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Correlation of Aphasic Individual's Performances in Three Turkish Aphasia Tests: A Study of Criterion Validity

İnmeli Bireylerin Üç Türkçe Afazi Testindeki Performansları Arasındaki İlişki: Bir Ölçüt Geçerliği Çalışması

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Summary

Objective: Assessing the language characteristics of aphasic patients is essential for aphasia rehabilitation. In Turkey, there is a limited number of tests developed for this purpose. There is a significant need literature for a study comparing aphasic patients' performance in Turkish aphasia tests. The overall purpose of this study is to investigate the correlation of aphasic individuals' performances on Language Assessment Test for Aphasia, Ege Aphasia Test, and Gülhane Aphasia Test-2 and to perform a criterion validity study for ADD. In addition to the aphasic participants, the performance of healthy participants as a control group on all three of the tests is analyzed.

Material and Method: This study was carried out in two stages, the correlation study for the Language Assessment Test for Aphasia and the Ege Aphasia Test; and the correlation study of Language Assessment Test for Aphasia and the Gülhane Aphasia Test-2. In both steps, the tests were administered to 30 aphasic and 30 healthy participants and data from the corresponding subtests of the two tests were used. In addition, in both steps, the tests were administered to healthy participants and their performances were compared with those of the aphasic subjects.

Results: The results show that aphasic subjects performed considerably less than healthy participants on all three tests and there is a significant difference between the performances of aphasic and healthy subjects. A high degree of correlation was found between the performances of aphasic subjects in the Language Assessment Test for Aphasia - Ege Aphasia Test and the Language Assessment Test for Aphasia - Gülhane Aphasia Test-2

Discussion: In conclusion, it was seen that all three tests show a high compatibility and they can be used interchangeably for the purpose of assessing the language characteristics of aphasic individuals. *(Turkish Journal of Neurology 2013; 19:15-22)*

Key Words: Aphasia, assessment of aphasia, Language Assessment Test for Aphasia, Ege Aphasia Test, Gülhane Aphasia Test-2

Özet

Amaç: Afazili bireylerin dil özelliklerinin değerlendirilmesi, afazi rehabilitasyonunda büyük önem taşımaktadır. Türkiye'de afazili bireylerin değerlendirilmesi amacına yönelik geliştirilmiş az sayıda test bulunmaktadır. Afazili bireylerin Türkçe'de kullanılan afazi testlerindeki performanslarının karşılaştırıldığı bir çalışma gereksinimi alanyazında önemli bir yer tutmaktadır. Bu araştırmanın genel amacı, afazili katılımcıların Afazi Dil Değerlendirme Testi, Ege Afazi Testi ve Gülhane Afazi Testi - 2 performansları arasındaki korelasyonun incelenmesi ve sonucunda da ADD'nin ölçüt geçerliği çalışmasını gerçekleştirmektir. Ayrıca, afazili katılımcıların yanı sıra çalışmada kontrol grubu olarak yer alan sağlıklı katılımcıların her iki testteki performansları da incelenmiştir.

Gereç ve Yöntem: Araştırma, Afazi Dil Değerlendirme Testi - Ege Afazi Testi korelasyon çalışması ve Afazi Dil Değerlendirme Testi - Gülhane Afazi Testi-2 korelasyon çalışması olmak üzere iki aşamada gerçekleştirilmiştir. Her bir aşamada söz konusu testler 30 afazili ve 30 sağlıklı katılımcıya uygulanmıştır. İki aşamada da karşılaştırılan her iki testte ortak olan alt testlerden elde edilen veriler kullanılmıştır. Aynı zamanda her iki aşamada da kullanılan testler sağlıklı bireylere de uygulanmış ve performansları afazili bireylerin performansları ile karşılaştırılmıştır.

