Critical Review:
Importance of language of therapy on outcomes across languages in non-monolingual individuals with aphasia

Leung, J.
M.Cl.Sc (SLP) Candidate
University of Western Ontario: School of Communication Sciences and Disorders

This critical review examines the importance of language of therapy on outcomes across languages in non-monolingual individuals with aphasia. A literature search was completed and yielded the following study designs: one single subject design and four individual case studies. With fair consistency (4/5 studies), research suggests that treatment provided in one language confers a generalized benefit to the other languages of the individuals with aphasia; however, premorbid language proficiency levels may affect the different patterns of generalization. Identification of profile indicators for optimal language of therapy in the treatment of non-monolingual individuals with aphasia has not yet occurred.

Introduction

Canada is progressively becoming a multilingual society according to language statistics from the 2006 Census of Canada. Of the 1.1 million immigrants who arrived in Canada from 2001 to 2006, 81 per cent have a mother tongue other than French or English--notably Chinese, Punjabi, Spanish, Arabic, Tagalog and Urdu (Statistics Canada, 2006). For the purpose of this critical review, non-monolinguals is broadly defined as "individuals who know (and use) two or more languages, typically acquire the two or more languages at different times in their lives, and use these languages at different levels of proficiency" (Wong, 2006, p.12).

Aphasia is defined as "an acquired communication disorder caused by brain damage, characterized by an impairment of language modalities: speaking, listening, reading, and writing" (Chapey, 2001, pg.3). For individuals with aphasia, recovery is significant within the first 6 months post injury and the initial severity, lesion size, and time post onset are among the best predictors of degree of spontaneous recovery (Stemmer, 1998). Spontaneous recovery is defined as "the psychological changes that take place in the brain in the immediate period following the onset of aphasia" (Gil & Goral, 2004, pg.208).

Paradis (2000) described two patterns of language recovery observed in multilingual aphasics: parallel and non-parallel. Parallel recovery occurs when both (or all) languages appear to recover at a similar rate while non-parallel recovery describes the faster recovery of one language over others.

Research has suggested mixed outcomes in efficacy studies for identifying the optimal language of therapy to treat non-monolingual individuals with aphasia. Nevertheless, numerous studies have suggested that treatment provided in one language (the trained) confers a generalized benefit to the other languages (the untrained) (Edmonds & Kiran, 2006; Filiputti et al., 2002; Mali & Mira, 2004; Miertsch et al, 2009).

Traditional approaches employed in aphasia rehabilitation still apply to rehabilitating non-monolingual individuals with aphasia. However, there is no one set of widely accepted guidelines that exist for selecting one or all languages in aphasia rehabilitation as the most effective method for non monolinguals.

Researchers have used a variety of approaches when examining which language to use as the language of speech-language therapy. Clinical decisions have been based on: the individual's mother tongue; the most proficient pre-morbid language, appeared better recovered language, individuals preferred language to receive treatment in, and the most used language of the individual's environment pre and post injury (Edmonds & Kiran, 2006; Filiputti et al., 2002; Meinzer et al, 2007; Mali & Mira, 2004; Miertsch et al, 2009). However, the extent to which factors affect the patterns of generalization has not yet been fully evaluated.

This is a topic of clinical and research importance. With increasing interaction between individuals from diverse linguistic and cultural backgrounds, due to factors such as immigration and globalization, the numbers of non-monolingual individuals will most likely increase. It is imperative we use evidence-based practice to inform our decisions regarding language of treatment, to provide optimal therapy to our patients.

Objectives

The primary objective of this paper is to provide a critical evaluation of existing research on the importance of language of therapy on outcomes across languages in non-monolingual individuals with aphasia. The secondary objective is to propose evidence-based practice recommendations for future research and clinical practice regarding language of therapy for non-monolingual individuals with aphasia.

