

Bilingual language control in connected speech

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Bilinguals make wrong-language intrusions extremely rarely in situations when their other language will not be understood. In the most established theory of this phenomenon, bilinguals inhibit the non-target language to prevent interference during target-language production (Inhibitory Control Model, Green, 1998). Such inhibition can act at the level of individual lexical representations (*local inhibition*) or at the level of the whole language (*global inhibition*). The most robust behavioral index of inhibitory control is a naming delay of previously inhibited words from the non-target language when this language becomes target, attributed to recovery from inhibition (and such recovery may last for at least ten minutes: Christoffels et al., 2016). This effect is more pronounced or only present for bilinguals' dominant language, consistent with the Inhibitory Control Model's feature that inhibition – and hence recovery from it – is proportional to the strength of the language it acts on (Calabria et al., 2012; Meuter & Allport, 1999). Such a slow-down in dominant-after-non-dominant picture naming is extremely robust, but it is unknown how bilingual inhibitory control dynamics affect connected speech.

In connected speech, lexical retrieval delays (assumed to reflect retrieval difficulties) should be manifest in a reduced speech rate, more filled (*uhs* and *uhms*) and unfilled pauses (Hartsuiker & Notebaert, 2009), fewer words overall, and/or an increased use of cognates (words with the same meaning and a similar form across two languages), which may be less affected by inhibition. More speculatively, a greater use of easier-to-retrieve words such as higher-frequency and more generic words (expected in the face of lexical retrieval difficulties, e.g. in AD: Ostrand & Gunstad, 2020) would be inconsistent with the implication of the Inhibitory Control Model that more robust representations are more strongly inhibited.

Method (Fig. 1). Eighty-six English-dominant Spanish-English bilinguals viewed two 8-min. videos (Tom-and-Jerry-type cartoons with no language) and after each viewing orally explained the video contents. Participants in the Changed-language group explained the first video in Spanish and participants in the Same-language group explained it in English (Phase 1). All participants explained the second video in English (Phase 2). Of interest was how the speech rate, fluency and quality during dominant English production in Phase 2 would be affected in the Changed-language group relative to the Same-language group. Also, half of the participants in each group explained the same two videos in Phases 1 and 2 (to target local inhibition), while the other half explained different videos (to target global inhibition). Bilinguals' English and Spanish proficiency (Table 1) was assessed with tests of productive vocabulary (MINT, Gollan et al., 2012) and grammar knowledge (MELICETⁱ and DELEⁱⁱ), and a language history questionnaire.

The data were analyzed with 2 (Phase 1 language) x 2 (Video Identity) ANOVAs. Contrary to the Inhibitory Control Model predictions, the Phase 2 English speech of the Changed-language group showed no significant differences from that of the Same-language group in speech rate, unfilled pauses and filled pauses. However, the Changed-language group produced fewer words overall ($p = .04$), fewer unique content words ($p = .04$), and words of higher overall frequency ($p = .04$) than the Same-language group (Figs 2-4). Video identity across phases had no effects except for unique content word frequency (Fig. 5). The remaining analyses will target a continuous measure of cognate status and, more exploratory, mean utterance length and number of clauses.

In conclusion, connected speech in bilinguals' *dominant* language showed clear effects of language control induced by previously speaking the non-dominant language. However, these effects were only partially consistent with strong predictions of the Inhibitory Control Model, and there was little support for a division of inhibition into local and global. Instead, our results may suggest that bilinguals possess compensatory measures to recover from adverse language-control effects on the dominant language to maintain speech fluency and quality – instead of being more disfluent or speaking more slowly, they used fewer and easier words.

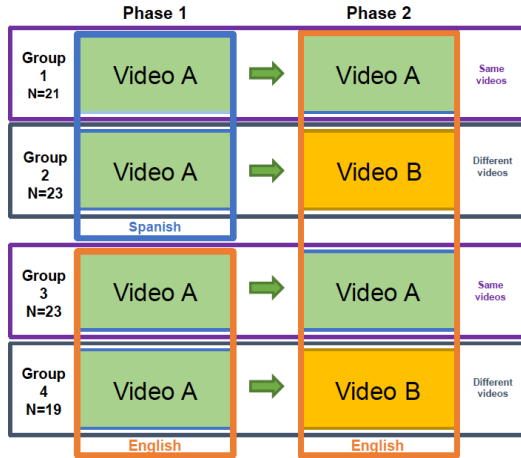


Figure 1: Design. The videos were counterbalanced across phases.