Bulgular: Elde edilen bulgulara göre, uygulanan üç testte de afazili bireylerin sağlıklı bireylerden belirgin biçimde düşük performans sergiledikleri ve afazili ve sağlıklı katılımcıların performansları arasında anlamlı fark olduğu bulunmuştur. Afazili bireylerin hem Afazi Dil Değerlendirme Testi - Ege Afazi Testi hem de Afazi Dil Değerlendirme Testi - Gülhane Afazi Testi-2 performansları arasında anlamlı düzeyde yüksek korelasyon olduğu bulunmuştur.

Sonuç: Sonuç olarak her üç testin birbiriyle yüksek korelasyon gösterdiği ve afazili bireylerin dil özelliklerinin değerlendirilmesi amacıyla birbirinin yerine kullanılabileceği görülmüştür. *(Türk Nöroloji Dergisi 2012; 19:15-22)*

Anahtar Kelimeler: Afazi, afazi değerlendirme, Afazi Dil Değerlendirme Testi, Ege Afazi Testi, Gülhane Afazi Testi-2

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Introduction

Aphasia is defined as loss or impairment of language functions as a result of brain damage (1). It may also cause destructive results including communication disorders, decrease in social activities, depression and termination of work life (2) and is very frequently seen following stroke. Acute stroke patients are reported to have aphasia at a rate of 21-38% (3). Aphasic individuals receiving intensive therapy within the first 2-3 months following stroke are observed to have an increase in their language skills. Therefore, early diagnosis as well as detailed language and speech evaluation to determine the form of language impairment caused by brain damage would increase the benefit to be derived by rehabilitation (4).

American Speech-Language-Hearing Association's (ASHA) Language-Speech Pathology Assessment Instruments Directory contains up to 50 tests used to evaluate language function in adults in USA, and most of them are related to assessment of aphasia (5). Benson (1) lists some of the commonly used aphasia evaluation batteries as follows: Minnesota Test for the Differential Diagnosis of Aphasia (Schuell, 1955, 1957, 1965), Functional Communication Profile (Sarno, 1969), The Assessment of Communicative Activities Relevant to Daily Living (Holland, 1980), The Porch Index of Communicative Ability (Porch, 1967), The Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1972, 1983), Western Aphasia Battery (Kertesz & Poole, 1974; Kertesz, 1979, 1982), Aachen Aphasia Test (Willmes et al., 1980), Sklar Aphasia Scale (Sklar, 1983) and Frenchay Aphasia Screening Test (Enderby, Wood ve Wade, 1987). In addition, Comprehensive Aphasia Test (Swinburn, Porter, Howard, 2005), Amsterdam-Nijmegen Everyday Language Test (Blomert, Koster & Kean, 1995) and Communicative Effectiveness Index (Lomas, Pickard, Bester, Elbard, Finlayson, Zoghaib, 1989) are also being used in evaluation.

Among the few tests used in the evaluation of aphasia in Turkey, and that have all been standardized, validated and tested for reliability, are the Frenchay Aphasia Screening Test (6), Gülhane Aphasia Test (GAT) (7) and Gülhane Aphasia Test-2 (GAT-2) (8), Aphasia Language Assessment Test (ALA) (9), and Ege Aphasia Test (EAT) (10). The lack of another aphasia test measuring the same characteristics in the field precludes criteria validity testing, and presents the most important limitation of these tests. Validity of measurement is described as the correct measurement degree of measuring tool of the feature intended to measure without the interference of other features (11). It is determined via three basic ways including validity of content, structure and criteria (12). The degree of association between the behaviour or characteristics assumed to be measured by a test and the measurement obtained from another known measurement tool provides criteria validity (13).

