

Case Study

# Rehabilitation Approach in Treating Auditory Hallucination Following Road Traffic Accident: A Single Case Study

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## ABSTRACT

Communication impairment and auditory hallucinations are common characteristic features exhibited by individuals following road traffic accident. The present study aimed to investigate and analyse the short term and long term treatment outcome of CBT and LSVT program on an individual with spastic dysarthria and auditory hallucinations following road traffic accident. Case profiling was carried out on a 60 years female diagnosed as spastic dysarthria secondary to RTA couple of years back. Detailed repetitive speech and language evaluation was carried out according to client's prognosis. LSVT loud program was introduced to reduce vocal loudness and CBT program for auditory hallucinations. Both the program was carried out by a trained and experienced speech language pathologist systematically. The treatment plan, principle and procedure were followed and prognosis was documented in the present study. The significant improvement was noticed in client during treatment and follow up evaluation. Comparatively in three phases of assessment improvement was evident.

**Conclusion:** Present study highlights the significance of LSVT program on spastic dysarthria patient and the potential of CBT in clinical use for auditory hallucinations and its long term effects on client's communication ability.

**Key words:** Auditory Hallucinations, LSVT, CBT, Spastic dysarthria.

## INTRODUCTION

Head injury and deaths due to road traffic accidents (RTA) are major public health problem in developing countries where >85% of deaths and 90% of disability is caused from RTA (Nantulya 2002). According to studies of Ameratunga et al, 2006 explains that the brain injury occurring due to RTA is a leading cause to traumatic brain injury (TBI). Several researchers have indicated that frontal lobe is more vulnerable to injury due to its location at the very front of our head. Damage to these structures can cause a wide range of issues which indeed cause many of the auditory and perceptual disturbances as well as cognitive dysfunction (Darley 1975). The frontal lobe is a major centre of brain

activity, involved in motor function, language, emotional regulation, judgment, executive processing, memory etc. People with TBI are much less likely to show negative symptoms (14% versus 25-84%). Of the positive symptoms typically associated with schizophrenia, TBI patients most commonly present with persecutory delusions (22%-80%) and auditory hallucinations (47%-84%) (Fujii and Fujii 2012)

According to Darley et al (1969) Neurological impairments like aphasia, dysarthria are evident consequences of TBI. Tanner 2003, suggested that dysarthria has more effect on communication which significantly affect an individual's quality of life.

An extensive range of traditional treatments for dysarthria are available and widely used in the clinical settings. Behavioural management, which aims to maximize communication efficiency, naturalness and intelligibility through direct symptomatic treatments and compensatory strategies (Boston 2004), is considered the most common approach. Neurological disorders as mentioned can often impair speech and voice production, making communication difficult (Duffy 1995). Where Lee Silverman voice technique (LSVT) proven effective in treating patients with neurological disorders like Parkinson's disease, dysarthria etc (Yorksten et al 2007).

Auditory hallucinations often co-occur as a result of RTA. Auditory hallucination into medical vocabulary means, perception disorders in which the individual perceives an event, or a series of events, in the absence of an appropriate stimulus, (Esquirol 1832) have been considered among the most mysterious and serious symptoms of psychological disorder. Hallucinations are influenced by sensorial deprivation or other forms of ambiguous stimulation and the post traumatic stress disorder. (Margo, Hemsley and Slade, 1981). Certain studies have indicated that auditory hallucinations tend to be associated with the concealed activity of the musculature responsible for speech (Green and Kinsbourne, 1990). Although the first-choice treatment approach for hallucinations is the use of neuroleptics, behavioural treatment can also be applied when the patient continues to experience hallucinations that do not respond to pharmacological treatments (Green & Preston 1980), when patients are especially sensitive to the side-effects of these, or when they fail completely or partially to adhere to the pharmacological treatment. For this group of patients behavioral treatments like cognitive behavioral therapy (CBT) may constitute a promising alternative (McInnis M 1990).

CBT was initially developed by Aaron Beck in the 1960s as a short-term

psychotherapy for depression. It was based on his findings that people suffering from depression exhibit altered cognition along common themes such as low self-esteem, ideas of deprivation, self-criticisms, and magnification of problems, self-commands to accomplish tasks which are often large-scale and mutually exclusive, and thoughts of escaping from life's problems. Beck postulated that depression could be treated through identification and correction of the patient's idiosyncratic cognitions and underlying depressive themes. Since then the cognitive model of therapy has expanded to include treatment of many psychopathologies including schizophrenia. This model suggests that cognitive distortions underlie both mood and behavior in all psychopathologies; cognitive therapy targets and alters these underlying distortions leading to symptomatic improvement.

