DEVELOPMENT OF NAMING, READING AND IMITATION SKILLS MANAGEMENT PROGRAMME FOR PATIENTS WITH BROCA'S APHASIA

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ABSTRACT

OBJECTIVES: To develop the naming, reading and imitation skills management programme through mobile application of patients with severe Broca's aphasia.

METHODS: A pilot study with eight patients was carried out. Purposive non-probability sampling technique was used to recruit the patients with severe Broca's aphasia who received therapy through mobile application. It contains three domains: naming, reading and imitation. The programme was developed in Urdu language. Study was conducted in Yusra General Hospital, Islamabad and Railway Hospital, Rawalpindi, Pakistan. The inclusion criteria were patients above age of 40 and three months of stroke with diagnosis of chronic Broca's aphasia, while patients with severe cognitive impairment were excluded. The pre and post score of patients was recorded. Treatment protocol included 30-45 mints sessions, 4 days per week for total of 8 weeks. Data for each patient was analyzed based on their pre and post intervention scores.

RESULTS: According to demographic variations 50.0% people lie in the age range 40-50 while 50.0% of people were 51-60 years. The mean age of sample was 49 years and 87% of participants were right handed. The pretest score on repetition was 16.25±6.96 and post-test was 60.5±9.11 (p-value=0.000). The pretest score on naming was 49.75±26.28 and post-test was 111.25±31.38 (p-value=0.000). The pretest reading score was 31.75±10.87 and post-test scores was 67.50±17.13 (p-value=0.000).

CONCLUSION: It is concluded from the results that the naming, reading and imitation skills improved in patients with severe Broca's aphasia through management applications.

KEY WORDS: Aphasia (MeSH); Broca's Aphasia (MeSH); Language Disorder (MeSH); Android management application (Non-MeSH).

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INTRODUCTION

Aphasia is a language disorder occurring mainly as a result of stroke.[1] It is an impairment of language, an acquired communication disorder that weakens people's ability to comprehend language, but is not shown to affect intellect. It is a neurological disorder caused by injury to those regions of the brain that are accountable for language input and integration (frontal/temporal lobe). Aphasia is mainly due to pathology of specialized language areas in the brain which effects spoken and written skills.[1] Causes of brain impairment vary from cerebral vascular accidents (stroke), tumor, penetrating wounds and other diseases. Stroke is the most widespread cause of aphasia, which may influence all means of expressive and receptive communication along with speaking, reading, writing, understanding and gesturing.[2] Aphasia persists as disability in 21-38% of stroke survivors.[3] Internationally community incidence is 43/100,000/year, and prevalence is 3000 per million.[4] The prevalence of aphasia indicates that about 100,000 people have aphasia per year in the United States.[5] About 82.37% of stroke patients suffer from speech disorder.[4] In Pakistan estimated annual incidence is 250/100,000, translating to 350,000 new cases every year.[5] Aphasia has heavily influenced the life quality of patients and is one of the most important indicators to evaluate the patients' social outcomes.[6]

There are different speech therapies most of them are for verbal expressive skills as stimulation-response method and the Melodic Intonation Therapy (MIT).[3] Some other techniques are linguistic-oriented learning approaches, Promoting Aphasics' Communicative Effectiveness (PACE) and the Response Elaboration Training (RET) are also to improve the length of verbal responses in patients with aphasia.[7] The constraint-induced aphasia therapy (CIAT) is also used to improve verbal abilities.[8] Some studies showed effectiveness of computer programs for management.[9] Computer-based aphasia therapy is appealing and the patient with severe Broca's aphasia managed with computer-based training has showed positive effects through on sentences making, reading and writing.[10,11]

The naming, reading and imitation skills management programme is android application for stroke survivors which faced difficulty to access intensive speech therapy services. It is home based individualized management programme for all patients with those in rural and distant locations. This programme maintain and improve recent treatment gains in chronic Broca's aphasia and allows patients independent, a pathway for maintaining and improving the functional life of patients. The main objective was to develop the naming, reading and imitation skills management programme through mobile application of patients with severe Broca's aphasia.

