

## PERSEVERATION IN RIGHT HEMISPHERE BRAIN DAMAGED INDIVIDUALS

Jayanti Ray\*, Shyamala Chengappa\*\*

### ABSTRACT

*This study examines the nature and extent of perseveration in 32 individuals with unilateral right-hemisphere brain damage (RHD) in various tasks (conversation, confrontation naming, and picture description). Performance of the 32 RHD subjects was compared with 32 neurologically normal individuals matched for gender, age, handedness, and educational level. The RHD subjects produced more perseverations than did the control group. Along with other varieties of perseveration observed, continuous perseveration was the most frequently occurring type, followed by verbal perseverations. The task of naming elicited the greatest number of perseverations. Underlying neuropsychological mechanisms responsible for perseverative behaviors in RHD subjects are discussed along with clinical implications.*

### INTRODUCTION

Damage to right hemisphere brain damage (RHD) results in a cluster of cognitive-linguistic impairments (1). Attention deficits, neglect, discourse deficits, pragmatic disorders, poor inferencing abilities, and semantic processing deficits have been described by Myers (2). RHD is frequently accompanied by other behavioral deficits that negatively interact with this syndrome, or at least complicates the nature of it. Perseveration is one among the recognised signs of brain dysfunction that is present in a variety of neurologic conditions like traumatic brain injury, dementia, amnesia, etc. (3, 4, 5). "Perseveration" refers to the continuation or repetition of an activity or percept when the stimulus is no longer present and typically when it has been replaced by a different one (6). Various forms of perseveration have been reported in brain-damaged patients, in a variety of both verbal tasks as well as in nonverbal tasks (7, 8, 9, 10, 11).

Following earlier reports of various forms of perseveration in neuropathological conditions, Sandson and Albert (12) proposed a new taxonomy for perseveration, consisting of three categories, which are distinctive at the levels of clinical features, process, and neuroanatomy. They found that “Recurrent perseveration” (unintentional repetition of a previous response to a subsequent stimulus) is quite common with posterior left hemisphere damage. “Continuous perseveration” (an abnormal prolongation of current activity), is common in frontal lobe and basal ganglia damage. They also described “Stuck-in-set perseveration” (an inappropriate maintenance of a current category or framework) to be a consequence of frontal lobe damage. Albert and Sandson (7) noted that RHD subjects showed continuous perseveration in a drawing task. They tended to produce an extra finger on the hand in the task of drawing a hand. Sandson and Albert (11) also reported of continuous perseveration in RHD patients. “Verbal perseveration” (13) is a characteristic of aphasia where patients continue to respond to different questions with the same answer. Verbal perseverations are frequently neologistic blends, or contextually irrelevant. Papagno and Basso (14) in a study stated that perseveration was seen to reappear after a series of three questions. Perseveration was also seen to set in when the client could not find the correct response. This was clarified when the answer in the written form was provided to an oral question. The client could read the answer and verbally produce the same with no interference.

Very little research (7,11) exists regarding study of perseveration in right hemisphere brain damaged individuals. The purpose of this study is to examine the nature and extent of perseveration in RHD subjects in various linguistic tasks and understand possible underlying neuropsychological mechanisms.

## **METHOD**

### **Participants**

The participants were thirty-two healthy, native English speaking volunteers with mean age range of 65.7 years (S.D. = 4.2). They were residing in assisted care homes attached to a long-term care facility. They had received an average of 16.6 (S.D. = 3.5) education. Thirty-two right-hemisphere damaged (RHD) clients from a long-term care facility were selected for the study. The RHD clients were matched on the basis of age, gender, handedness, and

