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Is semantic feature analysis effective when applied intensively? A randomized pilot study with non-fluent aphasic individuals

İbrahim Can Yaşa

Department of Speech and Language Therapy, Bahçeşehir University, Faculty of Health Sciences, İstanbul, Turkey

ABSTRACT

Objectives: In this study, it was investigated the effects of intensive aphasia treatment applied to individuals with non-fluent aphasia.

Methods: Sixteen patients diagnosed with non-fluent aphasia were included in the study and were randomly divided into two groups. The therapy interventions were one day per week for the eight patients in the first group, for a total of 8 hours in 2 months (standard intervention). For the eight patients in the second group, therapy was applied for a total of 48 hours in 2 months, for one hour per day, six days a week, excluding Sundays (intensive intervention). Participants were tested using the Turkish aphasia test (ADD), Aphasia Impact Scale-21 (AIQ-21), and Boston Naming Test (BNT) before starting the treatment (pretest), after the treatment (posttest), and one month after the treatment ended (follow-up).

Results: At the end of the treatments, a significant increase in ADD and BNT scores and a significant decrease in AIQ-21 scores were observed in both groups. Although there was a change in the follow-up test, the scores were still significantly different than the pretest scores. The rate of improvement in test scores of group II patients who received intensive aphasia treatment was superior to the group I patients.

Conclusions: Intensive application was superior to once-weekly aphasia treatment, and post-treatment improvement continued for at least one month after the treatments.

Keywords: Non-fluent aphasia, semantic feature analysis, intensive therapy, therapy effectiveness, randomized controlled trial

Aphasia is the loss of the ability to use speech and language skills as a result of lesions in the speech and language regions in the brain [1]. Aphasia usually occurs after a stroke and can lead to isolation, passivity, and depression, i.e., secondary psychological and psychiatric symptoms, due to deficiencies in using language and poor communication [2, 3].

The primary goal in the treatment of patients with aphasia is management and maximizing patients' language and communication skills, activities, and participation. Recently, positive results have been obtained with the collaboration of speech and language therapists, patient with aphasia, and their relatives and caregivers [4]. In a meta-analysis investigating the

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Address for correspondence: *İbrahim Can Yaşa, PhD., Assistant Professor, Bahçeşehir University, Faculty of Health Sciences, Department of Speech and Language Therapy, Çırağan Cad., Osmanpaşa Mektebi Sokak, No: 4-6, 34353 Beşiktaş, İstanbul, Turkey. E-mail: ibrahimcan.yasa@bau.edu.tr, Phone: +90 212 381 91 56*

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effectiveness of speech and language therapy for patients with aphasia, it was revealed that speech and language therapy benefited language production, functional communication, and comprehension of people with aphasia according to the results of the 27 studies reviewed by [4]. Although the optimal treatment intensity for aphasia rehabilitation is unknown, treatment intensity is very important for effective and efficient aphasia rehabilitation, in a study investigating the effectiveness of treatment intensity in the rehabilitation of patients with aphasia [5, 6]. Bhogal *et al*. [6] reported that more intensive therapy in less time (8.8 hours of treatment per week for 11.2 weeks) had more positive results than less therapy over a longer period (2 hours per week for 22.9 weeks). Recently described Semantic Feature Analysis (SFA) is a word retrieval process that acts by reinforcing disrupted semantic networks [7]. The SFA treatment protocol uses a "feature analysis chart" that includes action, group, use, location, features, and associations. Numerous studies have demonstrated that SFA has positive effects, especially in naming [8-10].

In this study, we aimed to investigate the results of SFA administered at two different intensities to individuals with aphasia. Turkish aphasia test (ADD), Aphasia Impact Questionnaire -21 (AIQ-21), and Boston Naming Test (BNT) were applied before starting the therapy, after the therapy, and one month after the therapy to evaluate the results of the therapies.

METHODS

Participants

Ethics approval for this randomized controlled trial was received from the Bahcesehir University Clinical Research Ethics Committee. Using the GPOWER 3.1 program, it was determined that the minimum sample size required to provide the power of the test (1-β) = 0.90 and the effect size 0.80 was 15 people, 8 people in each group. The study included 16 patients with a previous stroke and were diagnosed with non-fluent aphasia in MRI imaging and language-speech skills evaluations. Inclusion criteria for the study were not having any additional neurological disease diagnosis, having Turkish as their native language, being at least a high school graduate, being between 40-65 years old, and being able to understand the instructions given. Exclusion criteria were defined as having severe sequelae due to previous neurological diseases, being younger than 40 or older than 65, having a history of using psychoactive substances other than tobacco, having been diagnosed with mental retardation, having a history of head trauma with loss of consciousness, brain tumor, history of neurosurgery and/or intracranial implant, and being pregnant or using birth control pills. Participants determined according to the inclusion and exclusion criteria were listed and divided into two groups of eight, each using the computer-assisted randomization technique.