METHODS

This article is part of a major study which aims to develop mobile app to enhance of naming, reading and imitation skills for patients with severe Broca's aphasia thus improving their

TABLE I: DISCIPLINES NAMING, READING, AND IMITATION SKILLS MANAGEMENT PROGRAM

S. #	Domain name	Description	Levels
1	**Naming**	The pictures of daily functional things are presented in the order and client asked to name each item. In word fluency portion patients repeat the phrase and sentences of relevant picture. Then the action pictures shown and the client have to describe the picture. There are cues: sound from which word start, then spelling form and then written form of picture name along auditory feedback.	Level I: Includes picture and just name them Level II: Response in phrases and sentences Level III: Narration of pictures
2	**Reading**	This domain contains simple reading of functional items list, symbol recognition, number matching, word identification, sentence completion, oral reading and paragraph reading. Each has four option the patient click the statement which match the representative item from above. If wrong response then the option color fades out.	Level I: Characteristic of item match to picture Level II: Responses according to functional manners of item Level III: Patients have to answer the questions after reading paragraph
3	**Imitation**	Ask the patient to repeat the words listed below contain different categories then record the responses. Hints related to that word are presented in form of written and auditory form.	Level I: Easy Level II: Medium Level III: Difficult

quality of life. Purposive sampling was used to recruit the patients from various hospitals in Rawalpindi and Islamabad (Yusra General Hospital, Islamabad and Railway Hospital, Rawalpindi). Patients with age of 40 years or more presenting with severe Broca's aphasia (more than 03 month of stroke onset either ischemic or hemorrhagic) were included in this study. Patients who understand and can speak Urdu were recruited for study. Presence of cognitive impairment, tumors, infections and traumatic brain injury led to samples exclusion from the study. The procedure began with an informed consent and information disclosure. The programme was designed with specific consideration to patients' level of education, affordability, familiarity and comfortability with gadgets. The programme was developed in Urdu and content was selected from Urdu text book till three grades for participants and installed on their smart phones. Then sent to the five experts in the field, who communicated changes required which were made as per their feedback. The programme contains naming, reading and imitation skills (Table I). It also contains different daily functional statements, words, phrases and sentences according to the need of domain. Treatment stimuli consist of object images along with auditory sounds of person and actions with cues. The voice output can operate by pressing the selected picture with patient index finger. Participants received 1-8 weeks of therapy using software programme, specifically included four domains within the application comprising of 30-45 minutes sessions (4 days per week for total 8weeks). The initial session of the treatment program are devoted to the development of understanding the use of software by a speech-language pathologist (SLP) in partnership with the individual with aphasia and his/her attendant. Sessions were four days per week for approximately 30-45 minutes. Training and responses of each domain recorded at a rate appropriate for each particular client. Then, the SLP instructs the client about the use of the software in one session. After guiding and demo session if client agrees to work on it then they have to use it at home for a minimum of 30 minutes per day. The measurement will be taken at 0 week (baseline) after 8 weeks. Data was analyzed on the basis of pre and post intervention score (Table II).

Descriptive statistics of score calculated in terms of mean and standard deviation. The paired sample t-test using SPSS v20.0 was used to compare pre and post score, which was statistically significant (p-value$\leq$0.05).

RESULTS

The programme was designed and implemented on eight stroke patients

TABLE II: PATIENT TREATMENT PROTOCOL

Week	Domains	Time duration	Goals
1-3	**Naming Skill**	Session: 08 Duration: 30 minutes each	Can produce name of daily functional things and describe the pictures in phrases and sentences.
4-6	**Reading Skill**	Session: 12 Duration: 30 minutes each	The patients able to read of functional items list, symbol recognition, number matching, word identification, sentence completion, oral reading and paragraph reading.
7-8	**Imitation Skill**	Session: 08 Duration: 30 minutes each	Patient can repeat the words from different categories. Listen to the question and respond in sequence.

