

An Investigation of Auditory Comprehension Deficits Among Persons with Aphasia (PwA)

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Abstract

Background: Aging is an ongoing process composed of several features. It is a physiological change which leads to a functional decline (Hayflick, 1994). It has also been suggested that there is a continuum between age-related pathological changes leading to early stages of degenerative disease (Peter, 2006) which may lead to decline in auditory comprehension skills, hence communication abilities.

Present study aimed at investigating auditory comprehension skills using adapted version of Auditory Comprehension Test in Hindi (ACT-H) among Persons with Aphasia (PwA). 23

individuals Persons with Aphasia (PwA). using adapted version of Auditory Comprehension Test in Hindi (ACT-H)Adapted tool ACT-H showed high reliability and divergent ($\alpha=0.904$). Person with Aphasia showed statistically significant difference The study demonstrated significant findings regarding declining auditory working memory, praxis and auditory comprehension abilities related to syntactical performance across persons with Aphasia (PwA).

Introduction

Aging is an ongoing process composed of several features. It is a physiological change which leads to a functional decline (Hayflick, 1994). It has also been suggested that there is a continuum between age-related pathological changes leading to early stages of degenerative disease (Peter, 2006) which may lead to decline in auditory comprehension skills, hence communication abilities. Auditory comprehension is facilitated by neural mechanisms in the language areas of the brain, damage to these areas may result in cerebrovascular accident (CVA) in cases of stroke patients.

Stroke results in neurological impairment, it occurs when blood supply to a particular area of the brain is disrupted. Stroke may pertain to anatomical and physiological substrates in the infarcted hemisphere in post-stroke aphasia, including the nature of the hemodynamic response in patients with post-stroke aphasia, the nature of the peri-infarct tissue, and the neuronal plasticity potential in the infarcted hemisphere.

Aphasia is an acquired language disorder, observed in cases with stroke occurring in 25%–40% of stroke survivors according to National Aphasia Association, 2012 and national survey stroke, 2016 is a leading cause of long term disability.

Stroke is the 3rd leading cause of death in the USA and Great Britain. About 5,000,000 individuals survived strokes in the US. About 750,000 strokes occur each year in the USA on average, a stroke occurs every 40 seconds. Aphasia (or the inability to communicate) it is the effect of a stroke in the left (and sometimes right) hemisphere of the brain. Damage to regions in the left perisylvian regions: including the inferior frontal gyrus (IFG), middle frontal gyrus (MFG), angular gyrus (AG), supramarginal gyrus (SMG), superior temporal gyrus (STG), middle temporal gyrus (MTG), inferior temporal gyrus (ITG), and the supplementary motor area (SMA), results in aphasia. About 1/3 individuals are suffering from aphasia. There are 2,000,000 individuals in USA with aphasia. An individual with auditory comprehension impairment has difficulty in expressing themselves through meaningful speech even when the grammar, syntax and intonation are intact.

Auditory comprehension deficits are characterized by poor speech recognition, poor repetition of speech, paraphasias, phoneme retrieval deficits as well as semantic access. Individuals with aphasia also have difficulty in memory recalling, poor comprehension of pictures. It was also observed individuals with stroke also had difficulty with access

to semantics on auditory verbal tasks.

Aim of the study

Present study aimed at investigating auditory comprehension skills using adapted version of Auditory Comprehension Test in Hindi (ACT-H) among Persons with Aphasia (PwA).

Objective

To examine auditory comprehension deficits in Persons with Aphasia (PwA) by administering Auditory Comprehension Test in Hindi.

Research Methodology

Experimental group

Group consisted of 23 native Hindi speaking Persons with Aphasia (PwA) in the age range 30 to 80 years.

The group consisted of stroke individuals within the recovery time period of 3 to 6 months.

	Mean Age			
	Broca's Aphasia		Wernike's Aphasia	
	Males	Females	Males	Females
Total no. of individuals	8	9	4	2
Group mean	61.76		68.5	
Group SD	17.31		7.4	

To compare auditory comprehension skills of Neurologically & Cognitively Healthy Individuals with that of Persons with Aphasia (PwA).