The present work involves a case study where a multimodal therapeutic procedure is employed in a case of auditory hallucinations with spastic dysarthria followed by road traffic accident where the patient also exhibits communication impairment as a consequence of traumatic brain injury. The present study aimed to analyze the effect of LSVT and CBT procedure implied in treatment of the client.

## **METHOD**

A case of 60 year old Female was referred to the department of speech language pathology by neurologist with a complaint of speech disturbance following road traffic accident. A detailed speech and language evaluation was carried out by a qualified and experienced speech language pathologist and a signed consent was obtained from the client and spouse before conducting the study.

The medical history revealed that the client had an incidence of RTA in the year 2011 following which she lost her consciousness for 2 days, after she regained her consciousness she had an episode of seizure attack. 4 months later of the

incidence she received speech and language services. The neurological investigation (CT scan) indicated lesion of the motor and premotor cortex and descending corticospinal and corticobulbar pathways bilaterally.

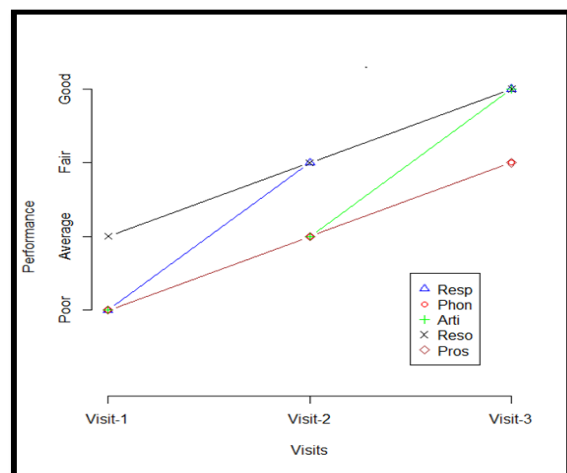
The communication profiling of the client was carried out in three visits. A checklist was assessed to evaluate oro motor skills following Dr Speech, PRAAT,

Kannada Articulation Test, 7 point speech intelligibility rating scale, Wilson’s rating scale, Frenchay’s Dysarthria Assessment and Western Aphasia Battery was administered. The visit 1 assessment was carried out in 2011, visit 2 assessments in 2014 and visit 3 assessments in 2016. The details of assessment in three levels are furnished in the table and graph.

**Table 1: The above table depicts speech language assessment carried out in three levels**

Test battery/ tool of examination	Rationale	Results and interpretation		
		Visit 1	Visit 2	Visit 3
Western Aphasia Battery(WAB). –English - Andrew kertes z	To assess aphasic components (language errors).	Aphasia quotient >90	Aphasia quotient >90	Aphasia quotient >90
Frenchay Dysarthria Assessment(FDA). – Enderby	To assess, differentiate and to determine the severity of dysarthric symptoms of all speech components both at rest and speech task by rating the response.	Bar graph indicates upto the level ‘d’ responses indicating moderately severe impairment	Bar graph indicates upto the level ‘c’ responses indicating moderate level of symptoms	Bar graph indicates upto the level ‘B’ responses for most of the components. Milder degree impairment
Quick Neurological Screening Test (QNST) - Mutti et al 1979	To assess the fine motor skills and neurological signs which is screening tool to assess the neurological symptoms.	A high score of >50 indicates severe impairment	A suspicious score of 43 indicating mild to moderate level of symptom	A Suspicious score 37 milder level symptoms which is suspicious between high and normal.
7 point rating scale	Perceptually evaluate speech intelligibility	Score-7 unintelligible speech	Score-4 rephrasing is necessary	Score-2 Listener’s attention needed.
Perceptual voice evaluation (GRBAS)	Rating voice quality using 4 point rating scale for Grade, Roughness, Breathiness, Asthenic & Strained.	G-3,R-3,B-3,A-2,S-3 severe hoarseness of voice	G-2,R-2,B-3,A-1,S-1 moderate breathy voice	G-2,R-1,B-2,A-1,S-1 Mild Breathiness
Spirometry	To evaluate aerodynamic measure (vital capacity) and respiratory measures.	Client was not co operative	Vital capacity: >1000cc	Vital capacity: >2000cc near normative value
DR speech	To evaluate voice	Jitter:0.8% shimmer :3,6db, NNE: -5 hoarse ness of voice	Jitter:0.6% shimmer: 2.9 db NNE: 4 breathy voice	Jitter- 2.3% Shimmer- 2.7db NNE: -11 Breathly voice
PRAAT	To determine pitch and intensity( speech analysis)	Poor phonation ability sample is not adequate for analysis	Pitch: 315.45 hz intensity : -21 db	Pitch: 190.34hzIntensity:>1 db Optimum pitch:194.16hz.
Didechokinetics(DDK)	To determine the coordination between phonatory and respiratory system.	Distortion of sounds difficult to administer	AMR: 2syl/sec SMR: 1-2syl/sec	AMR : 4-5 syl/sec SMR: 3-4 syl/sec Adequate phonatory and respiratory skills

The client was treated for improving her communication skills until Phase 3 assessment. In 2016, the caretaker complained of Auditory Hallucination (AH) and mentioned that following the episode of AH the client exhibited reduced loudness of voice. Hence the present study was designed to provide a comprehensive rehabilitation program for treating AH and improve loudness of voice.