The interventions were applied at Bahçeşehir University, Speech and Language Therapy Unit. After the participants were determined for the study, a test before intervention (pretest) was used. The treatment design was inspired by Stahl *et al*. [11]. The therapy interventions were one day per week for the eight patients in the first group, for a total of 8 hours in 2 months (standard intervention). For the eight patients in the second group, therapy was applied for a total of 48 hours in 2 months, for one hour per day, six days a week, excluding Sundays (intensive intervention). The same therapist performed therapy interventions. The test after intervention (posttest) was applied after the therapy interventions, and one month after the therapy sessions were completed, the follow-up test was applied. Another speech and language therapist performed the pretest, posttest, and follow-up tests. Thus, we tried to eliminate the bias effect. Demographic In-

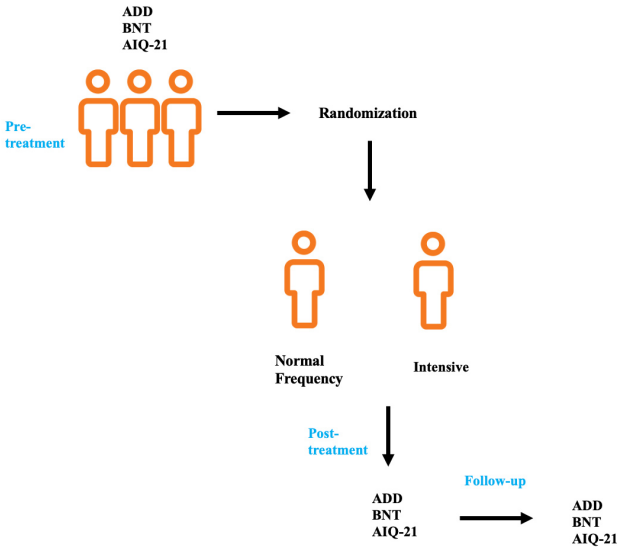

Fig. 1. Study design

formation Form, ADD, AIQ-21, and BNT were applied to the participants in the study (Fig. 1).

Randomization and Masking

The trained therapist completed baseline assessments before randomizing participants using a computer-generated block randomization sequence (permutated block of six, with 1:1 randomization to two groups to achieve an overall ratio of 1:2 via Research Electronic Data Capture (REDCapTM) [12]. Randomization was performed by the baseline assessor, who was not otherwise involved in the trial and participants were stratified by aphasia severity determined by the WAB-R (AQ) score. Participants, family members, and outcome assessors were not informed of group allocation, and all participants and trial staff were asked to refrain from discussing the treatment received. Only the therapist wrote in medical notes per healthcare standards and all research documentation was stored separately in a secured location to avoid unblinding. The blinded outcome assessor was not involved in the participants' stroke care and was not permitted to ask participants about treatment received during follow-up assessments. Only treating therapists were unblinded to treatment allocation.

Semantic Feature Analysis Treatment

In this analysis, a verbal word-picture matching task was designed to determine the framework and target of the treatment to be applied and to evaluate the treatment results. Each picture set in the designed 100-word-picture matching included four separate images, three distractors, and one target image. A target of 20 new words was studied in each session. After completing the targeted 100 words, 25-word repetition and generalization studies are carried out in order in the follow-up sessions. Photographs or color drawings of natural objects were used as picture stimuli. The target images were selected from different categories: clothing, objects (accessories), vehicles, body parts, and food and beverages. The three distractors in the target image were designed as semantic distracters, phonological distractors, and familiarity distractors. Previously, Tunçer [13] dealt with words in 6 categories: animals, vegetables and fruits, vehicles, clothes, body parts and furniture in his research with various age groups. In this study, the word frequency tables reported by Tunçer [13] were taken into account and words with high, medium and low usage frequency and functionality in daily language were used.

In the verbal word-picture matching task, participants were asked to identify the target picture in their picture set by verbally requesting, "Show me the _." Selected target images were randomly presented to the participants in three separate sessions over a week. Targets detected incorrectly on two or more occasions were selected for use in the treatment program.

SFA sets were prepared on a white A4 (29.7 × 21.0 cm) sheet. In the middle of the page was a large photograph or colored illustration (14 × 11 cm) of the target item. Around this photograph were written four pairs of printed words representing semantic features. One of the items in each semantic trait pair was consistent with the treatment goal, while the other was a distractor. Semantic features were presented in pairs to enable the participant to actively participate in semantic processing by making a correct and informed decision. The semantic properties comprised six options: Category, Use, Action, Properties, Location, and Associations.

Treatment

Pretreatment

The verbal word-picture matching task, as previously stated, was performed in three consecutive but separate situations over the course of one week. Before each treatment, word-picture matching tasks were presented to the participant in random order, and no feedback was provided as to whether the participant's response was correct. ADD, BNT, and AIQ-21 tests were administered to all participants the day before the therapy, and the scores obtained by the participants were recorded.

