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Improving Lexical Naming Using Orthographic Cueing in Bilingual Aphasia – A Case Study

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ABSTRACT

Word finding difficulty (Anomia) is a persistent problem with aphasia even after a significant recovery in domains of comprehension and expression. Majority of the studies that have focused on treating anomia have used either phonological of semantic cueing strategies, presently orthographic cueing has also been shown to have positive effects in word retrieval. There is a dearth of studies done using orthographic cueing in bilingual aphasia. The present study focuses on using self-generated orthographic cueing to overcome anomia in a person with aphasia. Study addressed the following questions: Does orthographic cueing improve word retrieval in aphasia? Does orthographic cueing in L2 lead to cross-linguistic generalization for naming in L1?

Participant was a 56 year male (MX), bilingual with L1-Kannada L2-English. Background testing was done to evaluate his present language abilities & the test results revealed that MX had naming difficulties especially on word fluency task of WAB. Hence lexical naming was taken up for treatment. This is an experimental research, single subject, baseline and post-therapy testing. A group of untreated items served as experimental control. Treatment was provided only in L2 and assessed for cross linguistic generalization post treatment. A conversation sample of pre and post treatment session was recorded & analyzed using POWERS to quantify the improvement in word retrieval.

There was a significant improvement in word retrieval in speech using self-generated orthographic cueing & cross-linguistic generalization was also seen for both the treated and control items. The study suggests that self-generated orthographic is an effective method to improve word retrieval in bilingual aphasia. The study also accounts for the use of the most proficient post morbid language to treat word retrieval in bilingual aphasics, which can help in parallel recovery of the other language.

Keywords: Bilingual aphasia, orthographic cueing, anomic aphasia, case study.

1. BACKGROUND

Bilingualism is the norm for at least half of the world's population (Lee, Kroll & De Groot 1997) and Grosjean (1998) stated bilinguals as, individuals who use more than one language to communicate on a regular basis. Aphasia is generally described as an impairment of language as a result of focal brain damage to the language dominant cerebral hemisphere (Darley, 1982). A bilingual aphasia results from focal damage to the dominant hemisphere, having a negative impact on both the languages, with relative variation in the degree of cross-linguistic impairment (Fabbro 2000; Domingue & Paradis 1990).

Word finding difficulty (anomia) is a persistent problem in persons with aphasia even after a recovery in domains of comprehension and expression has taken place. Word finding difficulty, also known as a lexical retrieval deficit, is a phenomenon whereby an individual can usually supply an accurate semantic representation of an object, but are unable to verbally label that same object (Saito & Takeda 2001).

Language therapy focused towards treating bilingual persons with aphasia have been challenging than treating monolingual patients. The challenges being the question: which language (L1 or L2) to choose for treatment? Does both the language need to be treated simultaneously? Cross linguistic generalization occurs from L1 to L2 or vice versa? Many researchers have

systematically explored the answers to these questions. Among the recent evidences, experts emphasize the use of both the languages while treating persons with aphasia in order to utilize the available strategies, (e.g.: Ansaldo et al. 2008; Centeno 2005). Croft (2011) did a study on five Bengali-English bilingual persons with aphasia and found that generalization followed L1 to L2.

Lexical access involves two stages: lexical item selection, which accesses the syntactically and semantically appropriate representation of the word, and phonological encoding of the selected item, which allows for its verbal articulation (Levelt 1991). The phonological and semantic cueing approaches for treating anomia are based on this theory.

Croft & Marshall (2009) used both semantic and phonological cueing in bilingual patients with aphasia and found both the cueing strategy provided an equal gains and cross-linguistic generalization, but maintenance with the phonological technique was somewhat less clear. In general, phonological cues are more effective than semantic cues, due to the straightforwardness of the cueing (Saito & Takeda 2001).

The semantic and phonological cues follow a hierarchy of increasing or decreasing order. Thomas (2011) found the effect of increasing and decreasing cueing order in a monolingual person with aphasia and found increased cueing hierarchy facilitated correct naming responses compared to decreased hierarchy.

Recently, evidences are found on orthographic cueing to treat anomia. The underlying assumption in the use of orthographic cueing is that, knowledge of written form of words is relatively intact and can be used to retrieve phonological form. Orthographic cueing works when written language abilities are better than spoken language abilities in a case study, Greenwood (2010) used a combination of phonological and orthographic cueing and found a generalized improvement in naming ability.

