International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Case Report

Multilingual Therapeutic Approach: Impact on Cross Language Generalisation

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Received: 14/10/2015 *Revised: 14/11/2015* *Accepted: 17/11/2015*

ABSTRACT

Aphasia, a neurogenic language disorder caused as a consequence of varied etiologies like stroke, Traumatic Brain Injury and other cerebro-vascular accidents. Aphasia alters the communication ability of the individual primarily impairing one or more aspects of the processes of comprehending and producing verbal messages. The language disturbance due to aphasia especially in a multilingual scenario like that, which exists in India, has a much greater impact on the individual's personal and social life as the individual uses two or more languages to communicate in diverse situations. The language intervention strategies generally used with multilingual aphasic individuals are using mother tongue (L1) of the individual rather than the other known languages. There is scare literature about choice of language for intervention. The current study is aimed in identifying the potential of providing language intervention in multiple languages and its impact across untreated languages. This is a single case study of a 43 year old multilingual male with predominantly receptive aphasia who was premorbidly proficient in Tamil (L1-mother tongue), Kannada (L2), English (L3), Hindi (L4) and Telugu (L5). Post-morbidly the subject revealed deficits in all known languages. Language therapy focused on training on spontaneous speech, auditory verbal comprehension, repetition and naming skills in L1 and L2 and naming skills in L3 alternatively across consecutive therapeutic sessions.Intervention strategies provided resulted in marked reduction in aphasic symptoms in both treated as well as in untreated languages due to effective generalisation of target skills. Hence treatment methods should be manipulated to maximize and facilitate generalisation.

Keywords: Aphasia, Multilingual, Recovery, Language Generalisation, Intervention.

INTRODUCTION

"Multilingualism" is defined as the frequent use of two or more languages in everyday life and does not imply a specific degree of proficiency in one or the other language. More than half of the population in the world is considered as multilingual. [1] Individuals with different neurological conditions (e.g., stroke, surgical excision of tumours) may also lead to language disorders affecting more than one language.

The two possible patterns of language deficit and recovery on multilingual aphasics are parallel and non-parallel. In parallel recovery, both or all languages demonstrate similar deficits and appear to recover at a similar rate. [1, 2] It is even possible that aphasia affects only one of the known languages by the patient.

There are reported cases of differential recovery of the two languages

wherein rapid recovery of the most familiar language prior to insult was observed, which could occur only if the lesion had not destroyed the language centers but only temporarily inhibited through pathological inertia. [3]

It has been proposed that the first learned or acquired language will have the least effect due to brain damage, which is relevant for bilinguals who learn their languages at different ages as compared to those who acquire both languages simultaneously. [4]

It has also been stated that, most often in multilingualism the treatment is focused on one language, primarily L1, usually the mother tongue. [5, 6] However, there exist evidences from prior research that not only the treated language but also the non-treated language(s) benefit from intervention, suggesting the existence of variables for cross language generalisation. [7, 8]

Studies have shown that cross-language generalisation might be limited to those linguistic aspects that are common to the languages under investigation and also may depend on the status of the treated language, [9] that is, whether the treatment is provided in the person's first language (L1) versus the second language (L2) or in the dominant language versus the less- dominant language.

Over past years a large body of neuroimaging studies has been attempting to study the brain language relationship and how multiple languages are represented in the brain. Broca's area and Wernicke's area which are connected via arcuate fasciculus are thought to be the two major language-relevant cortical regions. Functional imaging studies in adults show that sentence comprehension is supported by a frontotemporal network. [12,13] The processing of grammatical structures involves Broca's area, in particular Brodmann Area (BA) 44 and the posterior portion of Wernicke's area and a dynamic interplay between these two areas. [13-15] Basal ganglia are reported to be involved in various reading and language tasks.

Blood supply to most of these areas is accomplished by middle cerebral artery, which arises from the internal carotid artery as the larger of the two main terminal branches (Middle Cerebral Artery and anterior cerebral artery). It continues into the lateral sulcus where it branches and supplies the cerebral cortex, majorly to the lateral surface of the hemisphere apart from the superior portion of the frontal and parietal lobe, the inferior portion of the temporal and occipital lobe. In addition, they supply part of the internal capsule and basal ganglia. Damage to any of these sites is known to cause varied degrees of language disturbances.