**Graph 1: The above graph depicts performance of the client in three visits.**

### The Rehabilitation Program

As day progresses, the client presented with symptoms like - strangers calling, opening the door in midnight, during day strangers calling her frequently, people peep into restroom and bedroom. Based on the above mentioned details we tried to plan certain intervention using CBT for her hallucinations and LSVT to increase her loudness of voice. The speech language therapy focused on:

- To reduce loudness (LSVT)
- To reduce auditory hallucinations (CBT)
- To Enhance communication skills

LSVT is a treatment program teaches patients to ‘think LOUD’ and to focus their efforts on increasing vocal volume. With intensive treatment and frequent encouragement, patients learn to consistently increase their volume. As patients progress in therapy, the length and complexity of their speech increases, as does their volume, practice and feedback begin with a single sound to train the patient about the correct volume and the breath support required to produce increased sound. Training starts on to simple and frequently used phrases so that loudness becomes habitual. Speaking full sentences, reading aloud and engaging in conversation are also part of the therapy. Repetition and reinforcement are also very essential factor of the intervention. Through constant practice, patients learn to ‘recalibrate’ and become accustomed in using loud voice. Reinforcement from family and others in the

community is also important to strengthen the treatment outcome .Tape recorders and sound pressure level meters were used for feedback. Currently, the LSVT treatment program carried out for 4 one-hour sessions with a qualified therapist each week over the course of a month. In addition, patients where provided with home training exercises for one to two hours each day in order therapy to be successful.

Clinician began to employ the program based on the nature of the client’s speech disorder [low volume and decreased jaw movements]. In three weeks, the client improved with the length of sustained phonation (improved from 4.3sec to 11.16sec) and her loudness for phrases used normally in conversation gained a decibel. Therapist and family members noted that she improved in her communication skills, her self confidence and social interactions within a short span of 2-3 months after intervention.

The LSVT program employed on the case focused on constantly employing increased vocal loudness and optimal physiological effort. Each session consisted of the participant performing multiple repetitions of the following tasks using a high effort, loud, healthy-quality voice.

- a) sustained vowel phonation [maximum phonation duration] i.e./a/ ,/i/ ,/u/
- b) to achieve the highest and lowest pitch level that she can generate
- c) reading aloud a list of functional phrases with feedback

**Table 2: The above table depicts the LSVT program followed with the client**

Steps of LSVT	Treatment plan
Target	LOUDNESS increased movement amplitude directed predominantly to respiratory/laryngeal systems
Treatment duration	1 hour session, 4 consecutive days for 4 weeks (16 sessions all together)
Activities drilling	15 repetitions of a task at least
Effort of production	Sustain and push the effort 8/9 in a scale of 10 count each day
Exercises (First 30 minutes of session)	Maximum sustained movements (production of /ah/ with minimum 15 repetitions in loud and good quality of voice as long as possible)
Directional movements	Say /ah/ in loud good quality voice going on high pitch for 15 repetitions Say /ah/ in loud good voice going on low pitch for 15 repetitions
Second half of the session (last 30 minutes)	Patient was asked to identify phrases or sentences which she uses daily in functional living.
Functional phrases	Read phrases using same loudness/effort for 10 repetitions
Home activities	Designed and recommended to train amplitude of movement achieved in daily exercises and functional phrases into in variable speaking situations and activities at home repeatedly

These tasks were followed successively even in complex speech tasks during which the participant used the same loud voice as taught in the repetitive drills. As part of the program home work tasks were also introduced to complete multiple repetition tasks at least 3-4 times a day for 10-15 minutes each, which will be revised at the next session to check the consistency and regular practice outcome at home.

#### **Cognitive Behavioural therapy (CBT):**

CBT is a type of psychosocial intervention in which negative patterns of thought about the world are challenged in order to alter unwanted behaviour patterns or treat mood disorders such as depression (Beck JS 2011).