In a study Nickels (1992), used orthographic cueing in TC to improve word retrieval. TC was re-taught the grapheme phoneme correspondence and later to use the self-generated orthographic cueing to improve word retrieval. Howard & Harding (1998),

used letter pointing on the alphabet board to facilitate word retrieval using the initial phoneme.

Lorenz & Nickels (2007) on evidence based practice of adult language therapy mentioned two methods of orthographic cueing strategy. One method is generating phonemic cues from writing the initial letter (Nickels 1992), the other is using direct orthographic route, by writing the whole word. These cues can be self-generated or cued by others, while self-generated cues provide better generalization. The use of cue depends on the intact orthographic skills of the patient.

Impact of treatment of word retrieval on everyday communication can be assessed using a validated tool, POWERS (Profile of Word Errors and Retrieval in Speech) (Herbert 2008). POWERS is a valuable tool in quantifying the improvement for word retrieval in everyday conversation which is used to assess the difference in the quality of speech from pre to post therapy. It allows quantification of a number of features from conversation between the person with aphasia and the conversation partner. These features include production of nouns, paraphasias, and pauses, as well as conversational turns and collaborative repair. A conversation sample is acquired by recording 10 minutes of conversation between the person with aphasia and their usual conversation partner using audiotape. The middle five minutes of this sample are then analyzed.

Study addresses the following questions:

1. Does orthographic cueing improve word retrieval in speech?
2. Does orthographic cueing in L2 lead to cross-linguistic generalization for naming in L1?

2. METHOD

The participant with aphasia was a 56 year old male (MX), right handed, bilingual speaking Kannada (L1) and English (L2) with a formal education for 18years.

Background information revealed that MX had infract in the left MCA territory following an acute ischemic attack. MX attended speech language evaluation at eight months post onset

stroke. Brief history revealed that MX was more comfortable responding in English (L2) compared to L1. Detailed language evaluation was carried out with Western Aphasia Battery (WAB) (Kertesz 1982) to evaluate the type of aphasia. MX obtained an aphasia quotient of 74 (AQ= 74) indicating anomic aphasia. Test results on WAB revealed that MX had naming difficulties especially on word fluency subtest of naming while having preserved confrontation naming abilities.MX obtained a cortical quotient of 29.3 (CQ=29.3). His writing ability was good as tested with the writing sub test of WAB. Hence, fluency naming was taken up for therapy.

Language Experience and Proficiency Questionnaire (LEAP-Q; Marian, Blumenfeld & Kaushanskaya 2007) Performa was administered to obtain a clear picture of his pre morbid language proficiency. From LEAP-Q it was clear that MX was proficient in both Kannada (L1) and English (L2) for speaking, reading and writing pre morbidly, but used English more frequently as it was the lingua franca at his work place. Considering his good naming skills in L2, treatment was focused in L2 exclusively. Along with this, his area of strength being good writing skills, it was employed as the treatment strategy.

2.1. *Test development and content*

12 common lexical categories were chosen and 10 neurologically normal adults were asked to name as many items as possible under each category within one minute. Out of the 12 lexical category, 6 categories were selected for treatment paradigm, as it had more than 15 items listed by the subjects. Out of these six selected categories, three were taken as control groups and the rest 3 categories were subjected for therapy. The lexical categories selected were animals, fruits, vegetables, vehicles, clothes and profession. Animals, fruits and vegetables were used for therapy and vehicles, clothes and profession were considered as control group, on which no therapy was provided.

2.2. *Design*

Experimental research, single subject with multiple baseline and post-therapy testing. A group of untreated items served as

experimental control. Therapy was given for 10, 45 minutes session over a period of 3 weeks

2.3. *Treatment procedure*

A written consent was obtained from MX before the start of the study protocol. Baseline scores were recorded in both L1 and L2 for the fluency naming task on test and control categories. A conversation sample of 15 minutes was obtained in L2 at baseline session and three weeks post therapy. Therapy was provided in English (L2). A mid therapy testing on fluency naming in L1 and L2 was done at fifth session. For therapy realistic images of the lexical items were displayed using computer monitor.

The main focus of therapy was to take advantage of MX's intact orthographic skill to improve fluency naming. He was taught to self-cue the initial phoneme by writing with his finger or pen, whichever was comfortable. Therefore, recall the word through grapheme to phoneme correspondence (GPC). The three treatment categories were subjected to the following hierarchy during therapy (modified and adapted from Kiran [2009]).

