

## Measuring Alexithymia via Trait Approach-I: A Alexithymia Scale Item Selection and Formation of Factor Structure

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### ABSTRACT

**Introduction:** It is not clear in the literature whether available instruments are sufficient to measure alexithymia because of its theoretical structure. Moreover, it has been reported that several measuring instruments are needed to measure this construct, and all the instruments have different error sources. The old and the new forms of Toronto Alexithymia Scale are the only instruments available in Turkish. Thus, the purpose of this study was to develop a new scale to measure alexithymia, selecting items and constructing the factor structure.

**Methods:** A total of 1117 patients aged from 19 to 82 years (mean = 35.05 years) were included. A 100-item pool was prepared and applied to 628 women and 489 men. Data were analyzed using Explanatory Factor Analysis, Confirmatory Factor Analysis, and Item Response Theory and 28 items were selected. The new form of 28 items was applied to 415 university students, including 271 women and 144 men aged from 18 to 30 (mean=21.44).

**Results:** The results of Explanatory Factor Analysis revealed a five-factor construct of "Solving and Expressing Affective Experiences," "External Locus Cognitive Style," "Tendency to Somatize Affections," "Imaginary Life and Visualization," and "Acting Impulsively," along with a two-factor construct representing the "Affective" and "Cognitive" components. All the components of the construct showed good model fit and high internal consistency. The new form was tested in terms of internal consistency, test-retest reliability, and concurrent validity using Toronto Alexithymia Scale as criteria and discriminative validity using Five-Factor Personality Inventory Short Form.

**Conclusion:** The results showed that the new scale met the basic psychometric requirements. Results have been discussed in line with related studies.

**Keywords:** Alexithymia, alexithymia scale, affective, cognitive

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### INTRODUCTION

Alexithymia was introduced conceptually in 1970 and defined as alienation to self feelings; difficulty in describing, identifying, and expressing feelings; or a decrease in the capacity and potential to identify and verbalize emotions due to deficits or limitations in the cognitive processing (1,2,3,4,5,6). Two components of alexithymia are defined, one of them is the affective component characterized by reduced emotional awareness and the other is cognitive component characterized by operational thinking style (7,8,9). After the construct of alexithymia was introduced, various studies have been conducted to show the deficiency in people, negative impact on interpersonal relations and its association with physical and mental health problems (10,11,12).

Developmental, genetic, social learning, psychoanalytic, neurophysiological, neurobiological, and/or neuropsychological approaches are important in explaining the etymology of the construct (2,13,14,15,16,17,18,19,21,22,23,24).

Many models have been proposed to neurobiologically or neuropsychologically explain alexithymia. The right hemisphere is used more in processing nonverbal, unconscious, and emotional information compared to the left hemisphere, which predominately processes conscious and verbal information (25). In line with this information, two different widely accepted neurobiological explanations are formulated. The first explanation states that the information sent to the left hemisphere from the right hemisphere is at the corpus callosum, or there is an interhemispheric transfer deficit at the limbic system and between the two hemispheres. The second explanation states that dysfunction of the cortex of the right hemisphere causes alexithymia (22,26,27).

According to the psychoanalytic approach, alexithymia is related to defense mechanisms, or it is a defense mechanism against anxiety, conflict, and trauma states that causes discomfort or a style to cope with stress (28,29,30,31). Alexithymia scores have been found to stay quite stable over long periods in various longitudinal studies in clinical and nonclinical samples. Based on these findings, recently alexithymia as a personality characteristic has gained wide acceptance (32,33,34,35,36). For this reason, it has been reported that alexithymia is a characteristic or a construct showing normal distribution in a general sample (4,37,38). Alexithymia is not only related to an individual's emotions but also alex-

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ithymics exhibit deficits and disabilities in understanding and relating to the emotions of others (9,39). Thus, it has been emphasized that alexithymics have impaired capacity for empathy (40,41,42).

It has been shown that alexithymia is not a psychiatric diagnostic category by itself; it rather contributes to psychosomatic or psychiatric disorders. The prevalence of alexithymia varies in various groups due to different measuring instruments and their cut off points (43,44). In different studies, the prevalence in a general sample changes from 7.1% to 17.0% (45,46). Alexithymia has been reported as a risk factor for physical and mental health (19,47,48,49). An increasing number of clinical and experimental studies have associated this construct with various physical and mental disorders (50,51).