TABLE III: PRE-TREATMENT AND POST-TREATMENT SCORES OF PATIENTS ON MANAGEMENT DOMAINS

Patients	Repetition (Total Score: 78)		Naming (Total Score: 188)		Reading (Total Score: 98)	
	Pre	Post	Pre	Post	Pre	Post
Patient 1	10	42	34	96	30	62
Patient 2	8	56	40	102	20	68
Patient 3	12	60	30	88	18	36
Patient 4	10	62	22	98	28	60
Patient 5	22	70	38	86	40	86
Patient 6	22	58	58	98	28	60
Patient 7	20	66	78	154	40	88
Patient 8	26	70	98	168	50	80

who were eligible and willing to participate. According to demographic variations 50.0% people lie in the age range 40-50 while 50.0% of people were 51-60 years old. The mean age of sample was 49 years and 87% of participants were right handed while 13% were left handed.

The pretest and post-test score of each patient for treatment data of repetition, naming and reading was recorded. The scores show that all patients show remarkable improvement in these skills (Table III).

Table IV shows mean and standard deviation score of repetition, naming and reading domains. The pretest score on repetition was 16.25±6.96 and post-test was 60.5±9.11. Their p-value was 0.000 which is highly significant, indicating that participants had no trouble repeating spoken words through application program. The result of naming skill is also highly significant. This shows patients can easily name the functional item list from the application. The mean and standard deviation for pretest reading was 31.75±10.87 and post-test scores was 67.50±17.13 with p-value of 0.000 which is highly significant, which indicates that participants showed good response on reading material.

DISCUSSION

This study is on development of naming, reading and imitation skills management programme application for patients with severe Broca's aphasia. The programme increased the patient's independencies through use of this application by patients installed on their smart mobile phones which were not observed in other traditional techniques. The results of different studies also revealed that home based practice on the iPad participants were able to self-teach and showed improvement.[12]

The present study reveals that pre score of patients on naming 49.75± 26.28 while post test core was 111.25±31.38 which shows that patient naming skill enhanced through the software. The study on computer assistive programme is to compose naming words and sentences; the programme is specially designed with multiple equipments used by patients with severe aphasia so that patients learnt an alternative mean of communication through this symbol system.[13]

Present study showed significant result on the repetition domain. The results clearly depict that through implication of software patients show drastic change in their speech production. The study on computerized reading treatment, which contains 29 tasks along with 8 levels, showed patients have to maintain performance. For which results revealed positive effect of this computer-provided intervention.[14] A randomized computer-based aphasia therapy is conducted on patient with severe Broca's aphasia that was provided with a laptop installed program which shows instant recovery with in sessions on confrontation naming tasks.[14]

The result of reading skills from present study illustrates p-value of 0.000 which is quite significant. One of related research showed that computer treatment for sentence construction, word finding and reading had a positive effect and it was found that computer training has an additional effect: patients who received computer training in addition to their regular therapist-delivered therapy showed greater gains in linguistic functioning than patients who only received regular therapist-delivered therapy. This indicated that computer technology can be used to increase treatment intensity.[15] A study based on computer therapy conducted on aphasic patients after five months of computer treatment, showed that a significant improvement in naming skills of the patients was achieved.[16]

This is pilot project and more data is required to generalize and validate the study. Other type of aphasia should also be a target for management. This application should contain all seven domains for management of aphasia.

CONCLUSION

This study concluded that the reading, naming and repetition skills are improved in patients with severe Broca's aphasia using management programme application.

LIMITATIONS

- This management application is for post stroke chronic Broca's aphasia patients only.
- This application can only be installed on android mobiles.
- The application is only in Urdu language and target only three domains for management of Broca's aphasia.

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TABLE IV: DOMAINS OF NAMING, READING AND IMITATION SKILLS MANAGEMENT PROGRAM

Domains	Total Patients	Pretest (mean±SD)	Post-test (mean±SD)	t - value	P value
Repetition	08	16.25± 6.96	60.5±9.11	-18.411	.000
Naming	08	49.75± 26.28	111.25±31.38	-13.571	.000
Reading	08	31.75± 10.87	67.50±17.13	-9.485	.000

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AUTHORS' CONTRIBUTIONS

Following authors have made substantial contributions to the manuscript as under:

HSK: Concept & study design, acquisition, analysis & interpretation of data, drafting the manuscript, critical review, final approval of the version to be published.

SN: Study design, analysis & interpretation of data, critical review, final approval of the version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest

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