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# The Investigation of Validity and Reliability of the Turkish Version of the Brief Self-Control Scale

Melike Nebioglu<sup>1</sup>, Numan Konuk<sup>2</sup>, Sirri Akbaba<sup>3</sup>, Yuksel Eroglu<sup>4</sup>

## ÖZET:

Kısa Öz-Kontrol Ölçeğinin Türkçe versiyonunun geçerlik ve güvenilirliğinin incelenmesi

**Amaç:** Türkiye'deki araştırmalarda öz-kontrol ölçmek için Öğrenilmiş Güçlülük Ölçeği kullanılmasına karşın bu ölçeğin bir kişilik özelliği olarak öz-kontrol ölçmeye uygun olmadığı ifade edilmektedir. Bu nedenle bu araştırmada Tangney, Baumeister ve Boone (2004) tarafından geliştirilen Kısa Öz-Kontrol Ölçeği (KÖKÖ)'nin Türkçeye uyarlanması amaçlanmıştır.

**Yöntem:** Ölçeğin geçerlik ve güvenilirlik çalışmaları herhangi bir psikiyatrik tanı almamış 523 birey üzerinde yürütülmüştür. Ayırt edici geçerlik çalışmaları; 36'sı DSM-IV-TR'ye göre bipolar I bozukluğu tanısı almış ve ötimik dönemde bulunan, hastanemiz Duygudurum Bozukluğu Polikliniği'nde takip ve tedavi edilen, 50'si ise herhangi bir psikiyatrik tanı almamış 86 bireyden olmaktadır. Test-tekrar test çalışmaları ise 523 birey arasından seçilmiş 145 bireyle yürütülmüştür.

**Bulgular:** KÖKÖ'nün dilsel eşdeğerlik çalışmaları kapsamında ölçeğin Türkçe ve İngilizce formu arasındaki ilişkiler Pearson korelasyon ile incelenmiş ve dürtüsellik alt boyutu için  $r=0.72$ , öz-disiplin alt boyutu için  $r=0.76$ , ölçeğin bütünü için ise  $r=0.73$  olarak bulunmuştur. Faktörlerin belirlenmesi için ana bileşenler yöntemi ve varimax rotasyonu kullanılmış, dürtüsellik ve öz-disiplin olarak isimlendirilen iki faktörlü bir yapı elde edilmiş ve elde edilen bu yapının doğrulayıcı faktör analiziyle doğrulandığı görülmüştür. Ölçüt-bağıntılı geçerliği saptamak için KÖKÖ'nün alt boyutlarıyla TSZÖ sosyal beceriler alt ölçeği, DYBÖ olumsuz bedensel tepkileri kontrol edebilme ve öfke yönetimi alt ölçekleriyle ve BIS-11 arasındaki ilişkiler hesaplanmış ve dürtüsellik alt ölçeği için  $r=0.11$  ve  $r=0.64$ , öz-disiplin alt ölçeği için ise  $r=0.19$  ile  $r=0.63$  arasında değişen anlamlı ilişkilere rastlanmıştır. Ayırt edici geçerlik çalışmaları kapsamında KÖKÖ'nün alt boyutlarının bipolar I bozukluğu tanısı almış ve ötimik dönemde bulunan hastalar ile herhangi bir psikiyatrik tanı almamış bireyleri ayırdığını (eğri altındaki alan sırasıyla 0.85 ve 0.82), toplam puanın ise ayırdığını (eğri altındaki alan 0.56) göstermiştir. Dürtüsellik alt boyutu için kesim noktası olarak 13 alındığında duyarlılık 0.806, özgüllük 0.84, pozitif yordama değeri 0.04, negatif yordama değeri 0.99, pozitif olasılık oranı 5.03 ve negatif olasılık oranı 0.23; öz-disiplin alt boyutu için ise kesim noktası olarak 12 alındığında duyarlılık 0.917, özgüllük 0.62, pozitif yordama değeri 0.02, negatif yordama değeri 0.99, pozitif olasılık oranı 2.41 ve negatif olasılık oranı 0.13 olarak bulunmuştur.

**Sonuç:** Araştırmadan elde edilen sonuçlar KÖKÖ'nün geçerlik ve güvenilirliğinin sağlandığını göstermektedir. Ancak pozitif ve negatif yordayıcılık değerlerinin yanlış pozitifliğin ve negatifliğin oldukça yüksek olduğunu göstermesi ölçeğin tek başına bir tanı ya da tarama aracı olarak kullanılması yerine tarama sürecinin bir parçası olarak kullanılmasını daha uygun olacağını göstermektedir.