Methods

Search Strategy

Internet databases, including SCOPUS: Health Sciences and Social Sciences, PubMed, and MEDLINE were searched with the following terms:
(speech therapy) AND (bilingualism)
(aphasia) AND (therapy) AND (bilingualism)
(aphasia) AND (polyglot) AND (language treatment)
(aphasia) AND (treatment) AND (recovery)

The search was limited to articles written in English and published between 1999 and 2009. Additionally, relevant studies referenced within acquired articles were sought.

Selection Criteria

Studies included in this critical review were required to investigate whether the speech-language treatment provided in one language conferred any generalization to the other languages of non-monolingual individuals with aphasia. No limits were set on the demographics of research participants or outcome measures.

Data Collection

Results of the literature search yielded the following types of articles compatible with the aforementioned objectives and selection criteria: single subject multiple baseline design (1) and individual case study (4).

Results

Edmonds & Kiran (2006) employed a single subject multiple baseline design across participants and behaviours to examine the transfer patterns of a semantic naming treatment in three non-monolingual individuals with aphasia. Participant 1 (P1) had balanced premorbid language proficiency skills in English and Spanish and was treated only in Spanish. Participant 2 (P2) and participant 3 (P3) were more proficient premorbidly in English. P2 was first treated in English followed by Spanish and P3 was treated only in Spanish. All participants presented with an insult to the left middle cerebral artery due to a cerebral vascular accident. Treatment provided two times per week for two-hour sessions was discontinued when naming accuracy reached 80% for two consecutive sessions or when 20 treatment sessions were completed. Generalized naming to untrained examples occurred if levels of performance increased at least doubled baseline levels. The authors calculated a bilingual proficiency ratio (BPR) based on completed speech and comprehension ratings collected from the interviews. The BPR's were compared against normal Spanish-English bilinguals who were either Spanish or English dominant, or balanced in a previous study performed by Edmonds & Kiran (2004). Through C statistic, results of P1 after treatment in Spanish suggested crosslinguistic generalization to the untrained language (English) and P2 results suggested no crosslinguistic generalization to Spanish after receiving treatment in English. However, after treatment in Spanish was conducted, crosslinguistic generalization was observed for English. For P3, receiving treatment in only Spanish facilitated crosslinguistic generalization to English. The authors suggest that training the weaker pre morbid language may be more beneficial than training the dominant pre morbid language for non-monolinguals who do not have balanced premorbid language skills. In addition, for those who have balanced premorbid language skills, this study suggests treatment in either language will allow for generalization to the other untrained language, although P1 was only provided treatment in one language.

This is a well-designed single subject multiple baseline study. Baseline data, probes, post treatment, and maintenance measures give increased information and improve the evidence base for this treatment. Varying the number of baselines, stimuli set order, and counterbalancing language across participants were strengths. A time series analysis using the C statistic to determine which changes from baseline to treatment phases were statistically reliable is another example of the study's respectable data analysis. This study's treatment setting, procedures, and duration were described well, therefore allowing replication and thus increasing the reliability and internal validity of the study. Converging evidence from three participants demonstrating crosslinguistic generalization with training of their less proficient pre-morbid language is highly suggestive.

Filiputti et al. (2002) reported a single case study of a 55-year-old non-monolingual male with aphasia who suffered an ischemic stroke. The participant's L1 was