It has been shown that alexithymia is associated with anxiety, depression, and major depression in both general and clinical samples but not highly correlated (52,53,54,55,56). Similarly, many studies have reported associations between this construct and state and trait anxiety, post-traumatic stress disorder, psychopathology, and personality disorders (57,58,59,60,61). It is important to understand the relationship between the construct and the disorders to control the risk factors and thus prevent the disorders (4,50).

### Measurement of Alexithymia

The efforts to measure alexithymia appear to begin with Beth Israel Hospital Questionnaire, and it is rated by a clinician/observer (3). Other tests rated by observers are the Alexithymia-Provoked Response Questionnaire, the Karolinska Psychodynamic Profile based on psychoanalytic theory that composes one of the subdimensions of alexithymia, California Q-set Alexithymia Prototype, Observer Alexithymia Scale which is the revised form of the previous scale, and the Toronto Structured Interview for Alexithymia (62,63,64,65,66,67,68,69,70,71,72). In regard to the projective forms, one of them is the Objectively Scored Archetypal Test (73,74,75). Another one is the Rorschach Alexithymia Scale, which is developed to predict scores of the Toronto Alexithymia Scale (TAS) Revised Form Three using marker variables from the Rorschach system (76,77).

The self-report forms include the MMPI Alexithymia Scale, whose items were selected from the MMPI, Schalling-Sifneos Personality Scale, Amsterdam Alexithymia Scale, Bermond-Vorst Alexithymia Test, which is the revised form of the previous scale, and psychological Treatment Inventory-Alexithymia Scale (78,79,80,81,82). TAS has been found to have good psychometric qualities and to be the most widely used self-report scale (83). The first form of TAS was developed as a 26-item and four subdimensions' self-report scale (74,84,85). In the first revision of the scale, items have been reduced to 23 and subdimensions to two (86). The second revision and the third form of the scale have been reorganized to have 20 items and three facets (87).

In addition, there are scales developed to measure alexithymia in children and adolescents. The Alexithymia Observation Scale for Children, two revisions of TAS for children, which are called TAS for Children, the Emotional Awareness Questionnaire for Children, and the revised form of this scale are the tests developed for this group (88,89,90,91,92).

Alexithymia as a multidimensional construct and it is questionable whether a single measurement or a measuring instrument will be sufficient to measure this construct; thus, it is reported that much more instruments are needed. Moreover, existing measuring instruments have different error sources (93). Measuring instruments in Turkish are the two forms of TAS, 26-item first form and 20-item third form (94,95). Accordingly, with

the aim of developing a new measuring instrument for alexithymia, the procedures of item selection, creation of its factor structure, and developing a new form were conducted, and the new form was tested for internal consistency, test-retest reliability, criterion-related validity and discriminant validity.

## METHODS

### Creation of Item Pool

Firstly, considering the components of the construct and items in the similar scales, 110 items were written. The number of items were then reduced to 100; after scrutiny and corrections were made, these items were used in the first administration of the scale. Ratings were created using a five-point Likert scale ranging from "always" (1) to "never" (5).

### Participants

**Participants in the first administration (A1):** In the first administration, participants consisted of 628 women (56.2%) and 489 men (43.8%) from a total of 1117 individuals aged from 19 to 82 years (mean=35.05±11.49 years). Students were not included in this administration. The participants consisted of 451 single (40.4%), 625 married (56.0%), 24 divorced (2.1%), 17 widowed (1.5%), and 3 individuals with unknown marital status (0.1%). The education level was as follows: 135 primary school graduates (12.1%), 117 middle school graduates (10.5%), 286 high school graduates (25.6%), 576 bachelors (51.6%), and 3 individuals with unknown education status (0.3%). The income level was as follows: 67 people defined income as poor (6.0%), 756 as middle (67.7%), 255 as good (22.8%), and 39 people did not specify the income level (3.5%).

**Participants in the second administration (A2):** Participants consisted of 271 women (65.3%) and 144 men (34.7%) from a total of 415 undergraduate and postgraduate students from different faculties and universities aged between 18 and 30 years (mean=21.44±1.49 years). Out of these participants, 117 students aged between 18 and 25 years (mean=21.24±1.32 years) participated in the discriminant validity study, 50 students aged between 20 and 27 years (mean=21.86±1.33 years) participated in the criterion-related validity study, and 48 students aged between 20 and 25 years (mean=21.73±1.11 years) participated in test-retest study.