Treatment

The therapies were administered for the following eight weeks. Patients in the first group received eight therapy sessions once a week, one hour a day. The patients in the second group received a total of 48 therapy sessions of one hour a day, six days a week. In each session, the participant was asked to say what the middle image in each picture was. For each item, questions were asked around the image: Category: "This is a...", Usage: "used for...", Action: "What to do with

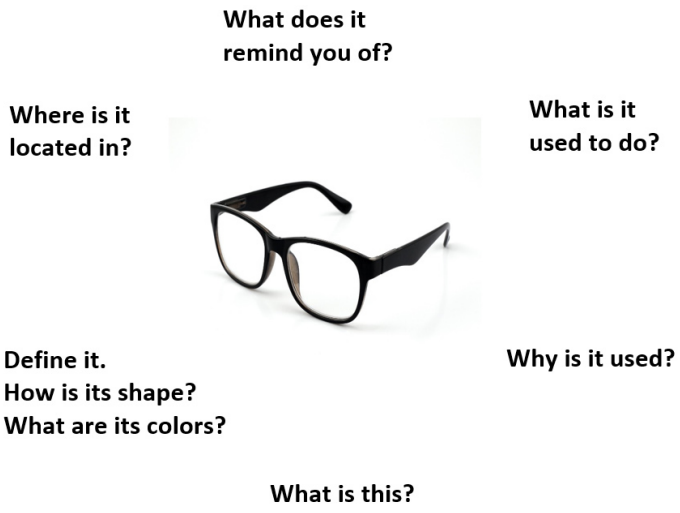

Fig. 2. Semantic Feature Analysis (SFA) Therapy Material (Turkish Language)

it?", Attributes: "Describe how," Location: "Where do we use it?", Relationship: "reminds me of…"

If the participant still has not named the image, they are told what it is and then asked to repeat it back. In the process of naming the target concept and forming the meaning network related to the concept, clues can be given to the participants to express the semantic features of the target concept verbally and they can be guided to benefit from the diagram. After the participants name it, the practicing clinician maps the semantic feature to the appropriate box and directs them to create relevant sentence structures (Fig. 2-Turkish version of the therapy material).

Post-Treatment

ADD, BNT and AIQ-21 tests were performed again on the participants one day after the completion of the therapy process. Thus, the effectiveness of the therapy was evaluated. One month after completion of the treatment phase, a follow-up evaluation was performed to determine whether changes in comprehension persisted long-term following treatment discontinuation.

Tests

Turkish Aphasia Test (ADD)

ADD was developed by Toğram and Maviş [14] for individuals with brain injury (a) to determine their performance in all language areas, (b) to diagnose aphasia, and (c) to help select appropriate therapy targets. Toğram [15] conducted a validity, reliability and standardization study for ADD applied to healthy individuals with stroke. ADD consists of 8 subsections that evaluate language and speech characteristics. These evaluation tests are spontaneous language and speech, auditory comprehension, repetition, naming, reading, grammar, speech, action and writing subsections. A high score indicates the effective use of language and speaking skills. Only the first 4 sections of the test were used and their total score is 162. The first 4 sections of the test are the sections that evaluate primary language and speaking skills such as speaking fluency, auditory comprehension, repetition, and naming. The remaining sections are sections that assess reading and writing skills in an academic context. The language and speaking skills of the participants are currently being evaluated, and they cannot be successful in writing tasks because their right side is paralyzed. For this reason, parts of advanced academic skills are not included. The reliability coefficients of the subsections of the ADD test are between 0.94 and 0.99, and the reliability coefficient for the overall test is 0.99 [15].

Boston Naming Test (BNT)

BNT, developed by Kaplan *et al*. [16], is currently the best-known neuropsychological tool for evaluating language skills, including object naming and word retrieval. BNT is used for neuropsychological evaluation in children, adults, and elderly individuals with different clinical pathologies such as communication disorders, aphasia, dementias, or brain lesions.

Aphasia Impact Questionnaire-21 (AIQ-21)

AIQ-21 is an aphasia-friendly scale that is administered face-to-face to individuals with aphasia and aims to evaluate the quality of life of individuals [17]. In the scale, there are a total of 21 items consisting of 3 sub-sections, namely communication, participation, and emotional state. The use of a large font, the fewest texts and simple pictures in the entire scale, and the repetition of the word "this week" at the beginning of each question, aim to support the aphasic individual to understand the scale more easily. In addition, the positive question sentences used in some questions aim to instill the thought of "you have positive things to do."

All questions in the scale inquire about how the

last one week of the aphasic individual has been, and the person is asked to rate the difficulty experienced between 0-4, with 4 being the worst and 0 being the best. The problems experienced by individuals with aphasia in this process are in the person's inwardness. Since the primary purpose of interventions and approaches is to maximize the participation of the individual, the perception of quality of life in the scale is derived directly from the answers of the individual.