Some of the previously mentioned and globally used tests were studied in relation to another test to determine their criterion validity in standardization, validation, reliability studies. For example. Frenchay Aphasia Screening Test is designed to be administered by non-specialist persons and takes about 3-10 minutes to administer. In the standardization study, the Functional Communication Profile (FCP) was found to have a high correlation between administration in patients 15 days following stroke (r=.87) and those who had chronic aphasia (r=.96) (14). Sklar Aphasia Scale (SAS) provides a brief aphasia evaluation in four areas including auditory analysis, visual analysis, verbal coding, and graphic coding, Based on the structural validity findings from the 1973 SAS version of the validity study of Cohen, Engel, Kelter, List and Strohner (15), the correlation of SAS and Trail Making Test and Token Test for nonfluent and fluent aphasia patients was .32 ($p<.05$) and .75 ($p<.01$), respectively, and .55 ($p<.01$) and .85 ($p<.01$), respectively. In the Scenario Test developed based on the Amsterdam-Nijmegen Everyday Language Test (ANELT), the subject is asked to provide appropriate responses to situations encountered in daily life, and aims to evaluate the aphasic individuals functional verbal and nonverbal communication skills on daily life. In the structural validity study of the Scenario Test, its compatibility with three separate tests, ANELT, the "communicative behaviour" subtest of the spontaneous speech section of the Aachen Aphasia Test (AAT) and the Communicative Effectiveness Index (CETI), a partner questionnaire was examined. There was high compatibility with ANELT and the "communicative behaviour" subtests of AAT of .85 ($p<.01$) and .79 ($p<.01$), respectively. On the other hand, there was moderate, but significant correlation with CETI (.50, $p<.01$) (16). The Comprehensive Aphasia Test (CAT) developed by Swinburn, Porter and Howard (17) is a comprehensive aphasia evaluation test aiming to measure the effects of the cognitive deficiencies, language disorder, and aphasia on the individual's life style and emotional status and observe the changes over time. Based on the structural validity studies, there was a correlation of .68 between the spoken word comprehension subtest of CAT and spoken word matching with image subtest of Morris, and a correlation of .71 between the written word comprehension subtest of CAT and written word matching with image subtest of Morris. In addition, there was a compatibility of .89 ($p<.01$) between the auditory comprehension in Test for Reception of Grammar (TROG) and spoken sentence comprehension test in CAT, and .89 ($p<.01$) compatibility between Nickels Naming Test and CAT naming subtest (18). Keklikoğlu, Selçuki and Keskin translated the Western Aphasia Battery (WAB) into Turkish to investigate the availability in Turkish speaking aphasic individuals (19) and administered it to 31 patients. In the second stage of the study they administered the Gülhane Aphasia Test (GAT) and the Frenchay Aphasia Screening Test (FAST) to the same patients and studied the correlation of the results of these tests. High degree correlation was found between these three tests; there was a high degree correlation between the spontaneous speech score in WAB and expression language score in FAST ($p<.01$), significant correlation between auditory comprehension, comprehension and comprehension scores in GAT, WAB and FAST, respectively, and high correlation between repetition scores in WAB and comprehension scores in FAST ($p<.01$). There was also high correlation between reading comprehension and writing scores in FAST and WAB ($p<.01$) (19).

Although some of these tests used widely in the evaluation of aphasia have been translated into various languages, direct translations do not provide an effective assessment due to selected terms and other cultural variables (20). Aphasia assessment tests should be developed taking the characteristics of the culture and language into consideration. Therefore, Turkish, a language from the Ural-Altaic language group is distinctly different from the Indo-European language group, and forms of translated aphasia

assessment tests developed for English speaking individuals in this specific language group would not be suitable to evaluate Turkish speaking aphasic individuals (21). Some tests used worldwide, such as Western Aphasia Battery (22) and Boston Diagnostic Aphasia Examination (BDAE) (23) have been translated into Turkish, used in aphasia clinics, and are still used. However, there will be some limitations in evaluating the language characteristics of aphasic individuals and consequently preparing an intervention plan, because these tests have not been adapted to Turkish and standardized. Therefore, using tests that have been standardized, validated and proven reliability and that reflect the characteristics of the language and culture carries great importance in the rehabillitation of aphasia. In Turkish there are no studies that contain various approaches to evaluate the language skills of aphasic individuals, to find out the compatibility of validated and reliable tests using distinct questions and distinct materials in identifying the strong and weak points of aphasic individuals. It is also not known whether similar results would be obtained if these tests were to be used interchangebly.