Slovenian, L2 was Italian, third language (L3) was Friulian, and fourth language (L4) was English. The case study investigated if treatment in L2 would result in parallel improvement to all languages (L1, L2, L3, and L4) and if these hypothesized benefits of rehabilitation would be maintained four years post treatment. One-month post injuries, standardized aphasia batteries specific to each of the four languages were administered. The participant was given a six-month course of therapy (3 times/week) for 45 minutes in Italian. L2 was chosen because this was the language of communication that his family used in daily living and it was the participants' strongest pre-morbid language. The therapy focused on fluency control, phonemic discrimination, improving his phonological and morphological deficits through oral and written exercises, and communication exercises. At the end of rehabilitation, 6 months post, the participant was assessed again using the BAT in all languages (Slovenian version became available at this time). Two 2-factor ANOVA's (linguistic levels and time) and (language and time) along with the administration of Newman Keuls post hoc tests were carried out. The interaction between language and time were significant ($p<.001$). Performance of Slovenian deteriorated significantly between the second and third assessment ($p<.01$) was found. Also, statistically significant ($p<.05$) was the improvement between the second and third assessment of Italian. Improvement of Friulian and English did not reach statistical significance between the second and third assessment. Although not significant, Friulian, Italian, and English also showed a trend toward improvement. The authors suggested that the participant's weakest pre-morbid language proficiency of Slovenian (L1) was the reason for lack of crosslinguistic generalization from treatment. Filiputti et al. interpreted these findings as reflecting that the benefits of rehabilitation were maintained four years post treatment.

While this study tries to provide persuasive evidence that treatment in one language created crosslinguistic generalization in three of the four languages. When synthesizing these results, several questions remain. Firstly, it is unclear why the authors chose four years to view if rehabilitation effects were maintained post treatment. Furthermore, it is unclear why the authors did not choose to perform a re-assessment annually leading up to the four-year re-assessment. The study also began treatment six months post onset of the insult, and with debate of spontaneous recovery, one may question if the measured improvements could still have been due to spontaneous recovery or to the treatment provided. Nonetheless, two languages that were non-treated after therapy did improve but overall, this study should be regarded with caution until further evidence emerges.

Meinzer et al. (2007) reported a case study on a 35-year-old non-monolingual patient (L1=French; L2=German) with balanced pre-morbid language skills diagnosed with chronic aphasia. Functional magnetic resonance imaging measuring activation during picture-naming was completed at the start of the study (32 months post stroke) and 2 weeks later after intensive therapy in German (3 hrs/day for 10 days in an interactive group setting). The treatment took place 3 hours /day for 10 consecutive days by way of language games in an interactive group setting. In addition, his language was tested with a German neuropsychological language test, Aachen Aphasia Test (AAT) and a naming test of 150 photographic objects. His word retrieval in French was assessed with the same naming test. No standardized battery for aphasia was available to test his French language. Post hoc analysis performed after treatment confirmed a larger increase of activation across time for German compared to French in a time x language interaction. Results of the participant's CIAT suggest an improvement in correct responses in the German naming task compared to the much lower number of correct responses for the French naming task. His AAT score indicated a significant improvement in German. Therefore, after receiving short-term treatment focused exclusively on the patients' German language abilities, results suggested no crosslinguistic generalization observed in the French language within this study.

Due to the extremely short intervention period, results from this study should be regarded cautiously. Crosslinguistic effects may take longer to result in a measurable difference. Another limitation to this study was the lack of standardization of the assessment protocols. No standardized version of the AAT in French and specialized battery (e.g. BAT) was used. The authors acknowledged not including a repeated baseline assessment of language functions and associated brain activation patterns due to the participants' late chronic stage of aphasia. Given such limitations, this research provides suggestive evidence that no crosslinguistic generalization to the untrained French language was observed following rehabilitation efforts focused exclusively on the patient's German language abilities.

Gil & Goral (2004) presented a single case study of a 57-year-old non-monolingual male, who suffered an ischemic left frontoparietal infarct. His L1 was

Russian and his L2 was Hebrew, which he considered his less proficient pre-morbid language. The participant was assessed four times (two weeks post onset, one month later, three and a half months later, and five months later) in both languages with the Israelia Loewenstein Aphasia Test (ILAT), BNT, auditory comprehension picture comprehension task, reading comprehension word-picture matching task, and writing evaluations. The participant received treatment in Hebrew for three-and-a-half months post injury five times per week for 45-minute sessions. Once results indicated progress of crosslinguistic generalization, he received a second treatment focused on Russian, for a period of one-and-a-half months. There are limited details on the course of language treatment changes. The participant approached 'ceiling performance' in both L1 and L2 for auditory comprehension. Upon visual inspection, reading and to a lesser extent writing improved for Russian more than Hebrew, whereas, the opposite was true for expressive performance. Although the focused language of treatment switched from Hebrew (L2) for three-and-a-half months to Russian (L2) for a month-and-a-half, there was an improvement in both the untreated languages within the treatment period, thus crosslinguistic generalization. However, the participants' Russian language consistently made more improvements through the entire therapy treatment.