Validity and Reliability of the Intervention

The scales which were developed by the researcher used in this study calculated the reliability of the tests. Cronbach's Alpha reliability coefficient was considered in these calculations. The reliability of the scales used in the research was previously ensured. A speech and language therapist carried out all pretest, posttest, and follow-up test interventions 7 years of experience, and all these interventions were recorded via a recording device. The whole process from the beginning to the end was recorded, steps such as answering and scoring were fully controlled, and any errors were prevented from entering the process. Inter-observer (evaluator) reliability intervention was used for the data obtained from the pretest, posttest, and follow-up tests. In the interventions, the score made by the researcher for the recordings was compared with the score made by the independent observer, and the consistency between the observers was checked. The higher agreement means the more reliable scoring. Moreover, the existence of an agreement between the researcher and the independent observer can be interpreted as the researcher measuring the target behaviors. A calculated agreement of 80-100% indicates that the agreement between the researcher and the other independent observer is reliable [18].

In the research, pretest, posttest, and follow-up test applications were recorded with a voice recorder, and 25% of the data randomly selected from the data was listened to carefully by two independent expert language and speech therapists. The relevant tests were scored and transferred to the data collection forms. Scoring was done according to the application protocol of the related tests, and reliability was calculated by using the intra-class correlation calculation technique, considering the evaluation scores of two independent experts. While calculating the reliability, the formula "Reliability = (Agreement) / (Agreement + Disagreement) × 100" was used [18]. The compatibility between these scores was checked, and the inter-observer reliability was calculated (Table 1). The "Therapy Applications Evaluation Form" developed by the researcher was used to show the application reliability of the study. In this form, there are a total of 7 questions consisting of a 5-point Likert structure (1-Lowest, 5-Highest). This form is intended for the observer to evaluate the therapist and therapy process for the language therapy method applied to participants with aphasia. Therapist gives the participants enough information about the sessions, the therapist follows the relevant therapy process, the therapist follows the known clue steps in the naming process, the suitability of the method used by the therapist, the suitability of the material used by the therapist, the therapist adjusting the therapy time correctly, and both observers gave almost the highest score to all items related to the appropriateness.

Statistical Analysis

NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) program was used for statistical analysis. While evaluating the study data, descriptive statistics were given as mean, standard deviation, frequency, and percentage. The conformity of the quantitative data to the normal distribution was tested with the Shapiro-Wilk test and graphical examination. Repeated measures ANOVA was used for within-group comparisons of normally distributed quantitative variables and Bonferroni-adjusted pairwise comparisons were used for pairwise compar-

Table 1. Inter-observer agreement values

Test	Before Intervention	After Intervention	One month After Intervention
ADD	94%	94%	99%
BNT	98%	91%	92%
AIQ-21	88%	86%	98%

isons. Student's t-test was used to compare the difference in questionnaire scores according to the frequency of therapy. Statistical significance was accepted as $p < 0.05$.

RESULTS

Demographic and clinical details of the 16 participants included in the study are given in Table 2. Based on independent sample t-tests, the randomization procedure did not result in significant differences between Group I and Group II regarding age, education level, employment status, months after disease onset, and marital status (Table 3).

Changes in ADD, A-21, and BNT scores over time according to repeated measures ANOVA is given in Table 4. Pretest ADD mean score was 70.25 ± 4.58, BNT mean score was 21.06 ± 4.75, and AIQ-21 mean score was 76.43 ± 1.54. In the posttest performed after therapy, the mean ADD score increased to 97.43 ± 18.61, the mean BNT score increased to 39.25 ± 4.83, and the mean AIQ-21 score decreased to 66.00 ± 3.26. The change in all three tests was statistically significant ($p < 0.05$). In the follow-up tests performed one month after the treatment, the ADD total score was 93.75 ± 16.31, the BNT total score was 36.56 ± 5.03, and the AIQ-21 total score was 67.62 ± 3.77. Although the decrease in ADD and BNT and the increase in AIQ-21 were statistically significant compared to the posttest, the scores in the follow-up tests were still substantial compared to the pretest (Table 4).

A mixed ANOVA method was used to compare ADD, AIQ-21, and BNT changes according to treatment frequency (Table 5). Student t-test was used to compare changes in ADD, AIQ-21, and BNT scores according to treatment frequency after mixed ANOVA (Table 4). The 36.87 ± 5.55 point increase in the ADD score after the intensive intervention was significantly higher than the 17.50 ± 4.85 point increase in the ADD score after normal treatment ($t(14) = -2625$; $p = 0.022$) (Fig. 3). The increase in BNT score after normal intervention (16.12 ± 1.55) was similar to the increase in BNT score after intensive intervention (20.25 ± 1.55) ($t(14) = -1.887$; $p = 0.081$) (Fig. 4). The reduction rate in AIQ-21 score (13.37 ± 0.82) after the intensive intervention was significantly higher than the decrease rate in AIQ-21 score (7.50 ± 0.56) after normal inter-

Table 2. Demographic and clinical characteristics of the patients from the two groups