	Mean (SD)
Age of first exposure in years	
English	^a 4.4 (3.7)
Spanish	^a 2.5 (3.0)
Other	15.1 (4.3), N = 43
% daily use now	
English	^a 71% (19%)
Spanish	^a 29% (18%)
Other	9% (15%), N = 6
% daily use as a child	
English	^a 56% (26%)
Spanish	^a 44% (26%)
Other	40%, N = 1
Self-rated proficiency	
English	^a 9.6 (0.6)
Spanish	^a 6.9 (2.1)
Other	2.0 (1.3), N = 32
Productive vocabulary (MINT, of 68)	
English	60.2 (3.6)
Spanish	41.0 (12.5)
Grammar knowledge	
English (MELICET Adapted, of 50)	39.0 (7.8)
Spanish (DELE Adapted, of 50)	22.4 (6.5)

^aN = 80 (the language history questionnaires of six participants could not be uniquely identified).

Table 1. Participant language history

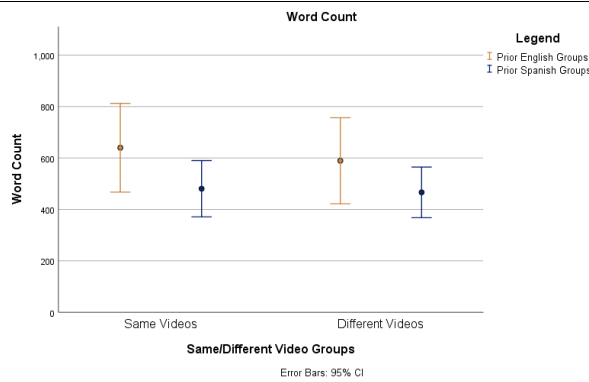


Figure 2: Total number of words

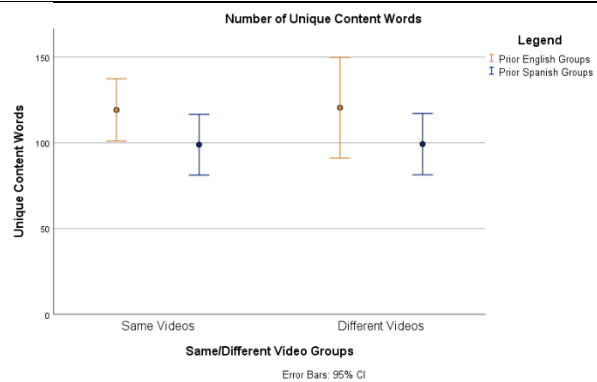


Figure 3: Number of unique content words

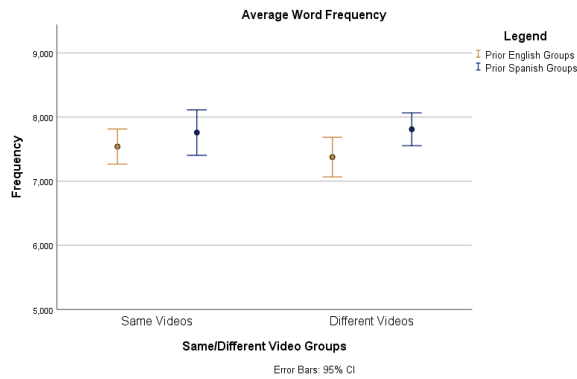


Figure 4: Average overall word frequency

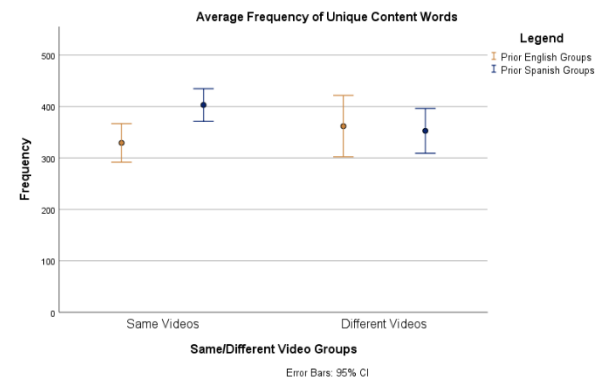


Figure 5: Frequency of unique content words

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¹ Michigan English Language Institute College Entrance Test, English Language Institute. (2001). MELICET—GCVR user's manual.

² Diplomas de Español como Lengua Extranjera, Ministry of Education, Culture, and Sport of Spain.