Hallucinations may be influenced by environmental conditions such as sensorial deprivation or exposure to white noise or other forms of ambiguous stimulation (Margo, Hemsley and Slade, 1981 & 1976). There is evidence that verbal auditory hallucination may be blocked or inhibited by tasks such as reading or conversation (James, 1983).

The clients' pre-illness level of social and work competence was good and acceptable. She had a group of friends with whom she shared her free time; she had completed a graduation degree and worked for more than 15 years as a bank employee. From the onset of this hallucinations, she became socially isolated, stopped going out with friends, and her social relationships became practically reduced. She spent almost all day lying on her bed, or occasionally watching television.

The CBT model is based on a combination of the basic principles from behavioural and cognitive psychology. The basic steps in a cognitive-behavioural assessment include: identifying critical behaviours, determine whether critical behaviours are excesses or deficits, evaluate critical behaviours for frequency, duration, or intensity. If the behaviour is excess, attempt should be made to decrease frequency, duration and behaviours.

The client attended CBT program for 18 sessions of one hour treatment followed by booster therapy sessions. The treatment was carried out in the following phases *copied with auditory hallucinations as client reported.*

#### *a) Training phase.*

The training phase was carried out over a period of time for 8-10 sessions in total.

A recorded cassette tape with various familiar voices of patient relatives and strangers as well and once we had confirmed that this recording was a good elicitor of voices, it was used as an exposure stimulus. Where the client was made to concentrate on those voices with other tasks simultaneously. The attention of the client was towards identifying familiar and unfamiliar voices and feedback was noted. Tailor made situations were created in clinics to make her more comfortable and to understand the situation that it is just her perception no external stimulus as such. The sessions were progressed with an explanation of the hypothesis and relaxation for some time. When the subject was relaxed the treatment of exposure to the voices began.

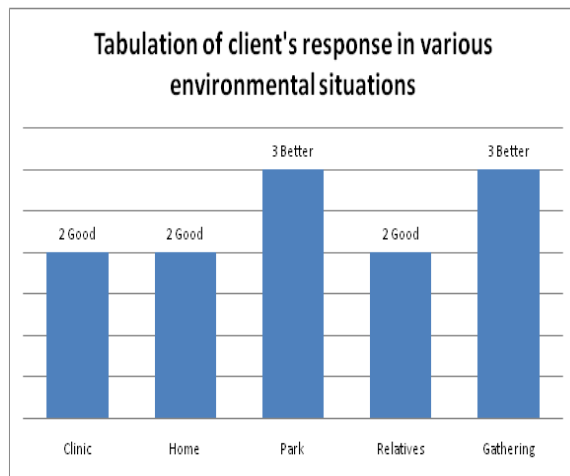
#### *b) Monitoring phase.*

In this phase it mainly focuses on stabilisation of what had been learnt in previous phase was put into practice. The aim of reattribution of the source of hallucinations was continued. It was sometimes necessary to have recall sessions. Similarly this was carried out for 4-6 sessions of intervention. Based on this treatment the client was also assigned with home training program. The client was also counselled not to concentrate to such instances and she was also motivated to attend certain recreational activities, social gathering and to involve herself in hobbies. The client was monitored to avoid circumstances which were disturbing to her.

The client's behaviour was made to rate by family members, clinicians and her friends which serves as a feedback and



phase of prognosis after introduction of treatment.



Graph 2: The graph depicts prognosis of client with CBT according to her communicative partners.

## DISCUSSION

Many clients exhibited persistent psychotic symptoms despite drug treatment and growing research has made CBT as a concern in treating AH. Consequently, there is a growing interest on psychological interventions, which are now recognized as important components of a comprehensive therapeutic approach in the treatment of schizophrenia. AHs are some of the most prominent and distressing of the treatment-resistant symptoms, and command hallucinations are the highest risk of these. The present study aimed to overview the efficacy of CBT intervention in AH.

The results of the study indicated that CBT is an effective intervention program to treat AH. The study supports the findings of McLeod et al. He found that schizophrenia group receiving CBT over 8 weeks showed a significant reduction in voice frequency and in perceived voice power, as well as a trend towards distress reduction at 12 weeks when compared to patients receiving neuroleptic drugs.

## CONCLUSION

This present study profiled the condition, spastic dysarthria secondary to road traffic accident associated with auditory hallucinations. It offers in understanding the effect of LSVT program

and CBT for individuals with hallucinations and dysarthric components. This single case study highlights the CBT and LSVT- loud program (In improving the vocal loudness for spastic dysarthric) outcome was noticed in the process of rehabilitation.

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How to cite this article: Thammaiah KI, Dev D, Kumar HSH. Rehabilitation approach in treating auditory hallucination following road traffic accident: a single case study. *Int J Health Sci Res*. 2017; 7(7):400-406.

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