### Procedure

After the approval from the ethic committee of Fatih Sultan Mehmet (FSM) Vakif University was received, two separate administrations were made in two semesters in Istanbul. Participants were determined using the convenience sampling method and voluntarily accepting to participate in the study. "Informed consent" was obtained from the participants of the study. The prepared forms were administered individually and answered as a self-report. In the first administration (A1), pool items and sociodemographic questions were completed. The second administration (A2) was made with the revised form of 28 items using a five-point Likert scale. TAS-20 was used to determine the criterion-related validity, and the Five-Factor Personality Inventory (5FPI) was used for the discriminant validity in this administration. Furthermore, 15 days after the second administration test, a retest study was conducted. In both administrations, besides the tests given, age, gender, education level, marital status, and income level information was collected to identify participant characteristics.

### Data Collection Tools

#### The Toronto Alexithymia Scale

TAS-20 is a self-report scale using the five-point, Likert-type answering

options. It assesses three dimensions of alexithymia: difficulty identifying feelings (DIF), difficulty describing feelings (DDF), and externally oriented thinking (EOT) and gives a total score (TS) (95).

### The Five-Factor Personality Inventory

The 5FPI comprises of 220 items answered on a five-point Likert scale; it assesses five factors and 17 subdimensions (96). In this study, the short form of the inventory that assesses five factors, namely Extraversion (E), Agreeableness (A), Conscientiousness (C), Emotional Stability (ES), and Openness to Experience (OE) were used (97).

### Statistical Analysis

In this study for the calculations of internal consistency reliability and test-retest reliability Statistical Package for Social Sciences 21.0 (IBM

Corp.; Armonk, NY, USA) programme, for the confirmatory factor analysis (CFA) Amos 21.0 (IBM Corp.; Meadville, PA, USA) programme and for the analysis of Item Response Theory (IRT) Parscale 4.1 (Scientific Software International, Inc., Skokie, IL, USA) programme were used.

## RESULTS

### Item Selection Procedure

Item selection process, Explanatory Factor Analysis (EFA), and assessment of parameters by Item Response Theory (IRT) were conducted in an interweaved manner in this study. Firstly, the items were examined with EFA, and the emerging factors were named according to item contents. Every factor was examined in its right, and the item loadings below 0.30 or items that were located in more than one factor with similar loadings to

**Table 1.** Five-Factor explanatory factor analysis results of the A Alexithymia Scale in first and second administration

Items	SEEE		EOCS		TSE		ILI		AI	
	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2
Item 98	0.68	0.78								
Item 100	0.66	0.57		0.29						0.22
Item 12	0.66	0.75								
Item 52	0.64	0.76								
Item 38	0.62	0.65		0.27					0.25	
Item 32	0.62	0.67								
Item 36	0.55	0.46				0.32				
Item 13	0.54	0.45								
Item 41	0.52	0.54		0.28					0.23	0.20
Item 86	0.48	0.41								
Item 91		0.25	0.70	0.65						
Item 75			0.69	0.74						
Item 49			0.66	0.61						
Item 39	0.24	0.22	0.56	0.55						
Item 72			0.54	0.57		0.26				
Item 78					0.72	0.80			0.23	0.23
Item 55					0.69	0.81			0.27	0.21
Item 94					0.60	0.42				-0.31
Item 45					0.58	0.58				-0.31
Item 51		0.22			0.46	0.33				-0.29
Item 22	0.31	0.28			0.44	0.49				
Item 14							0.81	0.85		
Item 2							0.78	0.81		
Item 60							0.74	0.76		
Item 18									0.75	0.66
Item 8									0.69	0.61
Item 31	0.36	0.22							0.49	0.55
Item 6	0.22								0.48	0.59
Eigen values	5.16	5.63	2.58	1.85	1.73	2.88	1.62	1.53	1.35	1.40
Percentage of variance	18.44	20.10	9.21	6.60	6.16	10.27	5.78	5.48	4.83	4.99
Cumulative %	18.44	20.10	27.65	26.70	33.81	36.97	39.59	42.45	44.42	47.44