- Confrontation naming of pictures from the lexical categories of Animals, fruits and vegetables.
- Naming the pictures through writing using (self-generated orthographic cueing).
- Word recall using self-generated orthographic cueing of the initial phoneme, failing which a semantic or phonological cue is given to aid recall.
- Finally generative naming task where the questions were based on the treated items. Generative naming was chosen to improve the functional use of the treated words in conversation.

2.4. *Analysis*

Profile of Word Errors and Retrieval in Speech - POWERS (Herbert 2008), an invaluable tool to quantify improvement for word retrieval in everyday conversation was used to analyze the conversational sample recorded before and after therapy. The

results on fluency naming task at baseline and post therapy session was analyzed using Chi-square test.

3. RESULT

Therapy was delivered through out in the patient's L2 and the cross linguistic generalization was assessed from L2 to L1 (English to Kannada) for the control and treatment categories

Table 1.*Comparison of scores on fluency naming task in English for the treatment and control categories at baseline, mid-therapy and post therapy*

Categories	Baseline	Mid therapy	Post therapy
Animals	3	6	10
Fruits	2	8	12
Vegetables	2	6	8
Vehicles *	2	5	8
Clothes*	2	5	9
Animals	1	6	9

Note.(*)= control category

Table 2. *Comparison of scores on fluency naming task in Kannada for the treatment and control categories at baseline, mid-therapy and post therapy*

Categories	Baseline	Mid therapy	Post therapy
Animals	2	4	7
Fruits	1	4	8
Vegetables	1	5	8
Vehicles *	1	3	5
Clothes*	2	4	6
Profession*	1	2	4

Note.(*)= control category

Table 1 and Table 2 presents fluency naming scores of MX in L1 and L2 for the control and experimental category. The scores indicate total number of items recalled under each category in one minute. It is clear that there was a slight improvement in naming from baseline to mid therapy and mid therapy scores to post therapy after 10 sessions.

The following sections analyses the results from the tables above in order to address the study questions.

1. **Does orthographic cueing improve word retrieval in speech?**
   The therapy delivery hierarchy used orthographic cueing as a strategy for word retrieval. The analysis compares the baseline, mid therapy and the post therapy fluency naming scores of the treated and control lexical groups. Chi square test was applied to see if the improvement was significant from pre- to post therapy responses. A significant difference was obtained with a score of $\chi 2$ (2) =21.8, p= 0.00. This results indicates that orthographic cueing improves word retrieval in speech.

2. **Does orthographic cueing in L2 lead to cross-linguistic generalization for naming in L1?**
   To analyze this, responses of MX on fluency naming task in Kannada for the treatment and control categories were compared across baseline, mid therapy and post therapy sessions. While the overall scores in Table 2 indicates an improvement in naming of items, Chi-square test was applied to analyze baseline and post therapy results. The result obtained ($\chi 2$ (2) =24.8, p= 0.00), indicated a significant difference. This answers the question that orthographic cueing in English led to successful naming of the lexical items in Kannada (L2 to L1). The successful cross linguistic naming of both the treated and the untreated lexical items is a strong indication for the generalized improvement while using orthographic cueing to improve naming in persons with aphasia.

To systematically quantify the outcome and generalization effects of the therapy, a conversational analysis of the language sample of L2 (English) was obtained before the therapy program and at three weeks post therapy. This conversation was between MX and clinician for 15 minutes. The conversation was audio recorded. The middle five minutes of the conversation sample

was extracted, transcribed and analyzed. The samples were compared to find the word retrieval in everyday communication. This analysis was carried out using POWERS test. The test results on Powers is presented in Table 3. Visual representation of word retrieval and errors are presented in Figure 1. This was further subjected to statistical analysis using Mc. Nemar's Chi square test. Results on POWERS showed a significant improvement in the word retrieval in speech and a reduction in the word errors with $\chi 2\ (2) = 5.2 (p=0.01)$.