number of years of education with the neurologically normal clients. All RHD individuals had a mean age range of 68.2 years (S.D = 3.9). They had experienced one single right hemisphere stroke as supported by their medical history and CT scan findings. CT findings were available for twenty-three clients only. Cause was ischemic in all cases. Out of twenty-three, fourteen clients had lesions involving the frontal lobe, five had lesions in the temporo-parietal regions, four of them had lesions in the parietal lobes. All of them had received an average of 16.1 (S.D. = 3.1) years of education. They did not have any significant neglect and visuo-perceptual limitations as reported by the Neurologist. No apparent cognitive problem was noted while scoring the Mini Mental State Examination (15). The average score was 24.6 (S.D. = 1.2). None of them had a history of psychiatric disturbances. All of them were tested after an average of 12.2 months (S.D. = 6.8) post-onset. Mini inventory of Right Brain Injury (MIRBI) (16) was administered to the RHD clients and results on MIRBI severity profile indicated mild right brain injury for all clients. The average performance score was 34.8 (S.D. = 2.3). Only RHD participants without aphasia participated in this study. All RHD clients evidenced an average Aphasia Quotient (AQ) of 93.8 (S.D. = 2.2) (17). The neurologically normal group scored within normal limits in both MIRBI and WAB. The RHD participants did have a left-sided paresis along with mild dysarthria of speech. All participants passed a pure tone hearing-screening test. All of them had received rehabilitation services (physical and occupational therapies) for a period of at least three months before the time of study. Only six RHD clients received speech therapy secondary to impaired swallowing and reduced speech intelligibility.

### **Tasks**

Other than noting perseverations during administration of Western Aphasic Battery and Mini Mental State Examination, perseverative responses were also analysed in the following tasks: spontaneous conversational sample, a structured conversational sample with a given topic (e.g. hobbies), picture description (18), and naming pictures of thirty randomly selected common objects (19). These tasks were given in order to identify the type and severity of perseveration errors.

### **Scoring Criteria**

All responses were initially identified as either perseverative or nonperseverative. Perseveration was defined as an inappropriate repetition of a preceding behavior when a newly adopted response was expected (20). All responses were tape-recorded and transcribed into score sheets. Nonperseverative errors were classified as lexical errors, phonemic errors, and other unintelligible utterances. Only the first response was analysed for perseveration. Two judges identified total number of perseverative responses and the percentage of perseverative responses were calculated based on the total number of utterances (words) in a particular task. Severity of perseveration was determined using a Perseveration Severity Rating Scale (21). Perseveration Severity Rating is calculated by dividing the number of perseverative responses by the total number of responses. 20-40% perseveration is considered to be within the moderate range and 49% and above perseveration is considered to be in the severe range. Two speech-language pathologists calculated the amount of perseveration for all responses and the inter-rater reliability was quite high as judged by Cohen's Kappa of 0.93.

### **RESULTS AND DISCUSSION**

No significant perseverative responses were noted in neurologically normal clients. Only three out of 32 normal clients showed perseveration of thoughts while they engaged themselves in the structured conversation with a given topic. Eight RHD clients did not evidence any type of perseverative errors in any type of perseverative errors in any of the tasks other than just a few phonemic errors, comprising of mostly substitutions and distortions. This finding is consistent with Mateer (22).

Most RHD subjects showed predominantly continuous perseverations (7, 11) and a few verbal perseverations (13) as compared to other forms of perseverations. Verbal perseverations comprised of contextually inappropriate responses as well as phonemic / semantic jargon. Contextually irrelevant verbal perseveration was noted in spontaneous conversational sample in three clients. While talking about education, a few of them articulated words related to religion. Other evidenced phonemic jargons and neologisms.

RHD clients evidenced perseverations in all four tasks (spontaneous conversation, structured conversation, picture description, and naming (Table 1). Only 28.12% of the clients showed perseveration in spontaneous conversation. 46.88% of the clients perseverated on structured

conversational sample. 56.25% of the clients perseverated on the task of picture description. 75% of the clients perseverated on the naming task. Perseverations were often a blend of current and previous stimuli (8) in the naming task.

