Journal of
Modern Rehabilitation
October 2020, Volume 14, Number 4

Case Report: The Effect of Combining Attention Training Program into Language-based Treatment of Anomia on Word Retrieval: A Case Report

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Citation: Modarres Zadeh A, Mehri A, Jalaie Sh, Nejati V, Khatoonabadi AR. The Effect of Combining Attention Training Program into Language-based Treatment of Anomia on Word Retrieval: A Case Report. Journal of Modern Rehabilitation. 2020; 14(4):253-260. http://dx.doi.org/10.32598/JMR.14.4.6

http://dx.doi.org/10.32598/JMR.14.4.6

Article info:
Received: 02 Aug 2020
Accepted: 17 Aug 2020
Available Online: 01 Oct 2020

Keywords:
Stroke, Aphasia, Attention, Naming, Treatment

ABSTRACT

Introduction: The present study is a case report of a 50-year-old man (SM) with aphasia whose word retrieval was severely impaired. The aim of the study was to compare the effect of a combined treatment program (attention training and language treatment) and a single program (language treatment alone) on the naming picture materials.

Materials and Methods: This case was affected by a hemorrhagic cerebrovascular accident in the territory of Middle Cerebral Artery branches of the left hemisphere. Two naming treatments, i.e. the single and combined treatments sequentially, were provided for SM; during each of them a 50-item wordlist was practiced (Lists A and B). 12 treatment sessions were implemented for him during each treatment program. These two lists along with another list (List C), left for assessment of generalization of treatments to untrained items, were probed 6 times during and after each program. The whole picture set was normalized in another study described in the text.

Results: Our patient's naming ability progressed during the treatment programs. However, this progression was more salient in combined treatment program. More specifically, List B had the mean score of 34.25 in combined treatment program that was higher than mean of List A in single treatment program (14.5). The slope of List B scores was also higher than that of List A (3.7 vs 1.2). List C showed more generalization of combined treatment to untrained items than single treatment based on its mean scores (27 vs 18.5).

Conclusion: the observed improvements of naming ability were felt to be the result of combining attention training into the language treatment which is lead to sustained attention, less distraction and more concentration.

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1. Introduction

It has been found that at least in some people with aphasia, cognitive impairments are present in addition to the core language symptoms that have been traditionally used to define the disorder. These impairments have been reported in short-term and working memory [1-3], attention [4-6], reasoning [7] and executive functions [8, 9]. Supposing that attentional functions, which support language processing, may be impaired in aphasia [4], these functions are essential in the rehabilitation of aphasia. That is because attention plays an integral role in language learning and response to intervention, limited attentional skills may decrease the effectiveness of intervention programs aimed at improving language functioning [10].

Some researchers have targeted attention disorders of people with aphasia with the hope that a significant increase in different areas of language functioning emerges. Murray at al. (2006) used the Attention Process Training-II program (APT-II) to investigate the effects of attention training on the language functioning of a participant with chronic aphasia. Attention, memory and auditory comprehension were reported to have significantly improved in this participant [11]. Helm-Estabrooks et al. reported that their designed program, namely, Attention Training Program, enhanced auditory comprehension and nonverbal reasoning in two participants with mixed non-fluent chronic aphasia [12].

Despite the aforementioned positive effects of specific attention training programs on various language functions and the fact that attention is fundamental to both language comprehension and production skills [13], the effect of attention training on verbal language abilities, in particular; picture naming, has not been well researched. So, the present case-report study compares the effects of a single treatment program (in which picture naming is practiced via language-based tasks) (ST) with a combined treatment program (in which attention training and language-based tasks are both presented to a participant) (CT) in terms of picture naming in a 50-year-old patient. It is assumed the combined program would be superior in improving the confrontation naming of a predetermined set of picture stimuli.

2. Materials and Methods

Case description

The participant of this study was a 50-year-old male with aphasia (SM). The first-ever cerebrovascular hemorrhagic accident inducing aphasia was occurred 15 months before the initiation of the study. He was formerly a school teacher with a bachelor degree in psychology and was a right-handed monolingual speaker of Persian language. At the time of the study, he had right hemiplegia and no other evident neuropsychological complication based on the reports of his caregivers. There was no evident dysarthria and apraxia in his spontaneous speech or in repeating words and sentences. A report of Magnetic Resonance Imaging, taken in the subacute phase of the disorder (3 weeks after the occurrence of the attack), indicated extensive signal abnormality and volume loss in the left hemisphere with dilatation in left lateral ventricles which was compatible with extensive left hemispheric chronic hemorrhagic infarction.