Though abundant literature is available on neuro-anatomical correlates and strategies for intervention in primary language (L1), the research pertaining to intervention strategies using multilingual stimulation and their generalisation to other untreated languages are limited. That is, the question of which language to choose for treatment has received little mention in the research literature. [10, 11]

It is critical to determine, in a multilingual whether language of treatment should be exclusively in one's L1 or in more than one language yielding positive outcomes in cross language generalisation and if so, what language components are most likely to benefit from treatment. This information is required for the appropriate selection of the language or languages of treatment. From a clinical standpoint, multilingual individuals who have aphasia ought to receive treatment in any and all their languages.

Hence, the present study is aimed at examining the the impact of treated language across untreated languages in multilingual aphasics by employing a within-participant design using a custom based therapeutic approach; generalisation of treatment across the non- treated

languages (L3, L4 and L5) by providing treatment in L1, L2 and L3 (naming) is highlighted.

MATERIALS AND METHODS

(a) Case Details: SB, a 43 year old right handed multilingual male with difficulty in comprehending and expressing language post stroke was enrolled for this study. Medical history revealed that he was under medication for diabetes mellitus and of hypertension and was also a chronic alcoholic since 8 years prior to stroke. Imaging studies revealed (?) aneurysmal bleed in left sylvian, basal ganglia and middle cerebral artery cisterns leading to severe deficits in all the known languages with right hemiparesis. The subject was a socially active businessman in the cargo transportation sector. The subject's mother tongue is Tamil (L 1), acquired from birth and was also exposed to Kannada (L2) in Infancy, English (L3) and Hindi (L4) in childhood and throughout adolescence and formally learned through schooling. He was exposed to Telugu (L5) post 16 years of age and has native like proficiency in all the five language. At the time of aphasia onset all the five languages were being extensively used by the subject. However premorbidly L3, L4 and L5 were not used extensively as compared to L1 and L2.With time, right hemiparesis showed improvement with medication and physiotherapy SB received therapeutic intervention for language impairment 3 months post stroke. (Table 1)

b) Language assessment: Formal and informal evaluation revealed presence of perseverations, phonemic and semantic paraphasias, word retrieval difficulties, circumlocutions, self corrections, few morphosyntactic errors with impaired comprehension and preserved reading skill in all known languages. Western Aphasia Battery (WAB) was administered in Tamil. Based on WAB and symptomatic correlates, SB was diagnosed having Predominantly Receptive Aphasia. Informal cognitive assessment evaluating memory, attention, problem solving and organisation skills showed no any signs of cognitive deficits. No dysphagic symptoms were present.

c) Treatment design and details: Following the detailed language assessment SB was counseled for intensive language therapy of 45 minutes duration. The initial language stimulation was in L1 and L2 primarily as these two languages were used for day to day communication with family members and with acquaintances. Other languages L3 (English), L4 (Telugu) and L5 (Hindi), though proficient, were used less frequently. The target skills and target languages (Table 2) varied alternatively, with similar treatment activities in both languages. The treatment was framed in a simple to complex paradigm for each of the following skills in the treatment languages (L1, L2).

Table 1: Summary of language use

	L1	L2	L3	L4	L5
Language	Tamil	Kannada	English	Telugu	Hindi
Age learned	Birth	Age 4	Childhood; throughout adolescence	Post age 16	Childhood; throughout adolescence
How learned	Acquired at home	Exposed in childhood; learned formally; then by immersion	Learned formally; then by immersion	Exposed and then Learned by immersion	Exposed and then by immersion
Language use at the time of aphasia onset	Frequently (with immediate family at home)	Frequently (at work, with friends, in the environment)	Frequently (at work, with friends, in the environment)	Frequently (at work, with friends, in the environment)	Rarely(in the environment)
Literacy Skills	Able to read and write	Able to read and write	Able to read and write	Not able to read and write	Not able to read and write