Group	Patient ID	Age	Sex	Education level	Time post-onset (months)	Aphasia Type	Hand Dominance	Paralysis	Severity
Group I	N6	51	M	University	11	Non-fluent	Right	Non-paralysis	Moderate
	N2	49	F	High school	17	Non-fluent	Right	Paralysis	Moderate
	N5	64	M	University	14	Non-fluent	Right	Non-paralysis	Mild
	N13	61	F	University	13	Non-fluent	Left	Paralysis	Mild
	N4	49	M	High school	19	Non-fluent	Right	Non-paralysis	Mild
	N10	58	F	High school	11	Non-fluent	Right	Non-paralysis	Moderate
	N16	57	F	High school	9	Non-fluent	Right	Non-paralysis	Moderate
	N8	45	M	High school	10	Non-fluent	Right	Non-paralysis	Moderate
Group II	N12	50	M	University	13	Non-fluent	Right	Paralysis	Mild
	N7	63	F	High school	14	Non-fluent	Right	Paralysis	Mild
	N11	59	F	University	14	Non-fluent	Left	Non-paralysis	Mild
	N14	56	M	High school	15	Non-fluent	Right	Non-paralysis	Moderate
	N9	53	F	High school	18	Non-fluent	Right	Non-paralysis	Moderate
	N3	52	M	University	11	Non-fluent	Right	Non-paralysis	Moderate
	N15	46	F	High school	12	Non-fluent	Right	Non-paralysis	Moderate
	N1	45	M	University	9	Non-fluent	Right	Paralysis	Moderate

Table 3. Comparison of demographic characteristics of patients in groups after randomization

		Group 1 (n = 8)	Group II (n = 8)	*t*	*p value*
Age (years)		54.25 ± 6.69	53.00 ± 6.18	0.388	0.704
Diagnosis time (months)		13.00 ± 3.50	13.25 ± 2.71	-0.160	0.876
Gender	Male	4 (50.0%)	4 (50.0%)	0.000	1.000
	Female	4 (50.0%)	4 (50.0%)		
Employment status	Yes	5 (62.5%)	5 (62.5%)	0.000	1.000
	No	3 (37.5%)	3 (37.5%)		
Educational status	High School	5 (62.5%)	4 (50.0%)	-0.475	0.642
	University	3 (37.5%)	4 (50.0%)		
Marital status	Married	7 (87.5%)	7 (87.5%)	0.000	1.000
	Single	1 (12.5%)	1 (12.5%)		

Data are shown as mean ± standard deviation or n (%). ᵗStudent t test

vention (t(14) = 5.582; p = 0.00004) (Fig. 5). Considering the difference between the follow-up test scores and the pre-test scores according to the frequency of treatment applied, the changes in ADD (t(14) = -3.18; p = 0.007) and AIQ-21 (t(14) = 3.793; p = 0.002) were significant. It was observed that the change in BNT (t(14) = -1.429; p = 0.175) was not statistically significant (Table 6).

DISCUSSION

In this study, the results of the modified SFA treatment method, which was applied to 16 patients diagnosed with aphasia, were compared in two different treatment intensities. In the posttest performed after both modified SFA treatments, significant changes were determined in ADD, BNT, and AIQ-21 total scores compared to the pretest. One month after the end of therapy, although there was a significant change in the follow-up test scores compared to the posttest, the follow-up test results were still statistically different from the pretest results. However, the test results of the patients to whom we applied intensive intervention were found to be significantly different from those who received the normal intervention.

Cognitive therapy and speech and language therapies are applied to people who develop aphasia after stroke to improve their communication skills. However, the issue still under discussion is the duration and intensity of speech and language therapy to be administered. However, recent studies have reported that intensive speech and language therapy is beneficial in patients with aphasia [19-21]. Especially in people with chronic aphasia, significant improvements in language skills have been achieved as a result of a training intensity of 5-10 hours per week [6]. Two different intensive therapies were compared by Stahl *et al*. [11]. The 30 patients included in the study were randomly divided into two groups and one of the groups was administered ILAT three days a week and four hours a day (total of 48 hours) for four weeks, while the other group was administered ILAT three times a week and two hours a day (total 24 hours) for four weeks. Stahl *et al*. did not detect any difference in therapies at the end of four weeks, but they demonstrated that prolonging the treatment period by even two weeks contributed to the improvement in chronic aphasia. In another study, Mohr *et al*. [22] documented that ILAT administered to individuals with chronic aphasia was effective not only on language recovery but also in depression symptoms in chronic aphasia.

SFA is a method that contributes to the process of verbalizing the semantic features of the targeted items by the aphasic person. SFA has been reported to be effective in different types of aphasia [7-10]. It has been observed that SFA gives positive results in both group and discourse therapies [23, 24]. In his study examin-

Table 4. Comparison of Turkish aphasia test (ADD), Aphasia Impact Scale-21 (AIQ-21), and Boston Naming Test (BNT) scores