Materials

A Persian picture naming test called the Parallel Picture Naming Test (PPNT) was used for determining the presence of word retrieval deficit in SM. This test has 109 black-and-white pictures, and its cut-off point is 86. Scoring is dichotomous, meaning that correct and incorrect responses are given 1 and 0, respectively [14]. To evaluate attentional functioning of the participant, two tests were employed. One test was the attention subtest of the Aphasia Check List (ACL). In this nonverbal test, six columns with 24 geometric stimuli in each, were represented to the examinee, and he must find some specific stimuli in 10 seconds for each column. The cut-off point is 103 [15]. Another nonverbal test for evaluating attention that was used in this study was the nonverbal visual attention subtest of the Oxford Cognitive Screen (OCS) battery. This subtest has been called “Broken Hearts” by the test developers. To complete this test, the examinee must cancel 50 closed-heart shapes from among 100 open-heart shapes in at most three minutes. Attention may be impaired if less than 42 targets are cancelled [16]. Table 1 demonstrates the results of the PPNT, ACL and OCS test in the participant. These tests were also carried out before and after each treatment program.

Intrvention

To initiate the therapy, a set of 150 pictures was asked in three baseline sessions, each of which was held one time a week. At the end of the third session, the 150-picture-set was divided to the three equal wordlists (List A, B and C) according to the naming scores in the baseline session, word frequency and the syllable number of each word. These Pictures were from a larger set of pictures normalized in Tahanzadeh et al. study [14]. List A was practiced in the ST (naming therapy), List B in the CT

Table 1. Naming and attention scores of the participant at the entrance to the study

Naming and Attention Scores	Cut-off Point	SM's Initial Score
PPNT score	86	12
ACL attention subtest	103	35
Broken hearts total score	42	11

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Table 2. Timetable and description of each phase

Phase ☞	Baseline ☞	Single Treatment Program (ST) ☞	Interval Between Two Treatments ☞	Combined Treatment Program (CT) ☞	Post-Treatment Assessment
Description	Three baseline sessions held once a weak	12 sessions held three times a week for 4 weeks. at the end of every three sessions (one day after) a probe session was held	3 weeks (9 sessions) During which two post-treatment and one pre-treatment assessment was conducted once a week	12 sessions held three times a week for 4 weeks. at the end of every three sessions (one day after) a probe session was held	2 sessions held once a week after the last treatment session

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(naming therapy plus attention training) and List C was used to assess the generalization of the treatments. Lists A and B were probed four times during the programs (i.e. after every three treatment sessions) and two times at their termination. List C was not displayed to the participant during the treatment sessions and was only questioned in the probe sessions. There was an interval between the ST and CT during which there was no treatment delivered to the participant, but only three probe sessions of the three lists were conducted. Table 2 represents the timetable for the participant.

In the ST, both semantic and phonological activities were practiced with the participant. In the CT, a computerized rehabilitation program called Attentive Rehabilitation of Attention and Memory (ARAM) was added to the naming program. This program intends to improve sustained attention, selective attention, switching/alternating and divided attention, spatial span, and visual span using simple nonverbal visual stimuli. For example, in the sustained attention subsection, the participant must find a picture of a particular house among different pictures of houses [17].

Both treatment programs had 12 therapy sessions which took place three times a week for four weeks. The single treatment program session lasted 45 minutes, and the combined program sessions lasted 20 to 25 minutes longer.

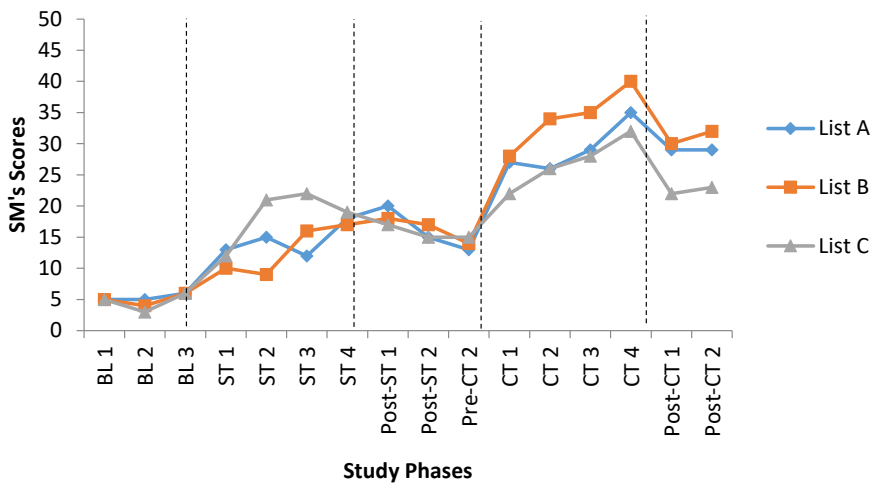

Figure 1. Graphical representation of SM's scores in three lists across study phases

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Table 3. SM's scores on each list during each phase of the treatment