The overall objective of this study is examine the correlation between the performance of aphasic subjects of the Aphasia Language Assessment Test (ALA) (9) and the Ege Aphasia Test (EAT) (10) and Gülhane Aphasia Test-2 (GAT-2) (8) and as a consequence test the criterion validity of ALA. The study will be conducted in two stages, and the questions to be answered in these two stages are as follows:

ALA-EAT correlation study

What are the scores for aphasic and healthy subjects in ALA and EAT?

2- Is there any difference between the performance of the aphasic and healthy subjects in these two tests?

3- What is the correlation between the performance of the aphasic subjects in ALA and EAT?

ALA-GAT-2 correlation study

1- What are the scores for aphasic and healthy subjects in ALA and GAT-2?

1- Is there any difference between the performance of the aphasic and healthy subjects in these two tests?

2- What is the correlation between the performance of the aphasic subjects in ALA and GAT-2?

Material and Method

This study was conducted in two stages, including determining the correlation between the results of Aphasia Language Assessment Test (ALA) and Ege Aphasia Test (EAT), and Aphasia Language Assessment Test (ALA) and Gülhane Aphasia Test-2 (GAT-2).

Investigational Model

This investigation was designed as a comparative descriptive model.

Participants in the Investigation

ALA-EAT Correlation Study

A total of 30 aphasic individuals (19 men, 11 women) were enrolled in this stage of the study. In addition, 30 healthy individuals (18 men, 12 women) without any neurologic problems were enrolled as the control group. Aphasic participants were subjects who had presented at Anadolu University Language and Speech Disorders Training, Research and Practice Center between November 2011 and April 2012. Healthy participants were those who live in Isparta and Eskisehir and who did not have a history of stroke or brain damage. All participants were included in the study on a voluntary basis.

Table 1. Demographic Information of Aphasic and Healthy Participants

		ALA-EAT Study		ALA-GAT-2 Study	
		Aphasic (n=30)	Healthy (n=30)	Aphasic (n=30)	Healthy (n=30)
Sex					
	Female	11	12	8	8
	Male	19	18	22	22
Age (years)		Mean:56.9±10.7	Mean:51.3±11.8	Ort:55.4±12.6	Ort:54.2±12.2
	23-44	4	8	8	8
	45-59	13	16	8	9
	60-74	12	5	13	12
	75+	1	1	1	1
Education (years)		Mean:8.3±3.9	Mean:11.1±3.8	Mean:8.9±3.9	Mean:8.5±3.8
	ILL	1	0	0	0
	1-5	12	6	12	13
	1-8	4	3	5	4
	1-11	9	9	7	7
	12+	4	12	6	6

ILL: Illiterate; ALA: Aphasia Language Assessment Test; EAT: Ege Aphasia Test; GAT-2: Gülhane Aphasia Test-2

ALA- GAT-2 Correlation Study

A total of 30 aphasic individuals (22 men, 8 women) were included in the study. In addition, 30 healthy individuals (22 men, 8 women) without neurologic problems were enrolled as the control group. Aphasic participants were individuals who had presented at the Istanbul Maltepe Darussafaka Physical Therapy and Rehabilitation Center and Anadolu University Language and Speech Disorders Training, Research and Practice Center (DILKOM) between November 2011 and April 2012. Healthy participants were those who lived in Istanbul and Eskisehir and who did not have a history of stroke or brain damage. All participants were included in the study on a voluntary basis.

Demographic information on all participants are presented in Table 1.

Data Collection Tool

The data of this study were collected using "Aphasia Language Assessment Test (ALA)" (9), "Ege Aphasia Test (EAT)" (10) and "Gülhane Aphasia Test-2 (GAT-2)" (8).