\*Loading values below 0.20 were excluded

SEEE: solving and expressing emotional experiences; EOCS: externally oriented cognitive style; TSE: tendency to somatize emotions; ILI: imaginary life and imagination; AI: acting impulsively; A1: first administration; A2: second administration

each other were excluded. Subsequently, the items in a factor were examined by an item analysis. Firstly, the items that raised the reliability in case of removal and then the items that showed item TS correlations below 0.30 were removed. In addition, the items in every factor and in the whole scale were separately examined using IRT. Using the two parameters logistic model (2PLM), item discrimination (a) and item difficulty (b) were calculated. At this stage, items with low-discrimination were removed, and the number of items functioning at low-high alexithymia levels were attempted to balance. All processes were performed repeatedly and the items were removed/selected gradually. At every stage, the construct obtained was tested using factor analysis to understand whether it is protected. At the last stage, the number of items selected was reduced to 28.

## Validity Study

### Exploratory factor analysis and construct validity results

All possible EFA solutions from a single factor to seven factors were examined in the A1 item selection process. Results showed that the most appropriate solution that coincides with the theoretical construct was the five-factor construct. It was observed that the data are suitable for factor analysis (Kaiser-Meyer-Olkin (KMO)=0.858; Bartlett  $\chi^2$  (378)=6437.09;  $p<0.001$ ), and the five-factor construct explained 44.42% of the total variance. The distribution of the selected 28 items located in the five-factor solution was protected exactly in the six- and seven-factor solutions. Out of the factors located in the five-factor solution, two or three combined and preserved exactly in the two-factor solution. Considering the factor content, the five-factor solution of the construct was named as follows: Solving and Expressing Emotional Experiences (SEEE; e.g., I have difficulty in describing my feelings. I have difficulty in expressing my feelings); Externally Oriented Cognitive Style (EOCS; e.g., I solve daily problems successfully); Tendency to Somatosize Emotions (TSE) emphasizing cognitive processes instead of expressing feelings (e.g., it is unnecessary to explain emotions), Imaginary Life and Imagination (ILI; e.g., I love daydreaming); and Acting Impulsively (AI; e.g., I give immediate reactions to events) (Table 1).

In two-factor solutions, when SEEE and AI factors are combined, they create Emotional Component (EC) of the construct (e.g., I have difficulty in expressing my feelings); when EOCS, ILI, and TSE are combined, they create Cognitive Component (CC) of the construct (e.g., It is unnecessary to describe feelings). When the factor items of EC and CC are examined separately using EFA, subdimensions are differentiated as in the case when they are combined. The two-factor construct explained 27.65% of the total variance. Thus, the construct, in accordance with literature, has two stages with EC and CC components in the first level, and the second level with five factors are underneath this upper construct (Table 2).

It was noted that the data obtained in A2 were satisfactory for factor analysis (KMO=0.826; Bartlett  $\chi^2$  (378)=3201.44;  $p<0.001$ ); factor loadings for both two- and five-factor solutions obtained in A1 were retained exactly, except for small differences. While five-factor solutions explained 47.44% of the total variance, two-factor solutions explained 30.37% of the total variance (Table 1, 2).

### Construct validity with confirmatory factor analysis

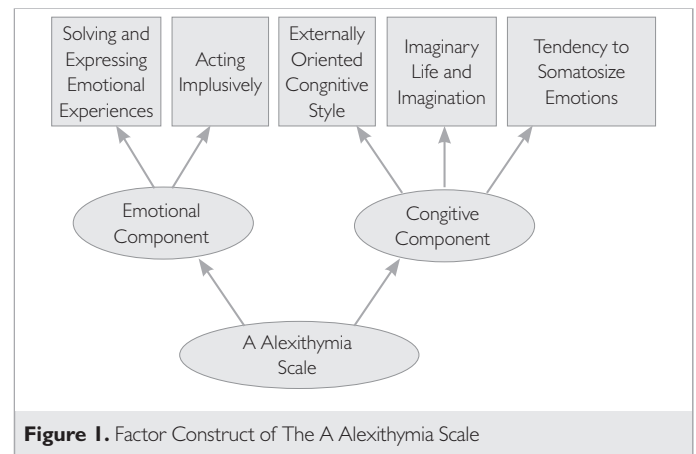
All the factor solutions obtained using the EFA analysis were examined additionally by confirmatory factor analysis (CFA) for A1 and A2 data. The most appropriate-fit values were obtained for the second-level five-factor construct under the EC and CC first-level construct (Figure 1). The results of A1 and A2 and the results of two- and five-factor solutions were close to each other according to the obtained values (Table 3). When all results were evaluated as a whole, GFI, AGFI, and RMR were at good fit, RMSEA and  $\chi^2$ /sd ratios were slightly over the acceptable fit, and CFI and NFI were below acceptable fit level (98).