Selection of Persons with Aphasia (PwA)

1. 23 individuals with Aphasia in the age range 30 to 80 years. Grouped into mild to moderate cognitive impairment.
2. Prior consent was taken from each individual. Detailed case history was taken including demographic data, medical history, MRI /CT findings. Cognitive Evaluation.
3. Western Aphasia Battery (WAB) was administered to categorize the individual on the basis of type of Aphasia.
4. Hindi Mental State Examination (Ganguli, M., 1995) was administered for each individual with Aphasia to distinguish mild and moderate severity of cognitive impairment along with confirmed diagnosis (Broca's aphasia, Wernikes's aphasia, Global aphasia, Transcortical sensory aphasia and Transcortical motor aphasia) ascertained by clinical neurologist.
5. Administration of Clinical Dementia Rating scale (Morris, J., 1993) which categorizes participants from experimental group into mild, moderate cognitive impairment.

Inclusion criteria for Experimental group- neurological degenerative disease

1. Participants in the study were from the age range 30-80 years.
2. All the participants were diagnosed by a certified clinical neurologist,
3. Based on detailed investigation.

4. Individuals within recovery period of 3 to 6 months

Exclusion criteria for individuals with neurological degenerative disorder

1. Individuals with previous medical illnesses or metabolic conditions that might have resulted in encephalopathy of any origin or H/O demyelinating diseases and uncorrected vision were excluded.
2. Individuals with reduced level of consciousness or sedation or history of psychiatric disturbance or on psychoactive drugs.
3. Individuals with history of heavy alcohol dependency or smoking were excluded from the study.

Results and Discussion

Table 1 Shows Mean, SD and SE of auditory comprehension scores across the 19 subtests, of persons with Aphasia with mild cognitive Impairment.=

Subtests	Mean	SD	SE
SI	14.00	1.500	.364
SII	18.41	3.183	.772
SIII	17.65	4.107	.996
SIV	19.53	7.875	1.910
SV	10.29	3.158	.766
SVI	26.65	7.008	1.700

SVII	24.18	6.435	1.561
SVIII	32.94	8.955	2.172
SIX	32.41	8.493	2.060
SX	29.18	7.828	1.899
SXI	27.53	8.232	1.997
SXII	24.47	6.276	1.522
SXIII	23.59	5.209	1.263
SXIV	33.12	6.244	1.514
SXV	24.41	4.317	1.047
SXVI	34.00	8.732	2.118
SXVII	32.00	10.671	2.588
SXVIII	27.29	5.977	1.450
SXIX	27.18	8.033	1.948
Total	478.82	76.25	8.73

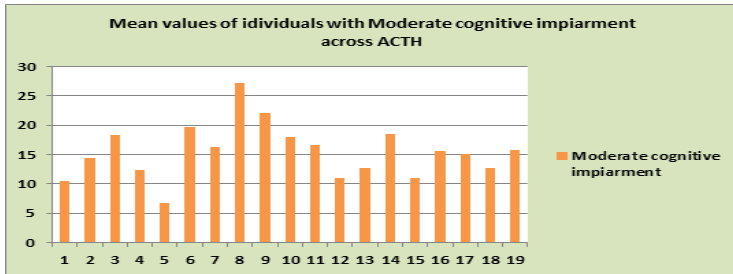
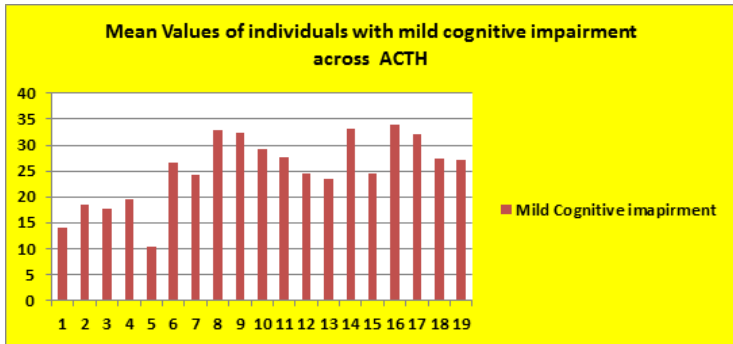
Table 2: Shows Mean, SD and SE of auditory comprehension scores across the 19 subtests, of persons with Aphasia with moderate cognitive impairment

Subtests	Mean	SD	SE
SI	10.50	2.588	1.057
SII	14.50	3.728	1.522

SIII	18.33	6.623	2.704
SIV	12.33	3.933	1.606
SV	6.83	2.401	.980
SVI	19.67	3.777	.980
SVII	16.33	3.559	1.453
SVIII	27.17	11.125	4.542
SIX	22.17	8.750	3.572
SX	18.00	8.295	3.386
SXI	16.67	8.618	3.518
SXII	11.00	4.817	1.966
SXIII	12.67	5.086	2.076
SXIV	18.50	5.753	2.349
SXV	11.00	4.000	1.633
SXVI	15.67	7.090	2.894
SXVII	15.17	6.047	2.469
SXVIII	12.67	4.633	1.892
SXIX	15.83	3.656	1.493
Total	295	53.11	7.28

