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A sentence to remember: Instructed language switching in sentence production

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ABSTRACT

In the current study, we set out to investigate the influence of a sentence context on language switching. The task required German-English bilinguals to produce responses based on an alternating language sequence (L1–L1–L2–L2- . . .) and concepts in a specific sequential order. The concept sequence was either a sentence which was syntactically correct in both languages (language-unspecific sentence), a sentence which was correct in just one language (language-specific sentence) or a sentence which was syntactically incorrect in both languages (scrambled sentence). No switch costs were observed in language-unspecific sentences. Consequently, switch costs were smaller in those sentences than in the language-specific or scrambled sentences. The language-specific and scrambled sentence did not differ with respect to switch costs. These results demonstrate an important role of sentence context for language switch costs and were interpreted in terms of language interference and preparation processes.

1. Introduction

Second language (L2) learners typically start out with learning individual words of a foreign language before communication naturally progresses into the use of these single words in sentences. Due to the use of sentences, L2 learners are no longer restricted to simple questions or demands, but can converse on a higher level. Further, they are able to switch between their languages in a sentence context, for example, by including words or phrases from the foreign language into sentences produced in the native language (i.e., code-switching, for reviews, see Heredia & Altarriba, 2001; Van Hell, Litcofsky, & Ting, in press). Yet, language switching studies have typically been limited to the investigation of single words. In the current study, we set out to examine whether a difference in language switching can be obtained by implementing a sentence context.

From a psycholinguistic point of view, word production and sentence production have certain differences. With respect to models of language production, the process of word production is assumed to take place in the following order (Levelt, Roelofs, & Meyer, 1999): a nonlinguistic concept is formed, which entails information that the speaker wants to convey. At the lexical level, the corresponding lemma (i.e., semantic-syntactic representation of a word) is selected, after which the sound representations of the response are added (i.e., phonological encoding). Finally, the word can be produced through articulation, which involves activation of the necessary muscles.

In sentence production, there is the additional process of integrating single words into the more complex context of sentences. Combining single words into a sentence sequence is assumed to be lexically driven (e.g., Pickering & Branigan, 1998). This entails that syntactic information

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directs the construction of a sentence through activation of syntactically corresponding lemmas.

1.1. Bilingual language control

The processes of word production and sentence construction already indicate that lemma activation and lexical (i.e., lemma) selection play a crucial role for language production. Therefore, it is important to note that, at least for bilinguals, language control (Green, 1998) is another process that guides lexical selection. Bilingual language control is necessary to ensure that production takes place in the target language, even though representations of the non-target language might be competing for selection (e.g., Gollan, Sandoval, & Salmon, 2011; Poulisse, 2000; Poulisse & Bongaerts, 1994; Schulpen, Dijkstra, Schriefers, & Hasper, 2003).

A prominent task to investigate the language control process is language switching (e.g., Christoffels, Firk, & Schiller, 2007; Declerck, Koch, & Philipp, 2012; Green, 1998; for a review, see Bobb & Wodniecka, 2013). During a typical language switching task an object and a language cue are presented to indicate, respectively, which concept has to be produced in which language. This set up allows for different concepts and languages to follow one another. A vast array of studies have shown that when two consecutive trials require production in a different language, performance is worse than repeating the same language (e.g., Costa & Santesteban, 2004; Declerck et al., 2012; Meuter & Allport, 1999; Philipp, Gade, & Koch, 2007; Verhoef, Roelofs, & Chwilla, 2009). This decrease in performance is known as switch costs and is considered to be a measure of language control (e.g., Christoffels et al., 2007; Declerck et al., 2012; Green, 1998).

Switch costs are usually explained with the notion of persisting inhibition (Green, 1998): When on trial $n-1$ a certain language has to be produced, the non-target language will be inhibited. Yet, when the previously inhibited language is required for production on trial n (i.e., switch trial), the inhibition that was exercised on trial $n-1$ will persist into trial n and thus will have to be overcome. This is not the case when producing in the same target language on trial $n-1$ and trial n (i.e., repetition trial). Hence, it should be harder to switch between languages than repeating the same language due to persisting inhibition in switch trials.

1.2. Language switching in sentences

These robust language switch costs raise the question why bilinguals switch between languages during natural bilingual language production (i.e., code-switching; Heredia & Altarriba, 2001; van Hell et al., in press) when it is costly. However, it might be that no switch costs occur in a language switching task if, as during natural bilingual language production, bilinguals can choose when to switch to another language. Gollan and Ferreira (2009) used a variant of the language switching paradigm described above, which allowed participants to freely choose when to switch to another language. Switch costs were still observed in this study, which indicates that voluntary language switching does not abolish switch costs[1].

Another feature of natural bilingual language production that might reduce switch costs concerns the fact that upcoming responses are predictably known to the speaker and can thus be prepared, whereas this is generally not the case during a language switching task. Previous language switching studies have shown that language preparation can reduce switch costs (Costa & Santesteban, 2004; Fink & Goldrick, in press). A recent language switching study investigated whether switch costs could be abolished by producing predictable responses with abundant preparation time (Declerck, Philipp, & Koch, 2013). To this end, a novel language switching paradigm was used: the sequence-based language switching paradigm. In contrast to other language switching studies, no visual objects or language cues were used. The bilingual participants had to produce one of seven weekdays, numbers or a novel sequence in the correct sequential order. Additionally, they had to switch languages after every second trial (i.e., alternating language sequence). This resulted in the following possible sequence: Montag (meaning Monday in German) – Dienstag (meaning Tuesday in German) – Wednesday – Thursday – Freitag (meaning Friday in German) – ... Similar to language switching results with unpredictable responses (e.g., Declerck et al., 2012; Meuter & Allport, 1999; Philipp et al., 2007), switching between languages resulted in switch costs in this study. Hence, although Declerck et al. (2013) demonstrated that switch costs can be reduced when responses are predictable and, thus, could be prepared in advance, they also showed that switch costs under these conditions were not abolished (see also Declerck, Koch, & Philipp, in press).

Whereas voluntary language switching and predictable responses do not seem to abolish switch costs, there are other differences between language switching in a laboratory and natural code-switching. Van Hell et al. (in press), have argued that the use of a sentence context is one of the major differences between standard language switching experiments (in which usually isolated words are used) and code-switching.

Evidence along these lines comes from a recent language switching study that investigated single word production in a sentence context (Gullifer, Kroll, & Dussias, 2013). In this study, participants had to silently read sentences and produce one marked word from the sentence. The sentences were always in one languages, but after two sentences, the language would change (i.e., alternating language sequence). Interestingly, no switch costs were observed for the produced words. However, there were always several words between the actual language switch, at the beginning of the sentence, and the marked word that had to be produced. This entails that in this study, responses were not measured immediately after switching from one language to another, but later on, which could have deteriorated the switch costs to the point that they were not observed anymore.

[1] However, no switch costs were observed when participants had to produce 50% of the trials in either language (Gollan & Ferreira, 2009, Experiment 2).