Aphasia Language Assessment Test

Aphasia Language Assessment Test (ALA) published by Maviş and Toğram (9) aims to identify in all language areas, diagnose aphasia and help select appropriate therapeutical targets in individuals experiencing left brain damage following cerebrovascular accident (CVA). ALA consists of 8 subtests evaluating fluency of speech, auditory comprehension, repetition, naming, reading, word action, grammar, and writing. If the subject answers correctly when the question is initially asked without any help or clues the score is 2, if the subject answers correctly when the question is repeated more than twice and/or if there is any help or clue, with a delay or there is a partial response the score is 1, if the subject answers incorrectly with or without help the score is 0.

Ege Aphasia Test

Ege Aphasia Test (EAT) was developed by Atamaz, Yağız-On and Durmaz (10) at Ege University to measure all language skills of aphasic individuals, including spontaneous speaking, speech fluency and output, auditory comprehension, repetition, naming, written output, reading comprehension, figure drawing and praxis. Although Atamaz et al. (10) mentioned that EAT consists of 9 subtests, the test battery acquired by the investigator in 2011 and used in the study consists of 8 subtests: figure and characteristics

Table 2. ALA Subtest Mean Scores for Participant Groups

Subtests	Groups	n	Highest Score	($\overline{X}$)	SD	SE	p
AC	Aphasic	30	66	45.10	19.27	3.51	.001
	Healthy	30	66	65.33	1.02	.18	
R	Aphasic	30	20	9.50	8.22	1.50	.001
	Healthy	30	20	19.97	.18	.03	
N	Aphasic	30	44	16.70	18.19	3.32	.001
	Healthy	30	44	44.00	.00	.00	
Re	Aphasic	30	50	17.17	19.29	3.52	.001
	Healthy	30	50	48.93	1.46	.26	
W	Aphasic	30	40	19.20	14.25	2.60	.001
	Healthy	30	40	40.00	.00	.00	

(AC: Auditory comprehension, R: Repetition, N: Naming, Re: Reading, W: Writing)

Table 3. EAT Subtest Mean Scores of Participant Groups

Subtests	Groups	n	Highest score	($\overline{X}$)	SD	SE	p
AC	Aphasic	30	0	34.23	27.56	5.03	.001
	Healthy	30	0	.17	.59	.10	
R	Aphasic	30	0	44	37.45	6.83	.001
	Healthy	30	0	.03	.18	.03	
N	Aphasic	30	0	66.93	38.59	7.04	.001
	Healthy	30	0	.73	1.63	.29	
Re	Aphasic	30	0	42.77	28.52	5.20	.001
	Healthy	30	0	.37	.66	.12	
W	Aphasic	30	0	44.87	23.68	4.32	.001
	Healthy	30	0	1.93	1.83	.33	

(AC: Auditory comprehension, R: Repetition, N: Naming, Re: Reading, W: Writing)

of speech, assessment of apraxia, auditory/verbal comprehension, repetition, naming, visual comprehension/reading, figure drawing/writing/sentenced forming, arithmetic operations. In scorting, there is some variability based on the subtests, but in general 0 point is given for a correct answer, 1, 2 or higher points are given to repeated and incorrect answers.

Gülhane Aphasia Test-2 (GAT-2)

GAT-2 consists of a total of 7 sections. These sections are spontaneous speaking, speaking comprehension, reading comprehension, oral motor evaluation, automatic speaking, repetition and naming. Total scores of the test are divided into two as 'language-score' and 'motor-score'. 'Language-score' consists of the total scores of the subtests spontaneous speaking, speaking comprehension, automatic speaking, repetition and naming, whereas 'motor-score' consists of the scores of the subtest oral motor evaluation. 'Language-score' provides information

Table 4. Correlation Between the ALA and EAT Performances of Particiant Groups

		EATAC	EATR	EATN	EATRe	EATW
ALAAC	r	-.904(**)				
	p	.000				
	N	30				
ALAR	r		-.890(**)			
	p		.000			
	N		30			
ALAN	r			-.977(**)		
	p			.000		
	N			30		
ALARe	r				-.904(**)	
	p				.000	
	N				30	
ALAW	r					-.942(**)
	p					.000
	N					30

