The Influence of Aging and Aphasia on Bilingual Semantic Organization

Samantha Siyambalapitiya[1], Helen J. Chenery[2] & David A. Copland[2]

[1] Discipline of Speech Pathology, James Cook University, Australia

[2] Language Neuroscience Laboratory, School of Health & Rehabilitation Sciences, The University of Queensland, Australia

Introduction

Most previous research into bilingual aphasia has investigated the language recovery patterns demonstrated following a neurological lesion. Very few studies have systematically investigated the nature of lexical-semantic organization in older bilingual adults or those with aphasia. Understanding the nature of language organization in bilingual speakers is integral to developing effective language rehabilitation therapies that accurately target the underlying deficit. The present study employed bilingual semantic priming to investigate on-line semantic processing in older bilinguals and a participant with bilingual aphasia. Findings of cross-language semantic priming in younger bilingual adults have previously been interpreted as indicative of shared semantic representation, as exemplified by the Revised Hierarchical Model (Kroll & Stewart, 1994), a prominent model of bilingual lexico-semantic organization. This study explored whether cross-language priming effects would be preserved in older adult bilinguals and following neurological injury.
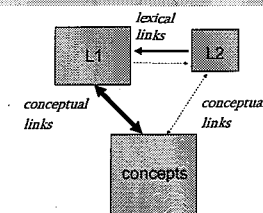

Figure 1. Revised Hierarchical Model

Method

Participants

Older bilingual adults: 20 native Italian speakers who were bilingual in English (13 female, 7 male), aged between 47-80 years (mean = 62 years). Participants had received an average of 10.6 years of education and had spent between 21 to 63 years in an English-speaking country.

Participant with aphasia: 1 x 70-year-old female Italian/English speaker with bilingual aphasia following a left CVA. The participant had received 4 years of education and had spent 53 years in an English-speaking country.

Stimuli & Procedure

Participants were presented with pairs of auditory stimuli in which the first stimulus was a real Italian or English word and the second stimulus was either a real word or nonword. There were four conditions in which the word pairs were related: Italian-Italian, English-English, English-Italian and Italian-English and four corresponding unrelated and nonword conditions (see table below for stimulus examples). Each of the related word pairs consisted of two words from the same semantic category that were low in association, with the aim that any observed priming effects were truly due to cross-language overlap at the semantic and not the lexical level. Participants were required to make speeded lexical decisions on the second stimulus in each pair and indicated real words with a button press. No response was required for nonwords.

Language pair	Related	Unrelated
Italian-Italian	aquila-gabbiano	cuore-gabbiano
English-English	green-white	friend-white
Italian-English	mucca-bird	scherma-bird
English-Italian	uncle-sorella	neck-sorella

Discussion

The older bilingual controls demonstrated both within and cross-language priming suggesting that semantic representation is shared in this cohort of bilinguals and is unaffected by aging mechanisms. In contrast, the participant with bilingual aphasia produced a priming pattern in the within-language conditions only. This finding suggests that cross-language connections may be disturbed by neurological insult whereas within-language representations may be better preserved. The distinction between priming patterns for within-language and cross-language conditions suggests semantic representation for each language may be stored separately in the participant with aphasia or that cross-language links are compromised or no longer accessible. Further research is required to verify whether this pattern is consistently demonstrated in people with bilingual aphasia and to explore the implications for devising effective language therapy techniques.

Results

For the **older bilingual adults,** mean reaction times (see Fig 2) from the related and unrelated conditions were analysed using a linear mixed model with the random factor subject, the within-subjects fixed factors of relatedness, language congruence and target language and the covariate English exposure (number of years spent in an English-speaking country).
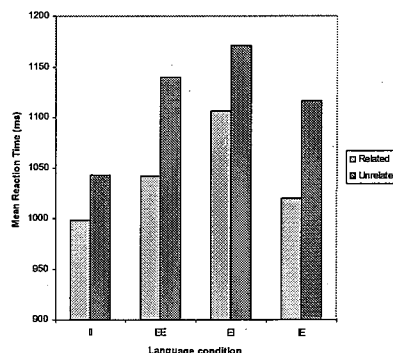