**Table 1. Perseverative behaviors of RHD in various tasks**

Total amount of perseveration across all tasks comprised from 15.6% to 19.3%. Perseverative

Tasks	Number of subjects	Percentage of perseverative errors
Spontaneous conversation (Mean = 250 words)	9/32	15.6%
Conversation (given topic)(Mean = 267 words)	15/32	17.5%
Picture description(Mean = 178 words)	18/32	17.2%
Naming (30 pictures)	24/32	19.3%

responses, however, belonged to a mild category as all of the responses were below 20% (21) (Table 1). Perhaps with a change of stimuli and nature of complexity of tasks, severity of perseveration would have changed.

Less automatic tasks (for example, confrontational naming) elicited more amount of perseveration as compared to other tasks like picture description, and conversation (Table 1). This was because of the failure to locate a target in semantic memory or the lexicon (7). It may also be attributed to diffuse lexico-semantic organisation in RHD clients (23) and impaired information processing (24). RHD clients who were identified with typical frontal lobe lesions evidenced more amounts of perseverations in the naming task. Traditionally perseveration has been ascribed to a frontal lobe dysfunction (25), characterised by “intellectual rigidity” and an inability to shift mental set (26). Kertesz and Dobrowolski (27) also described measures of neglect and perseveration that appeared significantly worse in the frontal and extensive central lesion groups.

Verbal perseveration seen in RHD clients may be due to their inability to process the current stimulus input secondary to selective attention deficits and vigilance problems (28). Wepman (29) also articulated that verbal perseveration was caused by impaired selective attention. When a response is called for, clients may produce the names of the last attended item

secondary to closure of the attention mechanisms. Sometimes, deficits in attention interfere with the ability to attend to and select crucial signals needed for tasks. Similarly, Adler and Achenbach (25) suggested that perseveration may be attributed to a deficit in selective attention, producing an arousal of irrelevant cues. This type of perseveration may reflect a dysfunction of the frontal lobe leading to disinhibition of ongoing processes and an arousal of irrelevant information.

Occurrence of continuous perseverations in speech, as reported by Sandson and Albert (12) consisted of multiple repetitions of a final sound in speech. In this study, RHD clients repeated the last word several times rather than the final sound (Table 2). Luria (5) proposed that continuous perseveration or efferent perseveration is due to pathological inertia of the stimulus previously initiated, which results in compulsive repetition. According to Luria, pathological inertia here refers to a disturbance in motor output caused by abnormal post-facilitation of motor impulses.

**Table 2. Samples of Perseverative behaviors of RHD in various tasks**

Sl.No.	Stimuli	Responses
1.	Bed	Bed
2.	tree	Tree
3.	pencil	Pencil.... Pencil.... I need one to write
4.	House	/paUs/, no... house house
5.	Whistle	Whistle....Blow whistle.... It is a good whistle
6.	Scissors	Whistle../hwizrs/.../hwlzrs/..scissor... a pair of scissors

### Tasks

#### Spontaneous conversation

I was a school teacher before. I liked my job. My son and my cousin are teachers too. My son and my cousin actually teach. They teach.

**Conversation (given topic)**

I like to go out and party with my high-school friends. It is a kind of good reunion. Good reunion. Reunion. My wife likes it too. I like it very much.

**Picture Description**

The mom is not careful with water. See, the water – how it is getting flooded. Not a good mom. Not a good mom. You need to be a good mom to raise good kids. I feel a good home means good kids and a good mom. A good mom.

Examining the array of cognitive-linguistic deficits found in RHD, it might be concluded that the possible underlying mechanisms that could have possibly contributed to perseverative errors, include deficits in divided attention (i.e. shifting attention from one task to another) (30), faulty perceptual processes (1), memory and organisational deficits, and reduced arousal (28). Although neglect has been explained as a part of attentional disturbance, it cannot be attributed to the cause of perseveration because none of the clients evidenced significant neglect.