**Anahtar sözcükler:** Psikiyatrik durumu değerlendirme ölçekleri, güvenilirlik ve geçerlilik, dürtücü davranış

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## ABSTRACT:

The investigation of validity and reliability of the Turkish version of the Brief Self-Control Scale

**Objective:** The Learned Resourcefulness Scale has been utilized to measure self-control in research in Turkey. However, this scale may not be appropriate to measure the trait of self-control. For this reason, we aimed to adapt the Brief Self-Control Scale (BSCS), which was developed by Tangney, Baumeister, and Boone (2004), into Turkish.

**Methods:** The validity and reliability tests were conducted with 523 participants who were not diagnosed with any psychiatric disorder. Discriminant validity was investigated by assessment with the BSCS, the social skills subscale of the Tromso Social Intelligence Scale (TSIS), the controlling negative body responses and anger management subscales of the Emotional Management Skills Scale (EMSS), and the BIS-11 on 36 euthymic bipolar I disorder patients (according to the DSM-IV-TR criteria) and 50 individuals without a psychiatric diagnosis. Test-retest reliability was done with 145 people who were chosen from among the 523 participants.

**Results:** For language equivalency of the BSCS, the relationships between the English and Turkish versions of the BSCS were investigated using Pearson correlation and they were found to be  $r=0.72$  for impulsiveness,  $r=0.76$  for self-discipline, and  $r=0.73$  for the total scale. To determine the factor structure of the BSCS, principal component analysis and varimax were used, and the analysis yielded two factors called impulsiveness and self-discipline. The two-factor structure of the BSCS was confirmed by confirmation factor analysis. For criterion-related validity, correlations among subscales of the BSCS and social skills of the TSIS, controlling negative body responses and anger management subscales of the EMSS and the BIS-11 were utilized. They ranged from  $r=0.11$  to  $r=0.64$  for impulsiveness, and  $r=0.19$  to  $r=0.63$  for self-discipline. The discriminant ability of impulsivity and self-discipline between euthymic bipolar I disorder patients and individuals without any psychiatric diagnosis was investigated by using discriminant analysis and it was confirmed that they could discriminate. ROC analysis indicated that impulsiveness and self-discipline differentiated between euthymic bipolar I disorder patients and the individuals without psychiatric diagnosis (area under the curve 0.85 and 0.82, respectively), while the BSCS Total did not differentiate (area under the curve 0.56). Using a cut-off score of 13 for impulsiveness, sensitivity was 0.806, specificity was 0.84, positive predictive value was 0.04, negative predictive value was 0.99, positive likelihood ratio was 5.03, and negative likelihood ratio was 0.23. Using a cut-off score of 12 for self-discipline, sensitivity, specificity, positive predictive value, negative predictive value, positive likelihood ratio and negative likelihood ratio were 0.917, 0.62, 0.02, 0.99, 2.41 and 0.13, respectively.

**Conclusion:** The results indicated that the BSCS is a reliable and valid instrument. On the other hand, utilizing the scale as a part of a screening process rather than a diagnostic or sole screening tool would be better, as positive and negative predictive values indicated that there was a fair percentage of false negatives and positives.

**Key words:** Psychiatric status rating scales, reliability and validity, impulsive behavior

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## Declaration of interest:

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## INTRODUCTION

Self-control, which is labeled differently by different research groups (1), is defined as controlling and managing of one's feelings, thoughts, and behaviors in order to provide compatible relationships with other people; it is comprised of not following fads, controlling negative feelings, and being able to work and inhibit impulsive behaviors (2).

Studies on the relationship between academic success and self-control have shown that individuals have a more successful academic career if they possess self-control which provides effective time management and prevent performance limiting mood disorders (3).

Moreover, self-control has been shown to be associated with the ability to build and maintain social relationships. In a study depending on lecturer-reported surveys, children reported to have a higher level of self-control were found to be loved by their friends and have higher popularity rates during their adolescent (4). Investigators also determined that low levels of self-control were associated with violence and committing crimes (5), obesity and anorexia (6), substance abuse (7), pathological gambling (6), internet addiction (8), shopping addiction (9), anger and aggressive behaviors (10), and suicide (11).