Table 3. *Baseline and post therapy results of word retrieval and word error in conversation using POWERS*

	Baseline	**Post therapy**
Word retrieval in speech	3.73	11.08
Word errors	1.87	0.26

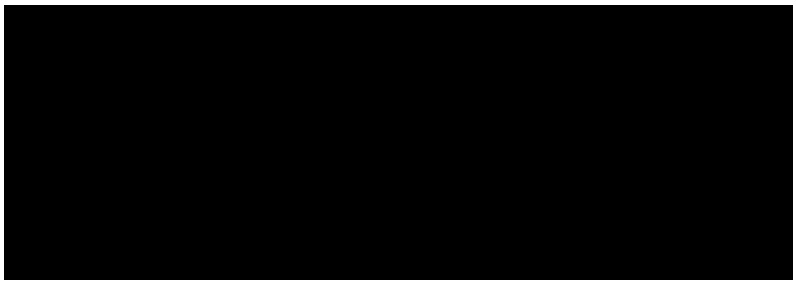

Figure 1. *Visual representation of word retrieval in conversation in L2 at baseline and post therapy*

4. DISCUSSION

The study focused on using orthographic cueing to remediate anomic aphasia. The results of the study clearly show that orthographic cueing aids lexical retrieval in anomic aphasia. MX was eight months post onset stroke at the start of therapy, hence out of spontaneous recovery window.

One of the reason persons with aphasia have residual word retrieval problem is because they cannot retrieve the phonological from of words though they have intact semantic

knowledge of words and good phonological lexicon. Their main problem is in the access to this phonological lexicon based on the neurological insult. Thus, phonemic cue aids word retrieval in such conditions.Others have suggested that a person with aphasia also needs to show a benefit from phonological cues to be able to use orthographic cues to help spoken naming via the non-lexical grapheme-phoneme correspondence (GPC) route (Howard & Harding 1998). The philosophy behind using orthographic cueing is that, the orthographic form of words activates the phonological lexicon and in-turn facilitates naming (Nickels 1992). Nickels (1992), re-taught phoneme grapheme correspondence to subject TC, in order to take advantage of TC's intact written naming skills to improve word retrieval. He also evidenced that TC was able to visualize the orthographic form of words, which led to successful word retrieval in conversation. When visualizing a word, PWA forms a mental image of the word, which facilitates word retrieval, it also avoids the need to have an external aid to retrieve words.

How can we account the gains of MX using orthographic therapy?

MX had good grapheme to phoneme correspondence and his written naming skills were better than word recall. Thus, self-generated orthographic cueing automatically improved his lexical naming due to GPC. MX might have been able to visualize the orthographic form of words, which is why his word retrieval improved in conversation (the POWERS scores).

The next question is accounting for cross linguistic generalization from L2 to L1.

The results of generalization of the treatment items can be attributed to the model of bilingual language processing which suggest an integrated lexicon for L1 & L2. The Bilingual Interactive Activation Model (Dijkstra & van Heuven 2002), a localist model of bilingual orthographic language processing, proposes an integrated lexicon that stores all the words known to a bilingual individual. Therefore, when naming a word in one language, it automatically activates the related words in the other language. Hence this explanation can account for the cross linguistic generalization seen in MX.

To account for the generalization from L2 to L1, The Revised Hierarchical Model (Kroll & Stewart 1994) proposes a separate lexicon for L1 & L2 and suggests that the connection from L2 to L1 is stronger than L1 to L2. Considering this, cross linguistic generalization is most likely to occur from L2 to L1 as it is seen from the results of our study. Hence this accounts for the cross-linguistic generalization of MX from L2 to L1.Alternately, the strategy of using an orthographic cue that was taught to MX can be applied to all words and in all contexts.MX also mentioned that he visualized the words whenever possible. This suggests that MX had internalized the procedure of orthographic cueing.

Finally, the results of POWERS for the word retrieval in conversation from base line to post therapy show a marked improvement in the content words. The topics of conversation ranged from shopping, daily routines to work experience and the conversation topics not only included the words from the treatment lexical groups but the groups beyond the treatment target. Thus the result of POWERS supports the generalized improvement in word retrieval.

5. CONCLUSIONS AND FUTURE IMPLICATIONS

In summary, self-generated orthographic cueing can be a useful technique to improve word retrieval for lexical naming and word retrieval in conversation. Clinically the outcome of this study supports the evidence of approaches using orthographic cueing in treating anomic aphasia. Orthographic therapy can be considered as a line of treatment when PWA has preserved writing ability. The study also accounts for the use of the most proficient post morbid language to treat word retrieval in persons with bilingual aphasia, which can help in parallel recovery of the other language. The limitation of the study is that the use of orthographic cueing for non-words and words that do not follow GPC was not explored. The same can be carried out as future directions and explore if cross-linguistic generalization is a possibility for words that do not follow GPC.

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