Mean values of ACTH In individuals with mildand Moderate cognitive impairment showing mean values of ACTH In

individuals with mild cognitive impairment



Graph 2 showing mean values of ACTH In individuals with moderate cognitive impairment

Franklin (1989) studied dissociations in auditory word comprehension of nine fluent individuals with aphasia. The individuals with poor receptive language skills showed qualitative differences between auditory and print comprehension. No two persons with aphasia showed the same pattern of impairment across different tasks administered in the test. Individuals with fluent aphasia showed poor auditory comprehension Deloche and Seron

(1981) Assessed the comprehension of locatives prepositions ‘in’, ‘on’ and ‘under’ by asking the listeners to place an object in a spatial relationship to another object. Persons with Broca’s aphasia perform better and showed more accurate response when prepositions were in association with two objects. However, performance of patients with Wernike’s Kothari, Karbhari-Adhyaru & Kaushik-Ray (2014) on administration of Marathi Auditory Comprehension Test on Persons with Aphasia (PWA) found that there was significant difference seen between the mean scores of the group NH is 493.63 and individuals with aphasia having good comprehension is 319.2 and that of the individuals with aphasia having poor comprehension is 16.8. Study also revealed that Individuals with aphasia having good comprehension (GC) were able to perform the different subtests in the MAC, though repetitions and cueing was required. Individuals with aphasia having poor comprehension (PC). aphasia was affected.

Table 3: Shows the results of Mann- Whitney U-test.

Mann –Whitney U- test was carried out to compare the scores of auditory comprehension in individuals with PwA classified into Broca’s and Wernike’s Aphasia.

Subtests	Mann-Whitney value	Z scores	Sig.
SI	9.50	-3.041	.002*
SII	16	-2.660	.013*
SIII	18	-2.290	.256

SIV	34.00	-1.246	.044 [*]
SV	22	-2.003	.020 [*]
SVI	19.5	-2.214	.024 [*]
SVII	16	-2.454	.013 [*]
SVIII	34.50	-1.158	.256
SIX	20.50	-2.142	.030 [*]
SX	18.50	-2.279	.020 [*]
SXI	19	-2.245	.024 [*]
SXII	5.00	-3.225	3.764
SXIII	8.00	-3.020	.001 [*]
SXIV	5.00	-3.225	3.764
SXV	3.00	-3.382	1.387
SXVI	6.50	-3.126	5.944
SXVII	8.50	-2.977	.001 [*]
SXVIII	5.00	-3.229	3.764
SXIX	10.50	-2.842	.002 [*]

Results show that there is significant difference seen on subtest SI, SII, SIV, SV, SVI, SVII, SIX, SX, SXI, SXII, SXVII, SXIX. Whereas, no significant difference obtained for subtest 3,8,11,14,15,16 &18.

Independent-Samples Mann-Whitney U-Test was conducted on total scores of auditory comprehension to

determine there is difference between Mild and Moderate cognitive impairment in PwA. Results shows ($U= 29$, $Z = -1.54$, $p>.135$).

Following study supports our findings which suggests that there is difference seen between the performance of auditory comprehension among Persons with Aphasia. Curtis et al. (1989) reported that sentence comprehension tends to decrease as length increases. The deterioration of comprehension with increase in sentence length is indicative of retention deficits in persons with aphasia. Similarly in the present study it was noticed that with increase in the sentence length, auditory comprehension decreases.

Conclusion

The study demonstrated significant findings regarding declining auditory working memory, praxis and auditory comprehension abilities related to syntactical performance across persons with Aphasia (PwA). Study reveals Decrease in scores across the age groups for auditory comprehension skills. Study also revealed that Individuals with aphasia having good comprehension (GC) were able to perform the different subtests in the MAC, though repetitions and cueing was required. Individuals with aphasia having poor comprehension (PC). aphasia was affected.

No significant differences seen on subtests I, II, III on comparison of scores of auditory comprehension in individuals PwA. There is difference seen between the performance of auditory comprehension among Persons with Aphasia

Recommendation

There is need to explore how deteriorating auditory comprehension skills & cognition affect communication in ageing and Individuals with impaired communication (PwA).

This is an important area to assess and address the increased incidence of neurological & cognitive morbidity in aging population causing decline in comprehension abilities . ACTH will also help in formulating proper intervention program step by step, to help improve cognitive communication abilities among Persons with Aphasia.

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