In the studies conducted in Turkey (12-15) the Learned Resourcefulness Scale has been used for evaluating the level of self-control (13). Due to the reports about this scale, indicating that it was not suitable for evaluation of self-control as a trait, as it involved some questions concerning the use of strategies for cognitive re-construction and attention shifting (6), investigators were directed to adapt the Brief Self-Control Scale (BSCS) (6), which considers self-control as a trait, into Turkish and investigate its psychometric properties. The BSCS is a 13-item, single-factor scale, based on self-reporting. Individuals rate each item from 1 (not at all true of me) to 5 (totally true of me) points by using a Likert type scale. For the calculation of negatively worded items (1,3,5,7,9,10 and 12), scores are reversely calculated. The internal consistency and test-retest reliability coefficients of the scale were found to be 0.85 and 0.87, respectively. The correlations of the BSCS with the Eating Disorder Inventory subscales were found between -0.51 ( $p<0.01$ ) and -0.16 ( $p<0.01$ ). With the Michigan Alcoholism Screening Test they were found to be between -0.32 ( $p<0.01$ ). With subscales of the SCL-90

they were found to be between -0.41 ( $p<0.001$ ) and -0.25 ( $p<0.001$ ), and with the Empathy Scale of Interest they were found to be between 0.14 ( $p<0.05$ ) and 0.25 ( $p<0.001$ ).

Although in the BSCS (6) development study, the BSCS was considered to be a single-factor scale (16-18), some investigators have suggested that the BSCS actually includes two factors which are related but not identical. Friese and Hofmann (16) have stated that regression analysis for alcohol dependence has indicated that self-control scores in the BSCS were the second most powerful predictive factor after impulsivity and this situation could be considered as evidence for the presence of some other factors in the BSCS beyond impulsivity. Fulford, Johnson, and Carver (17) obtained two different factors that might be referred as self-discipline and impulsivity in their BSCS factor analysis and they stated that impulsivity was negatively correlated with hypomania while self-discipline was positively correlated with narcissism. Maloney, Grawitch, and Barber stated that although the BSCS had been used in more than sixty studies there was not sufficient evidence about its factor structure (18). In addition, they obtained two different factors, referred as self-regulation and impulsivity in their factor analysis and stated that confirmatory factor analysis results showed excellent compatibility of these two factors with theoretical structure. Furthermore, in their discriminant validity study, they stated that the impulsivity subscale positively affected emotional exhaustion and counterproductive workplace behavior, whereas the self-regulation subscale negatively predicted emotional exhaustion. The differentiation of the factors involved in the BSCS in terms of direction and level, have supported the evidence that the BSCS has more than one factor.

## METHODS AND MATERIALS

### Study Population

Patients, who were followed at the Haydarpasa Training and Research Hospital, Mood Disorders Unit with a diagnosis of bipolar-I disorder and healthy subjects without any psychiatric diagnosis, who were selected from 5<sup>th</sup> and 6<sup>th</sup> grade medical school students, premed students, and hospital employees, were included in this study. The validity and reliability of the BSCS were conducted in the first group, which involved 523 healthy subjects without

any psychiatric disorder. In this sample, 380 (73%) subjects were male and 143 (27%) were female. The mean age and standard deviation of males and females were  $21.57 \pm 2.79$  and  $22.16 \pm 3.98$ , respectively. Discriminant validity study was performed in 86 subjects; 36 (42%) of these were diagnosed with bipolar-I disorder according to the DSM-IV-TR criteria (19) and were being followed at the Mood Disorder Unit of the hospital and 50 (58%) were not diagnosed with any kind of psychiatric disorder. The inclusion criterion for patients with bipolar-I disorder was determined as being in a euthymic period and exclusion criteria were determined as having a medical history of mental retardation or head trauma. The mean age and standard deviation of the females were  $23.89 \pm 1.07$ . The mean age and standard deviation of the males were  $27.18 \pm 2.001$ . The test-retest studies were performed in total 145 subjects, 75 (52%) of those were male and 70 (48%) of those were female, who were randomly selected from the 523 subject in the first group by considering the time and their availability. The average age and standard deviation of males and females were  $21.61 \pm 2.32$  and  $21.83 \pm 1.68$ , respectively.

### Data Collection Tools

The Barratt Impulsiveness Scale-11 (BIS-11), Controlling Negative Responses and Anger Management subscales of the Emotion Management Skills Scale (EMSS), and the Tromso Social Intelligence Scale (TSIS) Social Skills Subscale were used in order to determine the criteria-related validity with the BSCS.

**Barratt Impulsiveness Scale-11 (BIS-11):** The BIS-11, which is used to assess impulsivity, consists of 30 items and three subscales. These subscales are referred to as attention-related impulsivity (inattention and cognitive disorder), motor impulsivity (motor impulsivity and impatience), and designed impulsivity (inability to take control, intolerance to cognitive confusion). Higher BIS-11 scores indicate a higher level of impulsivity (20). In the adaptation study for the scale, which was conducted by Güleç et al. (21), the internal consistency coefficients of the scale for students and patients were found to be 0.78 and 0.81, respectively. When the study was repeated after two months, the test-retest reliability showed a result of 0.83 for the students.