Figure 2. Mean reaction times across language conditions (older bilingual controls)

Planned pair-wise contrasts indicated that priming occurred across all language conditions ($p < .01$), both within and across languages. Further analyses investigated the influence of English Exposure by dividing the cohort using a median split. These analyses revealed that participants from both the less English Exposure and more English Exposure groups showed priming across all four language conditions ($p < .05$), indicating that priming occurred across all language conditions, irrespective of language dominance patterns.
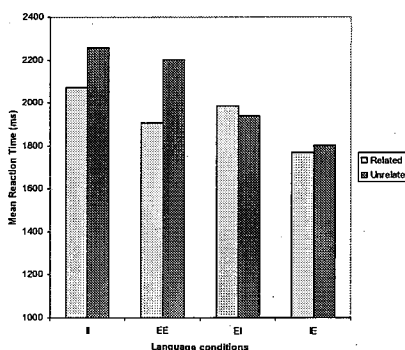

Figure 3. Mean reaction times across language conditions for participant with bilingual aphasia.

In contrast to the older bilingual controls, the **participant with bilingual aphasia** only showed a reaction time advantage for related pairs in the two within-language conditions. No priming pattern was evident for the cross-language word pairs.

References

Kroll, J.F. & Stewart, E. (1994). Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations. *Journal of Memory and Language, 33,* 149-174.

Please contact Samantha Siyambalapitiya with any comments: samantha.siyambalapitiya@jcu.edu.au

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

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S. Siyambalapitiya[1], H. J. Cherney[2], D. A. Copland[2].

[1]*Discipline of Speech Pathology, James Cook University, Australia*

[2]*Division of Speech Pathology, The University of Queensland, Australia*

Background

In managing bilingual aphasia, effective therapy techniques should be based on a clear understanding of bilingual language organization and the impact of aphasia on bilingual lexico-semantic relations. Whilst several studies have employed semantic priming to investigate the nature of bilingual semantic representation in younger adult bilinguals, few studies have investigated on-line semantic processing in older adult bilinguals or bilingual speakers with aphasia. In younger bilingual adults, evidence of cross-language priming is posited to be indicative of shared semantic representation across languages. The present study employed a bilingual semantic priming task to investigate whether cross-language priming effects would be preserved in older adult bilinguals and following neurological injury.

Method

Twenty bilingual Italian/English speakers (13 female, 7 male) aged between 47 and 80 years (mean = 62 years) participated in the experiment. The experiment was also completed by one 70-year-old female Italian/English speaker with bilingual aphasia following a left CVA. Participants were presented with pairs of auditory stimuli in which the first stimulus was a real Italian or English word and the second stimulus was either a real word or nonword. There were four conditions in which word pairs were related: Italian-Italian, English-English, English-Italian and Italian-English and four corresponding unrelated and nonword conditions. Participants were required to make speeded lexical decisions on the second stimulus in each pair and indicated real words with a button press. No response was required for nonwords.

Results

For the older bilingual adults, mean reaction times from the related and unrelated conditions were analysed using a linear mixed model with the within-subjects factors of relatedness, language congruence and target language and the covariate English exposure. The analysis revealed significant main effects for relatedness, language congruence and target language as well as a target language by English exposure interaction. Further pair-wise comparisons demonstrated that priming occurred in all of the within-language and cross-language conditions. This pattern was shown by participants with both less English exposure and more English exposure. In contrast, the participant with bilingual aphasia showed a reaction time advantage for related pairs only in the two within-language conditions. No such pattern was found in the cross-language conditions.

Discussion

The results indicate that both cross-language and within-language priming is found in older adult bilinguals which suggests that shared bilingual semantic representation is unaffected by aging mechanisms. The lack of cross-language priming, however, in the participant with bilingual aphasia suggests that neurological insult may disturb cross-language semantic connections whilst within-language semantic links appear to be preserved. The absence of cross-language priming suggests separate semantic storage for each language in the participant with aphasia.

Conclusion

The present study results suggest that aphasia may disrupt cross-linguistic semantic connections whereas within-language semantic links may be preserved. Further research is required to verify whether this pattern is consistently demonstrated in bilingual aphasia and to explore the implications for devising effective language therapy techniques.