	Pretest	Posttest	Follow-up test
ADD			
Spontaneous speech, language, and cognition assessment	9.06 ± 1.52	12.87 ± 1.92[a]	12.81 ± 1.79[a]
Spontaneous speech	1.93 ± 0.85	5.18 ± 3.03[a]	5.18 ± 3.03[a]
Understanding commands	7.00 ± 1.03	7.31 ± 0.79	7.18 ± 0.83
Understanding Yes / No questions	7.62 ± 1.36	8.18 ± 1.06	7.87 ± 1.02
Understanding objects	10.75 ± 0.93	10.75 ± 0.93	10.31 ± 1.19
Understanding the categories	8.62 ± 1.54	8.62 ± 1.54	8.31 ± 1.62
Understanding the details within the category	7.18 ± 1.22	7.81 ± 1.79	7.00 ± 1.96
Simple sentence matching	3.43 ± 1.75	4.43 ± 1.50[a]	4.06 ± 1.23
Complex sentence matching	3.81 ± 2.07	5.43 ± 2.36[a]	5.43 ± 2.36[a]
Repetition	4.37 ± 1.31	7.81 ± 3.74[a]	7.50 ± 3.48[a]
Categorical naming	0.31 ± 0.47	1.25 ± 1.00[a]	1.25 ± 1.00[a]
Naming by looking at the picture	3.31 ± 2.79	7.62 ± 5.03[a]	7.37 ± 4.51[a]
Noun naming	0.81 ± 1.10	4.81 ± 3.08[a]	4.37 ± 2.72[a]
Action naming	2.00 ± 1.31	5.31 ± 2.75[a]	5.06 ± 2.32[a]
Total score	70.25 ± 4.58	97.43 ± 18.61[a]	93.75 ± 16.31[a, b]
BNT	21.06 ± 4.75	39.25 ± 4.83[a]	36.56 ± 5.03[a, b]
AIQ-21			
Communication	21.37 ± 1.08	16.12 ± 1.70	17.31 ± 1.81
Participation	15.68 ± 0.47	11.00 ± 1.63[a]	11.31 ± 1.74[a]
Emotional state	39.37 ± 1.25	38.87 ± 1.08	39.00 ± 1.09
Total score	76.43 ± 1.54	66.00 ± 3.26[a]	67.62 ± 3.77[a, b]

Data are shown as mean ± standard deviation. Repeated measures ANOVA, [a]$p < 0.05$ compared with pretest, [b]$p < 0.05$ compared with posttest.

ing the effectiveness of the SFA, Boyle [24] observed that 16 of 17 participants improved their naming skills with pictures, according to the meta-analysis results of Efstratiadou *et al*. [25], it was determined that the duration of SFA applied was between 2 weeks and 12 weeks and varied between 315 minutes and 1500 minutes in 21 separate studies with a total of 55 participants. It has been reported that weekly treatment sessions are between two and four sessions, and the duration of the sessions varies between 45 minutes and 120 minutes; the most frequently applied session duration is one hour [26]. In the same meta-analysis, 45 participants (81.82%) found improvement in the naming of the trained items, and it was documented that 32 participants (58.18%) continued to name the trained items [26].

In this study, intensive intervention and normal intervention of SFA were compared. When comparing the results, ADD, BNT and AIQ-21 tests were used. In the pretest performed before starting the treatments, ADD, BNT, and AIQ-21 scores of both groups were similar. When the posttest results after eight weeks of treatment were compared with the pretest results, it was found that the ADD and BNT scores increased significantly, and the AIQ-21 score decreased significantly. According to these results, it can be said that the therapy applied in both groups was effective on language skills. However, when the differences in the

Table 5. Comparison of Turkish aphasia test (ADD), Aphasia Impact Scale-21 (AIQ-21) and Boston Naming Test (BNT) according to the frequency of treatment