**Table 2.** First and second administration two-factor explanatory factor analysis results of A Alexithymia Scale

Items	EC		CC	
	A1	A2	A1	A2
Item 38	0.65	0.67		
Item 52	0.65	0.69		
Item 98	0.65	0.70		
Item 100	0.62	0.67		
Item 32	0.58	0.63		0.23
Item 41	0.58	0.63		
Item 12	0.57	0.66		
Item 36	0.51	0.50		0.21
Item 31	0.50	0.44		
Item 13	0.50	0.41		
Item 86	0.48	0.47		
Item 6	0.44	0.38		-0.33
Item 8	0.43	0.38		-0.30
Item 18	0.41	0.40		
Item 39	0.26		0.32	0.45
Item 78		0.30	0.57	0.55
Item 55	0.24	0.23	0.54	0.55
Item 60			0.52	0.55
Item 94			0.52	0.50
Item 14	-0.27		0.52	0.66
Item 51			0.47	0.37
Item 2	-0.25		0.46	0.59
Item 75	0.27		0.41	0.43
Item 72	0.22	0.33	0.39	0.33
Item 49			0.38	0.37
Item 45			0.37	0.49
Item 22		0.27	0.36	0.39
Item 91	0.24		0.32	0.45
Eigen values	5.16	5.63	2.58	2.88
Percentage of variance	18.44	20.10	9.21	10.27
Cumulative %	18.44	20.10	27.65	30.37

\*Loading values below 0.20 were excluded

EC: emotional component; CC: cognitive component; A1: first administration; A2: second administration



**Figure 1.** Factor Construct of The A Alexithymia Scale

**Table 3.** First and second administration confirmatory factor analysis results of A Alexithymia Scale

Model fit summary	First administration		Second administration	
	Five-factor solution	Two-factor solution	Five-factor solution	Two-factor solution
$\chi^2$	50.44	37.77	34.26	33.49
df	5	4	5	4
p	0.000	0.000	0.000	0.000
$\chi^2/df$	10.09	9.44	6.85	8.37
Goodness-of-Fit Index (GFI)	0.98	0.99	0.97	0.97
Adjusted Goodness-of-Fit Index (AGFI)	0.95	0.95	0.90	0.88
Confirmatory Fit Index (CFI)	0.82	0.87	0.73	0.73
Normed Fit Index (NFI)	0.81	0.86	0.71	0.72
Root mean squared residual (RMR)	0.05	0.04	0.07	0.07
Root mean square error of approximation (RMSEA)	0.09	0.09	0.12	0.13

$\chi^2$ : Pearson Chi-Square Tests; df: degrees of freedom

**Table 4.** Correlation Coefficients of A Alexithymia Scale with Toronto Alexithymia Scale-20 and five-factor personality inventory

Solutions		Toronto Alexithymia Scale-20 (n=48)				Five-Factor Personality Inventory (n=117)				
		TS	DIF	DDF	EOT	E	A	C	ES	OE
Five factor solution	SEEE	0.65***	0.67***	0.79***	0.20	-0.40***	-0.13	-0.13	0.26**	-0.21*
	EOCS	0.50***	0.60***	0.54***	0.11	-0.14	-0.32***	-0.41***	0.46***	-0.23*
	TSE	0.33*	0.23	0.37**	0.29*	-0.17	-0.29**	-0.25**	-0.17	-0.25**
	ILI	-0.09	-0.14	-0.19	0.11	-0.02	0.13	-0.02	0.00	-0.06
	AI	0.40**	0.48***	0.47***	0.05	-0.01	-0.36***	-0.09	0.40***	-0.03
Two-factor solution	EC	0.66***	0.70***	0.80***	0.18	-0.32***	-0.25**	-0.14	0.37***	-0.18*
	CC	0.46***	0.39**	0.47***	0.34**	-0.20*	-0.32***	-0.40***	0.12	-0.31**
A Alexithymia Scale	TS	0.70***	0.70***	0.81***	0.27	-0.34***	-0.35***	-0.30**	0.34***	-0.29**