** The correlation is significant at the level of 0.01 (2-tailed).

(ALAAC: ALA Auditory Comprehension, ALAR: ALA Repetition, ALAN: ALA Naming, ALARe: ALA Reading, ALAW: ALA Writing, EATAC: EAT Auditory Comprehension, EATR: EAT Repetition, EATN: EAT Naming, EATRe: EAT Reading, EATW: EAT Writing)

Table 5. Mean ALA Subtest Scores of Participant Groups

Subtests	Groups	n	Highest score	($\overline{X}$)	SD	SE	p
LC	Aphasic	30	20	8.9	8.21	1.49	.001
	Healthy	30	20	19.8	.51	.1	
AS	Aphasic	30	12	3.3	4.24	.77	.001
	Healthy	30	12	11.9	.4	.07	
SLS	Aphasic	30	32	12.2	12.03	2.2	.001
	Healthy	30	32	31.6	.89	.16	
AC	Aphasic	30	66	36.8	17.93	3.27	.001
	Healthy	30	66	64.8	1.47	.27	
R	Aphasic	30	20	7.5	8.03	1.47	.001
	Healthy	30	20	19.9	.18	.03	
N	Aphasic	30	42	12.7	15.04	2.75	.001
	Healthy	30	44	43.6	.67	.12	
Re	Aphasic	30	50	13.3	17.17	3.14	.001
	Healthy	30	50	49.3	1.16	.21	

(LC: Language-cognition, AS: Automatoc speaking, SLS: Spontaneous language and speaking, AC: Auditory comprehension, R: Repetition, N: Naming, Re: Reading)

about the individual's performance on language, whereas 'motor-score' provides information about motor speech problems. The pronunciation of responses does not affect scoring. Each correct response scores 1 point.

Collection of Data

ALA, EAT and GAT-2 were administered to the aphasic subjects enrolled in the study by the investigators in the therapy rooms at the Anadolu University Language and Speech Disorders Training, Research and Practice Center. All tests were administered to the healthy participants by the investigator in their own environment. All three tests used in the study were administered to all the participants. However, consistent with the objective of the study, only the common subtests were used to determine the correlation of the tests in the aphasic participants. In the first stage, i.e. the correlation study for ALA and EAT, the association between the subtests auditory comprehension, repetition, naming, reading and writing was investigated. In the second stage, the association between the common subtests for ALA and GAT-2, i.e. the subtests language-cognition assessment/awareness, auditory comprehension, naming, repetition, reading comprehension, was investigated.

Data Analysis

All of the statistical analyses were performed with the SPSS 17.0 (SPSS Inc., Chicago, IL. U.S.A.) software. Arithmetic means ± standard deviation (SD) were used for descriptive statistics. As the data obtained from participants did not show normal distribution, nonparametric statistical analysis methods (Mann-Whitney U test) were used. Pearson product moment correlation coefficient analysis was used to examine the association between the common subtests of ALA, EAT and GAT-2. While evaluating the results of the correlation analysis, it was taken into consideration that subtests for ALA and GAT-2 were assessed for total score and subtests for EAT for total error score. Therefore, the performance of the subject is in direct proportion with the scores in ALA and GAT-2 and inverse proportion with the scores in EAT.

Findigs

Findings for the ADD-EAT Correlation Study

Examining the scores of aphasic and healthy subjects in ALA

The scores for aphasic and healthy subjects in the common subtests of ALA and EAT were calculated. The mean scores, standard deviations, and standard errors for both groups in the ADD subtests are shown in Table 2.

Mean ALA scores for aphasic subjects were seen to be clearly lower than the mean scores of healthy subjects.

Examining the scores of aphasic and healthy subjects in EAT

Tthe mean scores, standard deviations, and standard errors for both groups in the EAT subtests are shown in Table 3.

