduction

During conversation, people tend to mention a topic multiple times, and this repetition affects the acoustic form of an utterance (Arnold, 1998). The first time a word occurs in a conversation, production tends to be more exaggerated. For example, you may say, "I have a *cat*" placing emphasis on the word "*cat*." For the rest of the conversation, you may be less careful with your pronunciation of the word "cat," and as a result, subsequent mentions of "cat" will tend to have shorter duration and lower intensity compared to the first production. This phenomenon is known as repetition reduction. Repetition reduction is a well-characterized occurrence in which expressions that refer to repeated or given referents are produced with less prominence (i.e., shorter duration and lower intensity) than expressions that refer to non-repeated or new referents (Aylett & Turk, 2004; Bard et al., 2000; Bell, Brenier, Gregory, Girand, & Jurafsky, 2009; Fowler, 1988; Fowler & Housum, 1987; Galati & Brennan, 2010; Kahn & Arnold, 2012; Lam & Watson, 2010; Pluymaekers, Ernestus, & Baayen, 2005; Watson, Arnold, & Tanenhaus, 2008).

While it is known that speakers reduce prominence for repeated expressions, it is unknown where this repetition reduction manifests along the production stream, because repetition can occur at multiple levels in the production process (Baumann & Riester, 2013; Fowler, 1988; Lam & Watson, 2014). Though there are competing models of spoken word production, most models identify at least three

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important levels in the production process: a concept level, a word level, and a phoneme level[1] (e.g., Costa, Caramazza, & Sebastian-Galles, 2000; Dell, 1986; Dell & O'Seaghdha, 1991, 1992; Levelt, 1989; Levelt et al., 1999; for a review, see Rapp & Goldrick, 2000), and it is possible for repetition reduction to take place at each of these levels. Fig. 1A–C provide schematics of these levels of representation across different models of production.

The production process begins with the activation of concepts representing a speaker's intended meaning (e.g., CAT). Activation from the concept level is then mapped onto corresponding words at the word level. At this point, multiple words may be active and the system needs to choose which word(s) to send for further processing. For example, the concept of CAT may activate both the words "cat" and "kitten" due to overlapping semantic information. Activation from the word level then flows downward to activate phonemes for production (e.g., /k/, /æ/, /t/ for "cat"). Within a normal conversation, repeatedly naming an object would involve repeated activation of the concept, repeated activation of the word, and repeated activation of the phonemes for a word. Theoretically, repetition reduction could be rooted at any and all of these levels.

However, there is some evidence to suggest that repetition reduction is not due to phoneme level repetition. In a study by Fowler (1988), participants produced words that could be primed by either the same word or by a homophone. Homophones are words that completely overlap at the phoneme level (e.g., "seller" and "cellar"). Fowler found that while repeated words were reduced in prominence, words that were preceded by a homophone prime (i.e., phoneme repetition) were not reduced. This pattern suggests that repetition reduction is not due to repetition at the phoneme level, but rather the result of repetition at an earlier stage of the production process, specifically, at the levels of concepts or words.

Synonyms, or words that have nearly identical meanings but differ in form (e.g., couch and sofa), might offer a possible approach to determining if repetition reduction is due to repetition at the concept level or repetition at the word level. Indeed, synonyms were also tested for repetition reduction in the Fowler (1988) study described above, but the results were inconclusive because synonym primes resulted in durations that were in-between those of same-word primes (i.e., word repetition) and unrelated primes (i.e., no repetition), but that did not significantly differ from either prime type. This null result may be due to the fact that Fowler elicited synonym production via reading, as it is not clear that reading a word would necessarily activate its synonyms in the same way as with more spontaneous production, such as object naming (e.g., Costa et al., 2000). Synonyms may also be problematic because speakers may have a context-dependent preference for one synonym over another, and having chosen to use a particular word, speakers have a tendency to reuse that word when referring to the same referent (Brennan & Clark, 1996; Garrod & Anderson, 1987). Moreover, the introduction of a new word may lead listeners to interpret the word as referring to a different object (e.g., Metzing & Brennan, 2003) because, according to the principle of contrast, a difference in form would be expected to mark a difference in meaning (Clark, 1990, 1997). Even if listeners interpret the word as referring to the same referent, a change of referring expression may lead listeners to think of the referent differently, thereby altering the concept (Almor, 1999; Clark, 1990; Lam & Watson, 2014). In both cases, the concept may have changed as a result of the word change, making it difficult to separate concept and word repetition.

Given the inconclusive findings from work with synonyms, it remains unclear whether repetition reduction is primarily driven by concept repetition, word repetition, or a combination of the two. Bilinguals, who are known to code-switch between their two languages (Costa et al., 2000; Gollan & Ferreira, 2009; Kroll, Bobb, Misra, & Guo, 2008), may offer another way to separate these two forms of repetition. Models of bilingual language production suggest that a bilingual's two languages have mostly shared or highly overlapping concepts but separate words for each language (e.g., Costa, 2005; Costa et al., 2000; Kroll & Stewart, 1994). Because bilinguals have more than one word for any concept (i.e., one word for each language), it is possible to separate concept-level repetition from word-level repetition. Unlike with synonyms, where changing the word may imply a different concept, changing from a word to its translation equivalent can be motivated by a change in the response language while preserving the meaning. Indeed, Monsell, Matthews, and Miller (1992) used the language-switch paradigm to examine whether prior production of a word primes production for its translation equivalent. In the first phase of their study, word production was elicited from Welsh-English bilinguals via sentence completion (e.g., "a pine is a type of ___") in either Welsh (half the participants) or English (half the participants). Following the sentence completion task, participants completed a separate picture-naming task using Welsh. Speakers demonstrated repetition reduction for words primed in the same language (Welsh → Welsh) but did not for words primed in a different language (English → Welsh). Given these results, Monsell, Matthews, and Miller argued that concept repetition alone is not enough to elicit repetition priming.

While Monsell et al. (1992) did not find repetition reduction across languages, their paradigm may not have been well suited for examining repetition reduction because the primes from the first phase of their study did not describe the same referents as the words in the second phase. In their study, primes were words that were elicited via definition prompts or via sentence completion, which differ from the later picture-naming task. Thus, Monsell, Matthews, and Miller's results cannot speak to whether conceptually-driven repetition reduction will occur when there is also referent repetition. By contrast, in more natural conversation, concept repetition usually occurs when the same referent is mentioned multiple times, meaning that the method employed in this study involved less repetition of the referent than is typically observed in natural

[1] We will use the terms "concepts," "words," and "phonemes" throughout the paper, but these would correspond to "semantic features," "lexical nodes," and "phonemes" in models by Dell and O'Seaghdha (1991) and Dell and O'Seaghdha (1992) and to "lexical concepts," "lemmas," and "lexemes" in models by Levelt (1989) and Levelt, Roelofs, and Meyer (1999).