**Clinical Implications and Future Research**

Perseveration interferes with verbal/nonverbal tasks during the course of assessment as well as therapy. Perseveration contributes to the production of semantic and literal paraphasias and neologisms, especially in brain-damaged patients with poor self-monitoring abilities (31, 32). Overall the management of patients with RHD is challenging to speech-language pathologists (SLP) and to treat clients with perseverative disorders is a real challenge. Clinicians are concerned with the appearance of perseverative responses due to its influence as an obstacle to therapy (33). In order to maintain the functional communication status, SLPs needs to teach clients various strategies (21, 34) depending on their cognitive status, so that clients are able to produce appropriate utterances during communication tasks.

Future research should focus on understanding the nature and causes of various types of perseveration in different neuropathologies. Reliable and valid clinical tools need to be established for evaluating various perseverative behaviors. Clinical trials need to be performed to evaluate the efficacy of treatment paradigms to reduce perseverative responses and elicit more meaningful utterances. Clinical treatment paradigms may be able to throw more light

on the nature of perseverative errors and its extinction following therapy.

## CONCLUSION

Most (24/32) subjects with right hemisphere damage evidenced verbal perseveration on the tasks assessed in the present study. These subjects produced more perseverations than did the control group. Along with the other varieties of perseveration observed, continuous perseveration was the most frequently occurring type, followed by verbal perseverations. The task of naming elicited the greatest number of perseverations. Among the underlying cognitive mechanisms, deficits in divided attention, reduced arousal, faulty perceptual processes, memory and organisational deficits could be the causative/precipitative culprits leading to perseverations.

\*Assistant Professor

Washington State University  
Pullman, WA 99164, USA

\*\*Address for correspondence

Professor & HOD (DMD)  
Department of Speech - Language Pathology,  
All India Institute of Speech and Hearing  
Manasa Gangotri, Mysore - 570006.  
Email: [shyamalake@yahoo.com](mailto:shyamalake@yahoo.com)

## REFERENCCESS

1. American speech-Language-Hearing Association. *The role of speech-language pathologists in the habilitation and rehabilitation of cognitively impaired adults*: A report of the subcommittee on language. *ASHA*, 1987; 29, 53-55.
2. Myers P S. *Right hemisphere syndrome*. In L. LaPointe (Ed.). *Aphasia and related disorders* (pp. 201-225). New York: Thieme Medical Publishers. 1997.
3. Freeman T, Gathercole C. Perseveration – *The clinical symptoms – in chronic schizophrenia and organic dementia*. *British Journal of Psychiatry*. 1966; 112, 27-32.