Lists		Baseline Sessions Probes			ST Sessions Probes				Between two Sessions Probes			CT Sessions Probes				Post-treatment Assessment Probes	
		BL-1	BL-2	BL-3	ST-1	ST-2	ST-3	ST-4	Post-ST 1	Post- ST-2	Pre-CT-1	CT-1	CT-2	CT-3	CT-4	Post-CT-1	Post-CT-2
List A	Naming scores	5	5	6	13	15	12	18	20	15	13	27	26	29	35	29	29
	Level (average)		5.3			14.5				16			29.25				29
	Trend (Slope)		0.5			1.2				-3.5			2.7				0
List B	Naming score	5	4	6	10	9	16	17	18	17	14	28	34	35	40	30	32
	Level (average)		5			13				16.3			34.25				31
	Trend (Slope)		0.5			2.8				-2			3.7				2
List C	Naming score	5	3	6	12	21	22	19	17	15	15	22	26	28	32	22	23
	Level (average)		4.7			18.5				15.7			27				22.5
	Trend (Slope)		0.5			2.2				-1			3.2				1

BL: Baseline; ST: Single Treatment Program; CT: Combined Treatment Program

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Figure 1 and Table 3 represent the graphical representation of the naming scores and the amount of level and trends of scores throughout the phases of the study.

3. Results

The naming scores of Lists A, B and C in Baseline, during and after each study phase have been reported in Table 3. The level and slope of the scores for three lists in both ST and CT was higher than their respective amounts in baseline sessions. The post-test scores after two treatments never fell to the baseline range of scores. The slope of scores in three lists during the resting interval was negative. List B demonstrated the highest amounts of mean scores and slopes during CT among the three lists (34.25 and 3.7; respectively). List A showed higher mean (29.25) and slope (2.7) in CT compared to ST wherein mean score and slope amount were 14.5 and 1.2. List C expressed definitive increase in CT in terms of mean score (27) and slope (3.2) than in ST mean (18.5) and slope (2.2) scores. There was an increase in PPNT (30 to 55), ACL (26 to 67), and OCS (17 to 36) scores from Pre-ST to Post-CT administrations according to Table 4 data.

4. Discussion

According to Table 1, SM scores in naming PPNT items were far below the cut-off point for this test. His performance on the two attention tests was also weak. Therefore, his word retrieval deficits and attention impairments were evident before the initiation of the study. These tests were repeated five times after the first administration (Table 4) and his performance, though elevated during both the ST and the CT, never reach cut-off points. However, these score increments were higher comparing pre- and post-CT scores than Pre- and post- ST scores.

As mentioned above, List A and B were the targets of the ST and the CT treatments, respectively. However, they were asked during phases where they were not the target of treatment (e.g. List B during ST). According to Table 3, All Lists had similar level and trend during the baseline phase. The level and trend of List A scores when it was only asked during CT was higher than when practiced during ST that was its main treatment phase. List B scores had the highest level, and trend amounts among the lists during the CT phase. List C showed the highest level and trend of scores during the CT. The post-test Scores after the CT program was showed that these scores were well retained after the program, in contrast to the post-ST score that showed negative slopes.

One might assume that these treatment effects of the CT program are the result of repeated presentation of the picture items. However, one should attend to the fact that all lists were repeatedly asked ten times before the start of the CT, and no one showed such increment of data. This increase of naming scores during CT phase may be evidence for the fact that attention training program can facilitate language functioning through optimizing insufficient capacity or inappropriate allocation of attentional resources needed for language operations [18]. Neurologically speaking, lesions that induce aphasia may indirectly affect left frontal and subcortical centers responsible for attention which overlap with language centers. So, activating areas responsible for attention may activate those areas responsible for confrontation naming [19].

5. Conclusion

This limited single case study showed that attention may be impaired in aphasia patients in addition to language disorders and need to be considered by speech therapists in both assessment and treatment measures. Also, in this study, a training program targeting complex attentional skills was combined with language-based aphasia therapy. It was assumed that this combination brings about more treatment gains in terms of naming scores than a single language treatment. This hypothesis confirmed through naming performance of our patient in both a formal test, and a researcher designed a set of

Table 4. Performance of SM on PPNT, ACL and OCS before and after each treatment programs

Test	Cut-off Point	Pre-ST Score (At Third BL Session)	Post-ST Score	Pre-CT Score	Post-CT Score	Two Weeks Post Treatment
PPNT	86	14	30	24	55	50
ACL attention subtest	103	30	26	30	67	60
OCS broken hearts total score	42	15	17	16	36	38

BL: Baseline; ST: Single Treatment Program; CT: Combined Treatment Program

picture stimuli. Like the results of this study, literature search for clinical effect of direct attention training programs resulted in finding positive effects of such training on the reading impairment and auditory comprehension [11, 19, 20].

Ethical Considerations

Compliance with ethical guidelines

All of the participant's information was kept confidential by our colleagues in this study. The participant was entirely voluntary and had the freedom to abandon the study at any time he wanted to. An informed consent was obtained from the participant.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors contributions

Writing: Amin Modarres Zadeh; Reviewing:Azar Mehri; Statistical analysis:Shohre Jalaie; Software providing: Vahid Nejati: Supervising: Ahmad Reza Khatoonabadi.

Conflict of interest

The authors declared that they have no conflict of interest.

Acknowledgements

We acknowledge SM for his participation and engagement in the study.

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