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Linguistic and Non-linguistic Interference Suppression in Bilingual Aphasia

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Introduction

Interference suppression (IS) is the ability to suppress irrelevant information. This process plays a key role when bilinguals are required to speak one language, which requires inhibition of the non-target language. Previous research has evaluated linguistic and non-linguistic inhibition in bilingual and monolingual healthy adults, revealing a bilingual advantage on non-linguistic tasks (Costa et al., 2008; Luk et al., 2010). However an IS case study comparing healthy bilinguals, monolinguals and bilingual aphasic patients (BAs) contradicts the aforementioned studies (Green et al., 2010). No study has yet systematically examined IS in bilingual aphasia. In this study we investigate whether differences arise between healthy bilingual adults and BAs when completing linguistic and non-linguistic tasks that require IS.

Methods

Fifteen neurologically healthy Spanish-English bilinguals (NH) who were either English- or Spanish-dominant and 3 Spanish-English BAs participated in this study. Data collection is on-going; we anticipate a total of 8 BAs. The non-linguistic IS task was based on Erickson and Erickson's (1974) Flanker Task and included congruent, incongruent and neutral conditions. The linguistic task consisted of word pairs that varied by language direction from prime to target (e.g., English-Spanish, Spanish-English, non-translation pairs) and stimulus type (e.g., translation (Tr), semantic-related (S), semantic-translation (STr) unrelated non-translation (Un), and unrelated-translation (UnTr) word pairs).

Results

We conducted a 2x4 ANOVA on NH response time (RT) to evaluate main effects and interactions between language dominance and language direction. Language dominance was significant, $F(1, 132) = 9.67, p < 0.01$ but language direction was not, $F(3, 132) = 0.54, p = 0.66$, suggesting that English-dominant participants responded faster to all word pairs than Spanish-dominant participants. The interaction between direction and dominance trended towards significance, $F(3, 132) = 2.35, p = 0.08$ suggesting that English dominance may increase processing speed for English-English and Spanish-English language directions; however, English-Spanish and Spanish-Spanish does not appear to be affected by dominance. We then conducted a 2x5 ANOVA on NH RT to evaluate main effects and interactions between target language (English/Spanish) and stimulus type (S, STr, Tr, Un, UnTr). A significant main effect of stimulus type was observed, $F(4, 130) = 3.01, p = 0.02$. Post-hoc Fisher LSD tests revealed that Tr was significantly different than STr ($p = 0.03$), Un ($p < 0.01$), and UnTr ($p < 0.01$) (see Figure 1a), suggesting Tr required less processing than other word pair combinations. Other stimulus types were not statistically different from each other. Preliminary patient data show higher accuracy for related word pairs (e.g., spider-hormiga "ant")

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compared to unrelated word pairs (e.g., spider-iglesia “church”) (see Figure 1b). This indicates that patients showed an advantage for processing words that are semantically related compared to words that are not semantically related. All controls and patients demonstrated congruency facilitation on the Flanker Task.

Conclusions

For NHs, Tr RTs were faster than other word pairs which suggests that IS is occurring. However, BA data shows higher patient accuracy for all semantically related trials compared to unrelated trials suggesting a deviation from IS trends observed in controls.

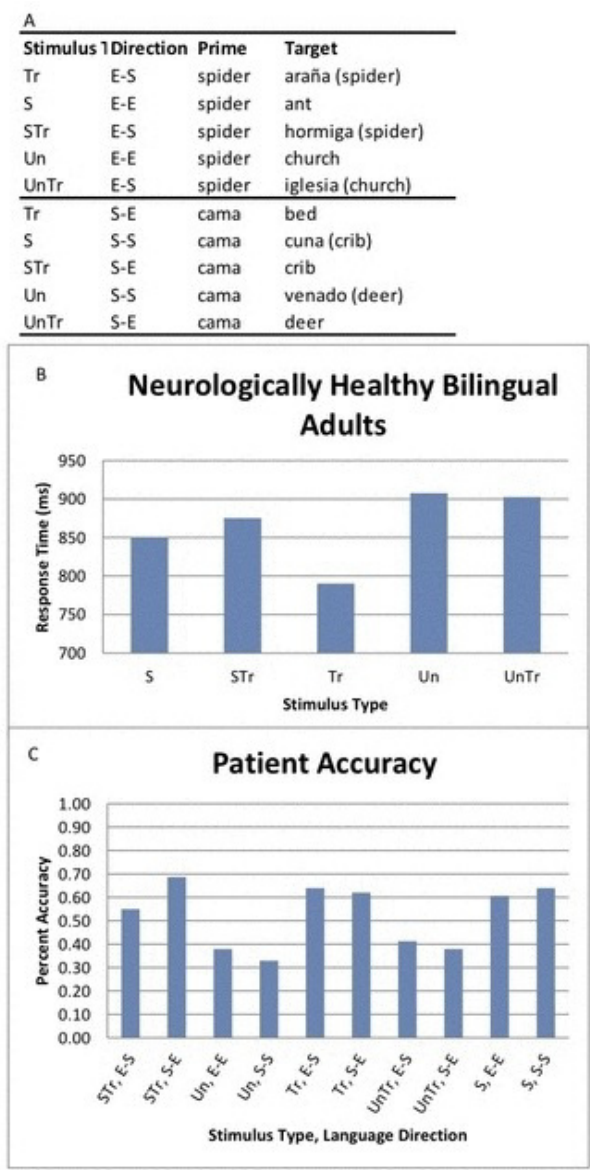


Figure 1: (A) Sample stimuli for experiment, (B) Response times of stimulus types for neurologically healthy bilingual adults, (C) Percent accuracy of stimulus types and language direction for bilingual aphasic patients.