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001  
 TS: total score; DIF: difficulty identifying feelings; DDF: difficulty describing feelings; EOT: externally oriented thinking; E: extraversion; A: agreeableness; C: conscientiousness; ES: emotional stability; OE: openness to experience; SEEE: solving and expressing emotional experiences; EOCS: externally oriented cognitive style; TSE: tendency to somatize emotions; ILI: imaginary life and imagination; AI: acting impulsively; EC: emotional component; CC: cognitive component

### Criterion-related validity

The comparison of the total scores of TAS-20 and A Alexithymia Scale showed a correlation coefficient of 0.70. The first-factor SEEE in five-factor solutions are represented in TAS-20 in two separate dimensions. This factor showed a correlation coefficient of 0.67 with the DIF dimension and a correlation coefficient of 0.79 with the DDF dimension of TAS-20. In two-factor solutions, EC showed a correlation coefficient of 0.70 with the DIF dimension and 0.80 with the DDF dimension of TAS-20. Another common construct in both scales was the EOCS dimension in five-factor solutions and the EOT dimension in TAS-20. A correlation coefficient of 0.11 was calculated between these factors of the two scales. However, in two-factor solutions CC showed a higher correlation coefficient (0.34) with the EOT dimension of TAS-20 (Table 4).

### Discriminant validity

When A Alexithymia Scale was compared with 5FPI, the correlation coefficients of SEEE factor with E; EOCS factor with A, C, and ES; and AI factor with A and ES were over 0.30. The correlation coefficient between 5FPI and ES ranged between 0.14 and 0.37, and it was between 0.12 and -0.40 for CC. The correlation coefficients between the TS of Alexithymia and personality inventory factors ranged between -0.29 and -0.35. The

results showed that in terms of discriminant validity, the correlations between the alexithymia scale developed based on the trait approach model, and the constructs of personality factors were generally in the expected direction and at a level that would not overlap with each other (Table 4).

### Reliability Study

#### Internal consistency reliability

For the components of five- and two-factor solutions related to A1 and A2, Cronbach Alpha internal consistency coefficients were calculated and reported in Table 5. Results showed that in the A1 internal consistency coefficient for five factor was between 0.59 and 0.83, for EC and CC were 0.83 and 0.69, respectively, for the whole scale, it was 0.81. In A2, the internal consistency coefficients were as follows: between 0.62 and 0.84 for five factor; 0.83 and 0.70 for EC and CC, respectively; and 0.82 for the whole scale.

#### Test-retest reliability

In test-retest reliability study, Pearson correlation coefficients were between 0.64 and 0.86 for the factors of five-factor solutions, were 0.85 for EC and 0.84 for CC for two-factor solutions, and was 0.87 for the whole scale (Table 5).



**Table 5.** For first and second administration internal consistency coefficients of A Alexithymia Scale

Solutions		k	First administration (n=1117)	Second administration (n=415)	Test-retest (n=50)
Five-factor solution	SEEE	10	0.83	0.84	0.85***
	EOCS	5	0.66	0.67	0.64***
	TSE	6	0.64	0.67	0.86***
	ILI	3	0.71	0.76	0.73***
	AI	4	0.59	0.62	0.76***
Two-factor solution	EC	14	0.83	0.83	0.85***
	CC	14	0.69	0.70	0.84***
A Alexithymia Scale	TS	28	0.81	0.82	0.87***

\*\*\*p<0.001  
k: item number; SEEE: solving and expressing emotional experiences; EOCS: externally oriented cognitive style; TSE: tendency to somatize emotions; ILI: imaginary life and imagination; AI: acting impulsively; EC: emotional component; CC: cognitive component; TS: total score

## DISCUSSION

Different models and approaches have been suggested to evaluate alexithymia in literature (11,69,81,82). The multidimensional construct of alexithymia creates difficulties in measurement (50). The need for new measuring instruments and different kind of error sources of the existing instruments have been reported (93). Also, an increasing number of studies emphasize that alexithymia is a personality trait (31). Instruments measuring alexithymia are quite few in Turkish and the existing ones (TAS-26, TAS-20) are relatively old (74,87). Besides, there are many recent studies on the subject. Thus, this study was conducted considering the critics toward existing instruments.