Table 2: Selection of languages

	L1- Tamil	L2- Kannada	L3- English	L4- Telugu	L5- Hindi
Language use at time of treatment	Frequently (with family; for practice)	Frequently (in environment ; for practice)	Rarely (at work, with friends, in the environment)	Rarely (at work, with friends, in the environment)	Rarely (at work, family, with friends, in the environment)
Language of therapy	Treated language	Treated language	Non-treated language	Non-treated language	Non-treated language

RESULTS

Table 3: Summary of therapeutic outcome

sessions	TAMIL(L1)			KANNADA(L2)			ENGLISH (L3)
	Spontaneous speech	Auditory comprehension	Repetition	Spontaneous speech	Auditory comprehension	Repetition	Naming
1	Fluent; irrelevant, circumlocutions and paraphasias present.	Poor; comprehends common objects, body parts, nouns, verb, accompanied by visual cues.	Impaired	Fluent; irrelevant, circumlocutions and paraphasias present.	Poor; comprehends common objects, body parts, nouns, verb, accompanied by visual cues	Impaired	Impaired
2	Fluent; circumlocutions persist along with paraphasias.		Monosyllables-phonetic cues required.		Required repetition with visual cues for 1 step commands.		Required frequent semantic and phonetic cueing.
3		Required repetition with visual cues for 1 step commands		Fluent; circumlocutions persisted along with paraphasias		Monosyllables-phonetic cues required.	
4	Fluent; circumlocutions reduced. paraphasias persisted.		Monosyllables 8/10 Bisyllables 4/10 phonetic cues required.		Could comprehend simple one step commands.		Required occasional semantic and phonetic cueing. Confrontational naming skills improved. Automatic naming required visual cues.
5		Could Comprehend simple 2 step commands and required cues for complex two step commands.		Fluent; circumlocutions reduced. paraphasias persisted.		Monosyllables-8/10 Bisyllables 6/10; phonetic cues required.	
6	Fluent; circumlocutions reduced. Semantic paraphasias reduced. No marked reduction in Phonemic paraphasias.		Monosyllables 9/10 Bisyllables 8/10 phonetic cues required Trisyllables 6/10		Could Comprehend 2 step simple commands. Required physical prompts for two step complex commands.		Confrontational naming tasks(of common objects)8/10 Automatic naming: required 2-3 practice trails.
7		Required physical prompts for two step complex commands.		Occasional circumlocutions. Phonemic paraphasias reduced.		Phrase level(2 words) repetition task: 5/10	

In this study, a multilingual individual with predominantly receptive aphasia was enrolled for therapeutic intervention. SB attended intensive speech and language therapy for one month, each session with the duration of 45 minutes. The last 15 minutes of each session were focused on counseling the family members regarding therapy activities, principles of therapy and language training. The treatment related gains in the non-treated languages (L3, L4 and L5) were qualitatively profiled for each skill trained, such as auditory comprehension, spontaneous speech, repetition and naming (Table 3).

(A.) Auditory Verbal Comprehension: Auditory verbal Comprehension was worked upon by training the client to follow simple to complex commands in both the languages (L1 and L2). Repetitions and visual cues were given as prompts.

(B.) Spontaneous Speech: Elicited Responses were used to facilitate spontaneous speech initially and progressively the client was involved in conversational and expository speech tasks. Prompts were used to facilitate spontaneous speech.

(**C.) Naming:** Naming included in treating the confrontational, responsive and automatic naming tasks. Appropriate visual cues including pictures and phonemic cueing as well as semantic cueing were given by the clinicians. Word retrieval deficits were treated by using cueing and visual prompts.

(D.) Repetition: Tasks were aimed at achieving good repetition skills in monosyllable words in both the languages initially and progressed to repetition tasks in bisyllabic and later on carried over to polysyllabic words in L1 and L2. The preserved reading modality was used as an advantage for this task as in an attempt to make SB comprehend the syllabification of the given words thus enabling better prognosis of repetition skills.