Overall, the study has strong reliability as it provided extremely detailed descriptions on tasks for each language modality, therefore the findings can be replicated. Having a single subject reduces the study's external validity because the results cannot be easily generalized to other non-monolingual individuals with aphasia. Although this is an on-going issue with having small populations within research, it does adversely affect the level of evidence. Due to crosslinguistic generalization occurring after the first focused treatment in Hebrew, a second treatment focused in Russian progressed. Methodologically there is some concern with the uneven amount of treatment time provided in each language (3.5 months vs. 1.5 months). It is also interesting to note that within this study it is the participants' strongest pre-morbid language (Russian) that improves the greatest, even when untreated. Although, he considered himself proficient in his L2, the participant did not learn Hebrew until he was 35 years old. Overall, this is a relatively well-designed study, and interpreted cautiously, it does provide suggestive evidence that treatment provided in one language confers a generalized benefit to other languages of non-monolinguals with aphasia.

Miertsch et al. (2009) presented a case study of a 48-year-old non-monolingual male who suffered a left hemisphere ischemic cerebrovascular stroke with Wernicke-aphasia. The participant's L1 is German, L2 is English, and L3 is French. Sessions began eight years post onset and consisted of 45 minutes sessions twice a day for three and a half weeks. French was the participants' chosen focused language of therapy. Miertsch et al. noted that for two weeks in acute care and for two and a half years post insult, the participant received speech-language therapy in German, which was not part of the present study. As a means of assessment pre and post treatment, the authors used the BAT in all three languages. A two way ANOVA with language (L1 L2, L3) and time (pre and post training) as the independent variables was completed. There was a significant main effect of language, showing the mean percentage of correct answers was significantly higher for German (90.4%) compared to French (82.9%) and English (78.3%). Time was also a significant main effect, which was indicative of the mean performances for all languages to be higher post training (89.9%) than pre training (77.8%). A significant interaction between language and time was found and subsequent post hoc t-tests indicated a significant improvement at the linguistic level in French and English, but not in German. Therefore, after receiving treatment in French, there was crosslinguistic generalization to both his French and English with no significant improvements made to his German language skills.

This is a well-designed study with a strong theoretical framework based on a clear concept, RH model. The authors rationale of a common system containing semantic-conceptual information for the different languages of a non-monolingual and then to train the system with one language (French) to affect the other languages (German, English, and French) was clearly stated and implemented. While the results of the study, may seem striking, the authors acknowledge that the participant's German language skills could have reached a 'ceiling', leaving very little if any room for improvement after the study. The study's three and a half week intensive therapy may not have been long enough for the participant's German to change significantly. Overall, generalization from one treated language to non-treated languages did occur.

Discussion

With fair consistency (4/5 studies), the literature suggests that treatment provided in one language confers a generalized benefit to the other languages.