Alexithymia is characterized by weak imaginary life, weak empathy level, impulsive actions and tendency of somatizing feelings, difficulty in decoding emotional messages, emotion expression, emotional experiences, externally oriented cognitive style, social adaptation, avoidance of conflict, being cold, independent, disturbances due to emotional changes in close relations (10,50,99,100). EFA results revealed that the factors of the construct were solving and expressing emotional experiences, externally orienting cognitive style, somatizing emotions tendency, having imaginary life and imagination, and acting impulsively.

Although factor analytic studies, especially those on TAS, showed description and expression of emotions as separate constructs, this distinction was not observed in this study. None of the seven separate solutions from one to seven on A1 data differentiated in describing emotional experiences (I have difficulty in describing my feelings) and expressing emotions (I have difficulty in expressing my feelings). No differentiation was observed even when a two-factor solution was applied only to the items of this factor. Furthermore, this situation is realized similarly for both expressions regarding self (I don't know how I feel in an event or situation) and for expressions about others (I have difficulty in understanding the feelings of others).

Explanatory factor analysis results showed two components in alexithymia, emotional and cognitive as previously shown in many languages/cultures (7,8). In the studies where TAS-23 was developed, it was observed that the two-factor construct explained 25.1% (86) of the variance; in the studies where TAS-20 was developed, the three-factor construct explained 31% (87) of the variance. In the study where TAS-20 was adapted into Turkish, the two factors obtained explained 34.9% of the total variance (95). These values do not appear different from the results of two-factor solutions of 27.65% and 30.37%, respectively. The values are

higher in five-factor solutions, 44.42% and 47.44%, respectively. Considering the variance explained when TAS-20 was developed and the variance of the scale adapted into Turkish, it appears that more than 10% incremental validity is obtained in this study. The result obtained in this study showed that the measurement level of the TAS-20 Turkish form was improved and even moved beyond it. Furthermore, the two- and five-factor solutions of the scale in this study seem as to provide a benefit in practice. When different results of different scales are compared, two- and five-factor constructs of this newly developed scale will provide convenience in comparison.

Results of CFA indicate good fit and appear to be a slightly better than the values of similar studies. Also, results show that basic qualifications of former studies have been captured. The first sample of the study where TAS-20 was developed, GFI was 0.89, AGFI was 0.86, and RMSEA was 0.07. For the second sample GFI was 0.86, AGFI was 0.83, and RMSEA was 0.07 (87). In the adaptation study of TAS-20 into Turkish, GFI was 0.87, AGFI was 0.84, RMSEA was 0.08 (95). In this study, for the two-factor solution in A1, GFI was 0.99, AGFI was 0.95, and RMSEA was 0.09; for the five-factor solution, GFI was 0.98, AGFI was 0.95, and RMSEA was 0.09. Values obtained for A2 were at a similar level.

In this study, for the whole scale, internal consistency coefficients obtained for A1 and A2 studies were 0.81 and 0.82, respectively. The study where TAS-20 was developed revealed internal consistency coefficients of 0.81 in the first administration, 0.80 in the second student administration, and 0.83 for the patient group for the whole scale (87). This value was found to be 0.78 in the adaptation study of TAS-20 into Turkish for the whole scale (95). Results are generally at a similar level in both two- and five-factor solutions. In contrast, although the A1 group was heterogeneous, A2 was homogeneous and it had fewer participants; internal consistency values obtained were very close to each other. Moreover, similar values had been achieved in two- and five-factor solutions in both groups, thereby showing stability of the scale. However, considering that the number of items is small for ILI and the internal consistency coefficient for AI is lower than that for the other factors, these factors of the scale need strengthening in further studies.

The results of test-retest study conducted at an interval of 15 days were well within the acceptable levels. Correlation coefficients were 0.87 for the whole scale, 0.85 for EC, and 0.84 for CC. This coefficient was stated as 0.77 in the study of the development of TAS-20 (87). This coefficient was reported as 0.75 and 0.82 for the Rorschach Alexithymia Scale (76).