Perseverations mainly phonemic and semantic were worked upon by phonetic cueing, semantic cueing and also by modeling.

DISCUSSION

Table III depicts the report of intensive language stimulation schedule incorporated for SB .Intervention was targeted towards above mentioned domains of language. Auditory comprehension tasks involved facilitating comprehension of commands (simple to complex paradigm) through auditory modality. Spontaneous speech was elicited using conversational and expository tasks. To improve repetition, the client was drilled in the order of monosyllables to trisyllables. All the above discussed tasks were alternatively worked in L1 and L2 across consecutive sessions. However, naming skills were worked upon in L3. It was surprising to observe that in L3(English), he was able to repeat monosyllables, bisyllables, trisyllables, phrases and naming also, indicating bilingual stimulation resulted in improvement in other language modality. This had lead us to analyze the improvement in L4 (Telugu) and L5 (Hindi), which was astonishing to observe that improvement in the mentioned language domains was also seen in L4 (Telugu) and L5 (Hindi).

To summarize, significant improvement was observed in the treatment languages (L1, L2 and L3 naming) as well as the non-treatment languages (L3, L4 and L5). Since L1 and L2 were stimulated they were called as treated languages and other languages L3, L4 and L5 were the non treated languages. Review of literature shows treatment in primary language (L1) may result in the further regression of the less treated languages. However, another hypothesis could be that it may also result in the indirect activation of the non treated languages. [7, 16] In the present case study,

it was observed that language stimulation in L1 and L2 contributed to the generalisation or treatment related gains in L3, L4 and L5. [17] Language proficiency has been considered as a critical factor in multilingual language organization. Age of acquisition of language also has to be considered as an important factor in parallel recovery generalisation of treatment gains across L3, L4 and L5 which is attributed to this fact and is in well agreement with the literature. [18]

Damage to middle cerebral artery can cause impairments in movement and sensation, attention, memory, judgment perception, speech and vision of various degrees depending on the type and extension of lesion. Sustained damage to basal ganglia affects the grammatical rule use and impaired morphological markers which can be related to SB's word salad like utterances. [19] Also Basal Ganglia is one of the prime centers of control for selecting as well as switching between languages. [20] Damage to Basal Ganglia might be attributed to the presence of grammatical errors. A relatively preserved angular gyrus could be the underlying reason for the preserved reading skills. The MCA aneurysmal bleed and the left sylvian cisterns would have affected the primary auditory cortex located directly below, which has lead to the significant impairment in receptive abilities. The conserved working memory in SB is suggestive of negligible or no damage to the prefrontal cortex and inferior parietal lobe which justifies the absence of code switching. [20]

CONCLUSION

The treatment method showed good post-therapy effects as a result of cross language treatment and effective generalisation was also observed across languages. Considering the good language proficiency of SB in L1, L2, L3 and L5, the prognosis across languages can be linked to the same. It has been postulated that transfer of benefits from therapy from one language to another may be based upon the structural similarities between the two languages and that therapy in one language would influence another language at the level of underlying structures that are common to all languages. [21,22] This statement has also been validated in case of SB due to the observed generalization across L1, L2 and L4. Hence treatment methods should be manipulated to maximize or facilitate generalisation. However, each individual with aphasia being unique, it is not possible to generalize these results. Instead, this study serves as preliminary step in exploring various treatment options for multilingual aphasics. The course of language recovery, evident and described in SB is consistent with the hypothesis that language stimulation given in one language of a multilingual aphasic speaker has positive effects on the treated as well as non treated languages. [23] Hence the answers to questions pertaining to the choice of language treatment, transfer of therapeutic benefits from treatment to non treatment languages need further research.

ACKNOWLEDGEMENTS

We thank Dr. S R Chandrasekhar Institute of Speech and Hearing and the management for providing us this opportunity. We extend our sincere gratitude to our patient SB and his family members for their valuable co-operation.

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How to cite this article: Subhashini D, Manalel LG, Swetha G et al. Multilingual therapeutic approach: impact on cross language generalisation. Int J Health Sci Res. 2015; 5(12):480-486.

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