Premorbid language proficiency levels may affect the different patterns of generalization. This literature had several limitations such as small sample sizes, variability in assessments, differing length and duration of treatment, language of treatment, and diversity in non-monolinguals with aphasia. This makes the literature somewhat difficult to compare given these limitations. Edmonds & Kiran (2006) found crosslinguistic generalization to occur with one participant with balanced premorbid language skills whereas, despite the fact that a participant with balanced premorbid language skills did not demonstrate any crosslinguistic generalization in the Meinzer et al. (2007) study. Gil & Goral (2004), Filiputti et al. (2002), and Miertsch et al. (2009) studies all had similar results of crosslinguistic generalization in at least one language with treatment provided in the participant's dominant language. When synthesizing these results, several questions remain. Firstly, it is unclear which language of therapy is more beneficial to participants. Furthermore, it is unclear if the strength of pre-morbid language abilities affects treatment generalization, given the variability in age of acquisition, proficiency, environments, family and daily use. Despite such limitations, results indicated that treatment in any language did provide within language improvements if not between crosslinguistic generalizations. Overall, the literature reported in this critical review provides optimistic support for clinicians who are treating non-monolingual individuals with aphasia. Given the lack of information regarding the optimal language of therapy, durations of interventions, or characteristics of appropriate candidates, continued research is warranted to further investigate which language of treatment is most beneficial for non-monolingual individuals with aphasia. Additional studies directly comparing treatment protocols is recommended. Future research should consider single subject multiple baseline experimental designs to provide a higher level of evidence than case studies. Multiple subject designs will also increase external validity. Also, sufficient procedure data used should be included to allow study replication, providing a frame of reference for future publications to compare their findings, thus improving the evidence based for a particular language of treatment for this population.

Conclusion and Clinical Implications

The integration of evidence-based principles into clinical practice can facilitate improved client outcomes and service that is more efficient. Despite the aforementioned design limitations, the evidence for use of providing treatment in the patient's non-dominant or dominant language with hopes of crosslinguistic generalization to occur is highly suggestive, with recognition of the differences in linguistic aspects across languages.

Given the potential benefits of crosslinguistic generalization and overall improvement with the individuals' speech and language following rehabilitation, clinicians should take into consideration the client's family's preference when deciding which language of therapy to progress would best functionally to suit their needs

There is persuasive evidence that non-monolingual individuals with aphasia can benefit from speech and language treatment. However, identification of profile indicators for optimal language of therapy in the treatment of this population has not yet occurred. Until that time, clinicians may use available research to deliver treatment with some confidence, anticipating positive benefits to the client's speech and language.

References

Chapey, R. (Ed.) (2001). *Language Intervention Strategies in Aphasia and Related Neurogenic Communication Disorders 0 4th edition.* Philadelphia, PA: Lippincott Williams & Wilkins.

Edmonds, L.A. and Kiran, S. (2006). Effect of Semantic Naming Treatment on Crosslinguistic Generalization in Bilingual Aphasia. *Journal of Speech, Language, and Hearing Research.* 49: 729-748.

Filiputti, D., Tavano, A., Vorano, L., De Luca, G., & Fabbro, F. (2002). Nonparallel Recovery of Languages in a Quadrilingual Aphasia Patient. *The International Journal of Bilingualism.* 6(4): 395-410.

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.

Meinzer, M., Obleser, J., Flaisch, T., Eulitz, C., & Rockstroh, B. (2007). Recovery from Aphasia as Function of Language Therapy in an Early Bilingual Patient Demonstrated by fMRI. *Neuropsychologia.* 45: 1247-1256.

Mali, G. and Mira, G. (2004). Nonparallel Recovery in Bilingual Aphasia: Effects of Language Choice, Language Proficiency, and Treatment. *International Journal of Bilingualism.* 8(2): 191-219.

Meirtsch, B, Meisel, J.M., & Frederic, I. (2009). Non-treated Languages in Aphasia Therapy of Polyglots Benefit from Improvement in the Treated language. *Journal of Neurolinguistics.* 22: 135-150.

Statistics Canada. Language, 2006 Consensus (2006). Retrieved from http://www.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=97-555-X2006039&lang=eng

Stemmer, B. & Whitaker, H.A. (Eds.) *Handbook of neurolinguistics* (pp.345-355). San Diego: Academic Press

Wong, P.C.M. (2006). Bilingualism and Aphasia, pp.12-16. In Encyclopedia of Language and Linguistics Second Edition (K. Brown, editor- in-chief). Elsevier: Oxford