		Pretest	Posttest	Follow-up Test
ADD				
Spontaneous speech, language, and cognition assessment	Group I	9.25 ± 1.83	12.37 ± 1.50	12.37 ± 1.18
	Group II	8.87 ± 1.24	13.37 ± 2.26	13.25 ± 2.25
Spontaneous speech	Group I	1.87 ± 0.83	4.87 ± 2.23	4.87 ± 2.23
	Group II	2.00 ± 0.92	5.50 ± 3.81	5.50 ± 3.81
Understanding commands	Group I	6.87 ± 0.99	7.25 ± 0.88	7.12 ± 0.83
	Group II	7.12 ± 1.12	7.37 ± 0.74	7.25 ± 0.88
Understanding Yes / No questions	Group I	7.62 ± 0.51	7.62 ± 0.51	7.37 ± 0.74
	Group II	7.62 ± 1.92	8.75 ± 1.16	8.37 ± 1.06
Understanding objects	Group I	10.87 ± 0.64	10.87 ± 0.64	10.62 ± 0.91
	Group II	10.62 ± 1.18	10.62 ± 1.18	10.00 ± 1.14
Understanding the categories	Group I	8.25 ± 1.83	8.25 ± 1.83	7.87 ± 1.64
	Group II	9.00 ± 1.19	9.00 ± 1.19	8.75 ± 1.58
Understanding the details within the category	Group I	6.62 ± 0.74	6.62 ± 0.74	5.75 ± 1.48
	Group II	7.75 ± 1.38	9.00 ± 1.77	8.25 ± 1.58
Simple sentence matching	Group I	3.75 ± 1.03	4.50 ± 1.06	4.12 ± 0.83
	Group II	3.16 ± 2.29	4.37 ± 1.92	4.00 ± 1.60
Complex sentence matching	Group I	4.37 ± 1.99	5.87 ± 1.55	5.87 ± 1.55
	Group II	3.25 ± 2.12	5.00 ± 3.02	5.00 ± 3.02
Repetition	Group I	4.50 ± 1.19	7.12 ± 3.27	6.87 ± 3.09
	Group II	4.28 ± 1.48	8.50 ± 4.27	8.12 ± 3.94
Categorical naming	Group I	0.37 ± 0.51	0.62 ± 0.74	0.62 ± 0.74
	Group II	0.25 ± 0.46	1.87 ± 0.83	1.87 ± 0.83
Naming by looking at the picture	Group I	3.87 ± 2.99	6.00 ± 5.12	5.50 ± 4.30
	Group II	2.75 ± 2.65	9.25 ± 4.68	9.25 ± 4.13
Noun naming	Group I	0.87 ± 1.24	3.37 ± 2.87	2.87 ± 2.41
	Group II	0.75 ± 1.03	6.25 ± 2.71	5.87 ± 2.23
Action naming	Group I	2.37 ± 1.59	3.62 ± 1.59	3.50 ± 1.41
	Group II	1.62 ± 0.91	7.00 ± 2.67	6.62 ± 1.99
Total score	Group I	71.50 ± 5.23	89.00 ± 15.16	85.37 ± 11.83
	Group II	69.00 ± 3.74	105.87 ± 18.71	102.12 ± 16.43
BNT	Group I	20.75 ± 3.05	36.87 ± 5.40	34.62 ± 4.56
	Group II	21.37 ± 6.23	41.62 ± 2.82	38.50 ± 4.98
AIQ-21				
Communication	Group I	21.75 ± 0.70	17.50 ± 1.06	18.50 ± 1.30
	Group II	21.00 ± 1.30	14.75 ± 0.88	16.12 ± 1.45
Participation	Group I	15.75 ± 0.46	12.12 ± 1.45	12.37 ± 1.59
	Group II	15.62 ± 0.51	9.87 ± 0.83	10.25 ± 1.16
Emotional status	Group I	38.75 ± 1.28	39.12 ± 0.83	39.50 ± 0.53
	Group II	40.00 ± 0.92	38.62 ± 1.30	38.50 ± 1.30
Total	Group I	76.25 ± 1.16	68.75 ± 1.03	70.37 ± 2.19
	Group II	76.62 ± 1.92	63.25 ± 2.12	64.87 ± 2.90

Data are shown as mean ± standard deviation. Mixed ANOVA, [a]$p < 0.05$ compared with pretest, [b]$p < 0.05$ compared with posttest

Table 6. The differences between the posttest and follow-up test results and the pretest results are according to the groups.

		Group I	Group II	t	*p value*
ADD	Post – Pre	17.50 ± 4.85	36.87 ± 5.55	**-2.625**	**0.022**
	Follow up – Pre	13.87 ± 3.75	33.12 ± 4.73	**-3.186**	**0.007**
BNT	Post – Pre	16.12 ± 1.55	20.25 ± 1.55	-1.887	0.081
	Follow up – Pre	13.87 ± 1.60	17.12 ± 1.60	-1.429	0.175
AIQ-21	Post – Pre	-7.50 ± 0.56	-13.37 ± 0.82	**5.582**	**0.0004**
	Follow up – Pre	-5.87 ± 1.05	-1.75 ± 1.12	**3.793**	**0.002**

Data are shown as mean ± standard deviation. [t]student t test.

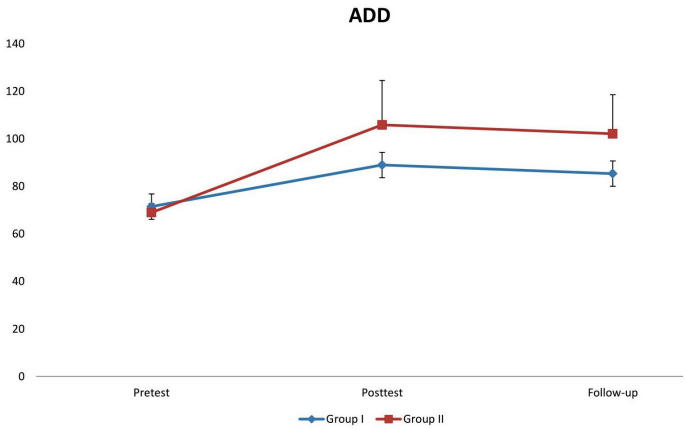

Fig. 3. Comparison of Turkish aphasia test (ADD) administered to the participants according to the frequency of treatment. Group I, Aphasic patients receiving therapy for one hour a day, once a week for eight weeks (total 8 hours); Group II, Aphasic patients receiving therapy for one hour a day, six days a week for eight weeks (total 48 hours).