4. Fuld PA, Kazman R, Davies P, Terry R D. *Intrusions as assign of Alzheimer dementia: Chemical and pathological verification*. Annals of Neurology, 1982; 11, 155-159.
5. Luria A. *Two kinds of motor perseveration in massive injury of the frontal lobes*. Brain, 1965; 88, 1-10.
6. Plant D C, Shallice T. *Perseverative and semantic influences on visual object naming errors in optic aphasia: A connectionist account*. Journal of Cognitive Neuroscience, 1993; 5(1), 89-117.
7. Albert M L, Sandson J. *Perseveration in aphasia*. Cortex. 1986; 2, 1, 103-115.
8. Allison R S, Hurwitz L J. *On perseveration in aphasics*. 1967; 90, 2, 429-448.
9. Halpern H. *Effects of stimulus variables on verbal perseveration of dysphasic subjects*. Perceptual and Motor Skills. 1965; 20, 421-429.
10. Helmick J W, Berg C B. *Perseveration in brain-injured adults*. Journal of Communication Disorders, 1976; 9, 2, 143-156.
11. Sandson J, Albert M L. *Perseveration in behavioral neurology*. Neurology. 1987; 37, 1736-1741.
12. Sandson J, Albert M L. *Varieties of perseveration*. Neuropsychologica, 1984; 22 (6), 715-732.
13. Yamadori A. *Verbal perseveration in aphasia*. Neuropsychologica, 1981; 19 (4), 591-594.
14. Papagno C, Basso A. *Perseveration in two aphasic patients*. Cortex, 1996; 32, 67-82.
15. Folstein M, Folstein S, Mc Hugh P. *“Mini Mental State”: A practical method for grading the cognitive state of patients for the clinician*. Journal of Psychiatric Research, 1975; 12: 189-198.
16. Pimentel PA, Kingsbury N A. *Mini Inventory of Right Brain Injury*. Texas: Pro-Ed. 1989.
17. Kertesz A. *Western Aphasia Battery*. New York: Grune and Stratton. 1982.
18. Goodglass H, Kaplan E. *The assessment of aphasia and related disorders*. Philadelphia: Lea and Febiger. 1983.
19. Kaplan E, Goodglass H, Weintrub S. *Boston Naming Test*, Philadelphia: Lea & Febiger. 1983.
20. Cohen L, Dehaene S. *Competition between past and present: Assessment and interpretation of verbal perseveration*. Brain, 1998; 121, 1641-1649.
21. Helm-Estabrooks N, Emery P, Albert M L. *Treatment of aphasic perseveration (TAP) program: A new approach to aphasia therapy*. Archives of Neurology, 1987; 44, 12, 1253-1255.
22. Mateer C. *Impairments of nonverbal oral movements after left hemisphere damage: A follow-up analysis of errors*. Brain and Language, 1978; 6, 334-341.
23. Joannette Y, Goulet P, Le Dorze G. *Impaired word naming in right-brain-damaged right-handers: Error types and time course analyses*. Brain and Language, 1988; 34, 1, 54-64.
24. Santo Pietro M J, Rogrodsky S. *The effects of temporal and semantic conditions on the occurrence of the error response of perseveration in adult aphasics*. Journal of Speech & Hearing Research, 1982; 25 (2), 184-192.

25. Adler G, Achenbach C. *Verbal perseveration after right unilateral ECT*. European Psychiatry, 2001; 16, 1, 75-78.
26. Hecaen H, Albert M L. *Human Neuropsychology*, New York: Wiley.1978.
27. Kertesz A, Dobrowolski S. *Right hemisphere deficits, lesion size and location*. Journal of Clinical Neuropsychology, 1981; 3, 283-299.
28. Myers P S. *Process-oriented treatment of right hemisphere communication disorders*. Seminars in Speech & Language, 1999; 20, 4, 319-332.
29. Wepman J M. *Aphasia therapy: A new look*. Journal of Speech & Hearing Disorders, 1972; 37, 203-241.
30. Sohlberg M M, Mateer C. *Introduction to cognitive rehabilitation*. New York: Guilford Press.1989.
31. Buckingham H. *Perseveration in aphasia*. In S. Newman and R. Epstein (Eds.). Current Perspectives in Dysphasia. Edingburgh. Churchill Livingstone. 1985.
32. Ray J. *Treatment of perseveration in aphasia: A case study*. Paper presented at the Annual Convention of the American Speech, Language, and Hearing Association, New Orleans, LA.2001.
33. Van Riper C. *Success and failure in speech therapy*. Journal of Speech and Hearing Disorders, 1966; 31 (3), 276-279.
34. Ray J. *Metacognitive monitoring in conversational tasks: A study in individuals with right hemisphere brain damage*. Paper presented at the XII Annual Stroke Conference, Cambridge, MA. 2000.

## **EUROPEAN YEARBOOK OF DISABILITY LAW**

**Editors: Gerard Quinn, Lisa Waddington**

**ISBN 978-90-5095-820-2**

This Yearbook reviews the significant developments at European level regarding disability law and policy. It contains a series of essays on current challenges and developments from senior analysts and academics in the field; a review of the previous year's significant events and developments; a bibliography detailing major new publications on European disability law and policy; and an annex containing the full text of the most significant documents and policy developments.

Available from:

**Intersentia nv, Groenstraat 31, BE-2640 Mortsel, Belgium.**

**[www.intersentia.be](http://www.intersentia.be)**