EAT error score for aphasic subjects was seen to be clearly higher than the mean score of healthy subjects.

Examining the correlation between the ALA and EAT performances of aphasic subjects

As the scoring for both tests were different, the participants' scores were converted into standard z scores to examine the correlation between the ALA and EAT scores of the aphasic subjects. Pearson correlation coefficient was calculated to analyze the association between the common subtests using z scores. The findings are shown in Table 4.

There was also a high correlation (between -.89 and -.977, $p<.001$) between the scores the aphasic group got in the common ALA and EAT subtests (auditory comprehension, repetition, naming, reading, writing).

Findings for the ALA-GAT-2 Correlation Study

Examining the ALA scores for aphasic and healthy subjects

Mean ALA scores for aphasic subjects were seen to be clearly

Table 6. Mean GAT-2 Subtest Scores of Participant Groups

Subtests	Groups	n	Highest score	($\overline{X}$)	SD	SE	p
AWA	Aphasic	30	5	1.9	2.16	.39	.001
	Healthy	30	5	5	0	0	
SC	Aphasic	30	14	8	4.26	.78	.001
	Healthy	30	14	13.9	.18	.03	
RC	Aphasic	30	23	6.5	7.93	1.45	.001
	Healthy	30	23	22.8	.46	.08	
C	Aphasic	30	37	14.5	11.61	2.12	.001
	Healthy	30	37	36.8	.61	.11	
AS	Aphasic	30	4	1.5	1.74	.32	.001
	Healthy	30	4	4	0	0	
R	Aphasic	30	13	5.1	5.51	1.01	.001
	Healthy	30	13	13	0	0	
N	Aphasic	30	10	3.1	3.95	.72	.001
	Healthy	30	10	9.9	.18	.03	

(AWA: Awareness, SC: Speaking comprehension, RC: Reading comprehension, C: Comprehension, AS: Automatic speaking, R: Repetition, N: Naming)

lower than the mean scores for healthy subjects.

Examining the GAT-2 scores for aphasic and healthy subjects

Mean scores, standard errors, and standard deviations for both groups in the GAT-2 subtests are seen in Table 6.

Mean GAT-2 scores for aphasic subjects are seen to be clearly lower than the mean scores for healthy subjects.

Examining the correlation between the ALA and GAT-2 performances of aphasic subjects

There was a high degree correlation (between 0.763 and 0.949, p<.001) between the ALA and GAT-2 common subtest (language-cognition evaluation/awareness, auditory comprehension, naming, repetition, reading) scores for the aphasic subjects.

Discussion

This study was conducted to test the criterion validity of the Aphasia Language Assessment Test (ALA) developed to assess the language skills of aphasic individuals in Turkey, and to determine the correlation the correlation between ALA and EAT and GAT-2, two other tests developed with the some objective, by administering these tests to aphasic individuals.

The findings of the study showed that performances of aphasic subjects in ALA, EAT and GAT-2 are lower than those of healthy subjects and there was a statistically significant difference. When the performance of aphasic subjects was examined, there was a high degree of correlation in all the common subtests of auditory comprehension, repetition, naming, reading and writing in ALA and EAT. Similarly, there was high and statistically significant correlation in common subtests of language-cognition evaluation/awareness, auditory comprehension, naming, repetition, reading in ALA and GAT-2. Within the validity and reliability study of a newly developed test or scale, the results are compared with scores of another measuring tool serving the same purpose to test criterion validity. If the coefficient of correlation obtained as a result of this comparison is high, the crietrion validity is considered to be high (24). Therefore, the higher the coefficient of correlation, the more similar both tests measure the behaviour or characteristics assumed to be measured. The finding of high correlation between ALA-EAT and ALA-GAT-2 shows that the common subtests measure the behaviours with a high degree of association. In short, both tests serve the same purpose.