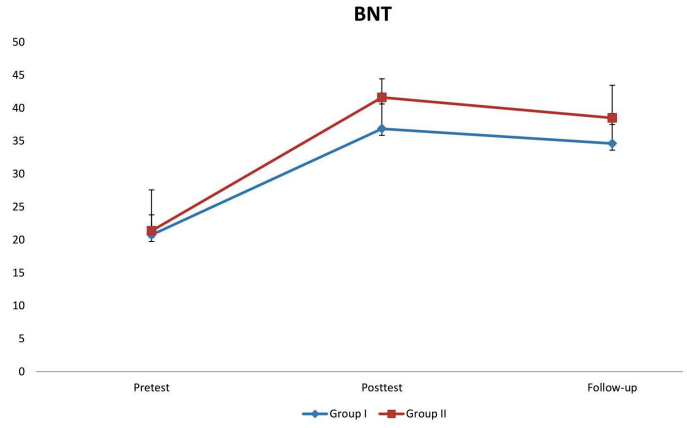

Fig. 4. Comparison of Boston Naming Test (BNT) administered to the participants according to the frequency of treatment. Group I, Aphasic patients receiving therapy for one hour a day, once a week for eight weeks (total 8 hours); Group II, Aphasic patients receiving therapy for one hour a day, six days a week for eight weeks (total 48 hours).

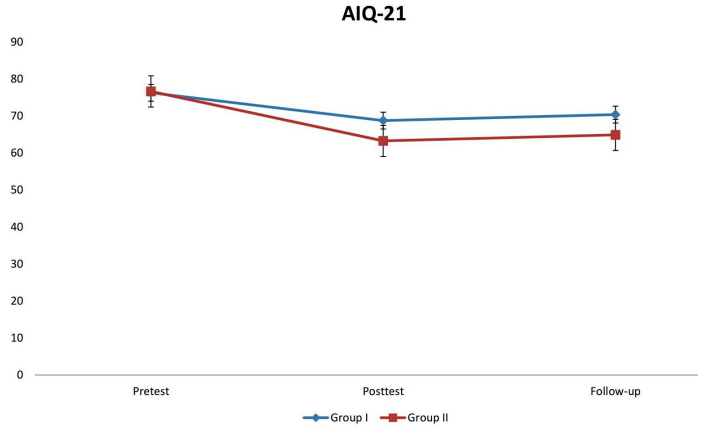

Fig. 5. Comparison of Aphasia Impact Questionary-21 (AIQ-21) administered to the participants according to the frequency of treatment. Group I, Aphasic patients receiving therapy for one hour a day, once a week for eight weeks (total 8 hours); Group II, Aphasic patients receiving therapy for one hour a day, six days a week for eight weeks (total 48 hours).

test results of both groups were compared, the intensive intervention was more effective than the normal intervention. Obtaining different treatment results from studies on SFA may be due to different treatment durations, dosages, and the total amount of treatment. In the previous meta-analysis, it was reported that SFA was applied for a maximum of 1500 minutes so far. In our study, a total of 2880 minutes of SFA was administered in the intensive intervention group. The results of our study are consistent with both studies in which SFA is effective in aphasia patients and the results of studies showing that intensive speech and language therapy is more effective.

How much the acquired skills are maintained is as important as the effectiveness of speech and language therapy applied to patients with aphasia. It has been documented that the gains obtained from training on word retrieval were maintained one month after the treatment [27]. Breitenstein *et al*. [19] reported that the effects of intensive treatment applied to individuals with chronic aphasia were maintained after six months. In another study by Meinzer *et al*. [27], they determined the stability of the effect of intensive restraint-induced aphasia treatment at 6-month follow-up. In this study, we performed a follow-up evaluation one month after the end of treatment. Although follow-up evaluation results varied from the posttest, they were still significantly different from pretest results. These results show that the gains from the therapy we applied are maintained one month after the treatment.

The strength of the study is that it is the first study to compare both the normal intervention and the intensive intervention of SFA. In addition, working with individuals with chronic aphasia is important in terms of demonstrating the effectiveness of the treatment applied. The limitations of the study are that it was single-centered and did not have long-term results. The results of our study should be supported by multicenter studies, more participants, and longer-term studies.

Limitations

The study consisted of only individuals with non-fluent aphasia and was limited to only the specific group in order to eliminate the effect of different types of aphasia on recovery. At the same time, only chronic individuals were included, and spontaneous recovery processes were excluded, and education level and pre-therapy history were not considered when determining the participants. Furthermore, no neuropsychological evaluations were made after the applications.

CONCLUSION

According to the results of our study, intensive intervention treatment was superior to normal intervention of SFA. In this study, individuals with chronic aphasia benefited from both SFA interventions. Therefore, it is very important to include aphasic patients in therapy processes (especially in intensive intervention SFA), even if they are in the chronic phase.

Authors' Contribution

Study Conception: İCY; Study Design: İCY; Supervision: İCY; Funding: İCY; Materials: İCY; Data Collection and/or Processing: İCY; Statistical Analysis and/or Data Interpretation: İCY; Literature Review: İCY; Manuscript Preparation: İCY and Critical Review: İCY.

Conflict of interest

The author disclosed no conflict of interest during the preparation or publication of this manuscript.

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