Test-retest correlation coefficients for the five factor of this study were between 0.64 and 0.86, and in general, the dimensions of the scale showed high correlations that could be called stable against changes over time.

In the criterion-related validity study, correlation coefficients between TAS-20 and the total and five-factor scores of the A Alexithymia Scale were at an acceptably good level. Correlation coefficients were higher in a two-factor solution. At this stage, the problem is that while the correlation coefficient between the "EOCS" factor and the two dimensions and the TS of TAS-20 was at a high level, the correlation coefficient with the EOT dimension of TAS-20 was 0.11. It is clear that these two constructs are incompatible. In contrast, correlations with the other dimensions and the TS of TAS-20 and the results of EFA and CFA show that the construct named "EOCS" is a part of alexithymia. If the contents are examined, a great difference between the EOT items of TAS-20 (e.g., I'd prefer to resolve the problems rather than defining them) and the EOCS items (e.g., I solve daily problems successfully) is not noted. Considering that a large part of the variance of alexithymia could not be reached, the most likely solution is to make a more explicit operational definition of EOCS or EOT. Although a positive outcome has not been specified for this dimension in the criterion-related validity study, it is understood that a hint has been captured for better understanding of the subject. The content of this construct or factor should be better defined and then measuring procedures should be performed at a better level.

A similar result is also noted in two-factor solutions. While EC of the A Alexithymia Scale shows high correlation coefficients with the TS and both with DIF and DDF of TAS-20. Thus, EC yielded a low correlation with EOT (cognitive component of construct). Nevertheless, correlation coefficients between 0.34 and 0.47 have been calculated between CC of A Alexithymia Scale and TS and dimensions of TAS-20. Instead of showing that CC of the scale developed in this study is not correlated with TAS-20, it seems that TAS-20 has been weak to reflect the CC of alexithymia compared to A Alexithymia Scale. Because the main similarity between the two scales is in the expression of feelings. The highest correlation coefficient between the TS of the A Alexithymia Scale and DDF dimension of TAS-20.

Another validity study is the discriminant validity study. The results of longitudinal studies conducted in groups of different natures and over different periods showed that alexithymia was a personality trait (32,33,36). Alexithymia has been often associated with the constructs of 5FPI in previous studies; thus, it is important to associate the A Alexithymia Scale developed based on the trait approach with the constructs of this model. The expectation was that the correlation of the construct would be at a weak level not to overlap with personality traits and at a high level to reveal the relationship. The results were in the direction of expectations both in two- and five-factor solutions. Correlation coefficients between -0.29 and -0.35 were calculated for the TS of A Alexithymia Scale and the constructs of 5FPI. In a similar comparison study, correlation coefficients between the TS of TAS-20 and the factors of NEO Personality Inventory were -0.25 for Extraversion, 0.03 for Agreeableness, -0.28 for Conscientiousness, 0.42 for Emotional Stability, and -0.38 for Openness to Experience (83). Considering the qualitative difference in the participating groups, the results of this study and the results mentioned above are quite similar, except for the Agreeableness factor.

Although A2, due to its participant characteristics, was more homogeneous than A1 and that no significant differences were seen in the results of EFA, CFA and internal validity in a sense with repetitive results contributed to the validity of the scale. However, the lack of the number of participants in different groups in A2 for criterion-related validity (n=48)

and for test-retest reliability (n=50) and participants not being balanced in the whole study was a limitation of the study. In the context of the specified studies, it could be useful to be repeated with larger participant groups. The scale to be tested in different groups and the creation of cut scores are observed as the features that can contribute to the validity of the scale in future research.

Measuring instruments differ from each other whether they fulfill the technical requirements or not, such as the features of being easily accessible, easy-to-use and understandable, and having strong psychometric properties. Although it is clear that the scale developed in this study should be supported with other validity findings, it is shown that the scale carries basic psychometric properties that can be used in studies on the subject. When the A Alexithymia Scale developed is evaluated in terms of the presented results, it appears that it can be considered as an alternative to the existing scales and be used in the studies on the subject. The scale seems to be more advantageous for reasons, such as having a higher percentage of explanation than similar scales, showing higher reliability coefficients, having multidimensional structure, and cognitive component, as well as emotional component included at the same ratio. It is believed that the use of this scale will be of practical benefit that it will give more powerful/reliable results and provide more detailed information.

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**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

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