When literature was reviewed in context of the findings of this study, high correlation was found in some correlation studies between some tests used in global aphasia assessments similar to our findings (14, 16, 18, 25). In Turkish literature high correlation was found in some studies conducted to investigate the correlation between more than one aphasia test (19).

In the validity, reliability and standardization study for ALA, the performances of healthy subjects in all subtests of ALA were reported to be significantly higher than the performances of aphasic subjects (21). In the validity, reliability and standardization study conducted by Colay (26) for GAT-2, performances of healthy subjects were found to be significantly higher than the performances of aphasic subjects. The findings of this study are seen to be parallel to the results of the Toğram (21) and Colay (26) studies. In the Atamaz et al. (10) study for EAT, there were no comparison findings because it was conducted with only healthy

Table 7. Correlation Between the ALA and GAT-2 Performances of Participant Groups

		GAWA	GSC	GRC	GAS	GR	GN
ALC	r	.935(**)					
	p	.001					
	N	30					
AAC	r		.763(**)				
	p		.001				
	N		30				
ARe	r			.949(**)			
	p			.001			
	N			30			
AAS	r				.90(**)		
	p				.001		
	N				30		
AR	r					.936(**)	
	p					.001	
	N					30	
AA	r						.937(**)
	p						.001
	N						30

** The correlation is significant at the level of 0.01 (2-tailed).

(ALC: ALA Language-cognition, AAC: ALA Auditory comprehension, ARe: ALA reading, AAS: ALA Automatic speaking, AR: ALA Repetition, AN: ALA Naming, GAWA: GAT-2 Awareness, GSC: GAT-2 Speaking comprehension, GRC: GAT-2 Reading comprehension, GAS: GAT-2 Automatic speaking, GR: GAT-2 Repetition, GN: GAT-2 Naming)

subjects and there was no data collected from aphasic subjects. In this study, as in ALA, there was a significant difference between the two participant groups in EAT, and healthy subjects were found to have a statistically significantly higher mean scores than aphasic subjects.

The reason for the significantly negative correlation between the ALA and EAT common subtests in the first stage of this study is the difference in the scoring systems in the two tests. While a correct response scores 2 points and an incorrect response scores 0 point in ALA, a correct response scores 0 point and an incorrect response scores 1, 2 or higher points in EAT. For example, when all the questions in the auditory comprehension subtest are correctly answered ALA will be scored 66 points, and EAT will be scored 0 point, whereas when all the questions are incorrectly answered ALA will be scored 0 point and EAT will be scored 100 points. Therefore, ALA scores increase and EAT scores decrease as the subject's performance improves. Due to this difference in scoring, as previously mentioned, to make test scores comparable, scores were converted into standard z scores in SPSS and consequently correlation was analyzed. As a result, all tests were found to be negatively and significantly associated (-.89 and -.977).

Conclusion and Suggestions

In this study investigating the correlation between the Aphasia Language Assessment Test, Ege Aphasia Test and Gülhane Aphasia Test-2 scores, there was a difference between the ALA-EAT and ALA-GAT-2 performance of aphasic and healthy subjects and the scores of aphasic subjects were significantly lower than the scores of healthy subjects. There was a high correlation (between 0.763 and 0.949, $p<.001$) between the ALA and GAT-2 common subtest (language-cognition evaluation/awareness, auditory comprehension, naming, repetition, reading) scores of aphasic subjects. There was also a high correlation (between -.89 and -.977, $p<.001$) between the ALA and EAT common subtest (auditory comprehension, repetition, naming, reading, writing) scores of the aphasic group. The high correlation between the two tests used to identify the language characteristics of aphasic subjects emphasizes the importance of developing language and culture specific tests.

In addition, the performances of groups with other neurologic problems including dementia, head trauma, right brain damage known to be seen in communication and/or language-speech problems can be compared in these tests. Performances can be compared taking into consideration variables such as sex, age, education level and socioeconomic level. Finally, performances can be compared based on the location of lesion supported by brain imaging techniques (MRI, CT etc.) and/or type of aphasia.

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