**Controlling Negative Body Responses and Anger Management Subscales of the EMSS:** The EMSS consists of 28 items and 5 subscales, named verbal expression, plain expression of emotions, negative physical reaction control, coping, and anger management (22). High scores indicate the capability of the individual to manage emotions. Internal consistency coefficients for the main scale and subscales, verbal expression of emotions, recognizing and accepting of emotions, plain expression of emotions, negative physical reaction control, coping, and anger management, were found to be 0.83, 0.79, 0.67, 0.65, 0.64, 0.64 and 0.82, respectively.

**TSIS Social Skills Subscale:** The TSIS, which has been developed by Silvera, Martinussen, and Dahl (23) and adapted to Turkish by Dogan and Cetin (24), has 21 items and 3 subscales named social information process, social skills and social awareness. The internal consistency coefficients of the TSIS for the main scale and subscales, social information process, social skills and social awareness, were found to be 0.83, 0.77, 0.85, and 0.67, respectively.

### Process

Approval for the study was obtained from the ethics committee of the hospital and a written informed consent was obtained from each participant prior to the study. In order to obtain the scale's test-retest reliability, the test was repeated 3 weeks after the first evaluation for 145 subjects, who were selected out of the 523 subjects in the first sample group.

### Statistical Methods

The translation-back translation method was adopted for the Turkish translation of the English scale; after the translation of the scale, both the English and Turkish forms were applied to 48 subjects, who had advanced level knowledge of English, and the relationship between both versions was evaluated using Pearson's correlation method.

EFA (exploratory factor analysis), principal component analysis and varimax rotation were used for the determination of the factor structure of the scale. Scatter diagramming was used for the determination of the number of factors and a significant change in the scatter diagram

curve was realized. Then, CFA (confirmatory factor analysis) was used to test this theoretical structure.  $\chi^2 / df$ , CFI (comparative fit index), RMSEA (Root Mean Square Error of Approximation) and GFI (Goodness of Fit Index) were used for the evaluation of the model, obtained from CFA. Criterion-related validity was evaluated through the correlations between the BSCS and the subscales of BIS-11, controlling negative body responses and anger management subscales of the EMSS and the Tromso Social Intelligence Scale-Social Skills subscale. Discriminant analysis was used in the discriminant validity studies, and in order to distinguish the euthymic patients from the subjects without any psychiatric disorder diagnosis, the impulsivity and self-discipline subscales of the BSCS were used.

Cronbach's alpha values were calculated in the reliability studies as an indicator of internal consistency for both the BSCS and the impulsivity and self-discipline subscales. In order to determine the test-retest reliability, the intraclass correlation coefficient (ICC) was calculated between the first and second BSCS applications with an interval of three weeks. Receiver Operator Characteristic (ROC) curves were used in order to calculate the cut-off scores of the impulsivity and self-discipline subscales, sensitivity, specificity, and negative and positive predictive values. In addition, positive and negative likelihood ratios were calculated for the cut-off points. LISREL 8.54 was used for the confirmatory factor analysis (25), MedCalc was used for the ROC analysis (26) and SPSS 11.5 was used for the other analyses.

## RESULTS

### Linguistic Equivalence

Approval for the Turkish translation of the scale was obtained from Roy F. Baumeister, who developed the scale, and then the scale was translated into Turkish by 4 native Turkish speakers, who were psychiatrists, a psychiatric counselor, and a measurement and evaluation expert. All of them had advanced level knowledge of English. After that, the back translation of the final Turkish form, which was adapted with most appropriate expressions, was performed by two native Turkish speakers, who had no information about the aim of the study and had never seen the English version of the form.

These translations were compared with the original English version of the scale. As no significant difference was determined between the texts and the original scale, the Turkish form and the original form were given twice to each of the 48 subjects at an interval of two weeks. The correlations between the English and Turkish forms for the main scale and the sub-scales of impulsivity and self-discipline were found to be 0.73 ( $p < 0.001$ ), 0.72 ( $p < 0.001$ ) and 0.76 ( $p < 0.001$ ), respectively.

### Reliability

The internal consistency of the scale was evaluated by using Cronbach's  $\alpha$  and in variance in time was evaluated by using test-retest reliability. Cronbach's  $\alpha$  coefficients for the total scale and the subscales of self-discipline and impulsivity were found to be 0.83, 0.81, and 0.87, respectively. After the repeated application of the scale to 145 people with an interval of three weeks, test-re-test reliabilities for the total scale and the subscales of impulsivity and self-discipline were found to be 0.88, 0.83, and 0.85, respectively. According to the results of the item analysis, which was performed in order to determine the strength of the discriminant power of the items, corrected item-total correlations were identified between 0.519 and 0.681 for the self-discipline subscale, while they were between 0.645 and 0.788 for the impulsivity subscale. Information on the corrected total item correlations and internal consistency are shown in Table 1.

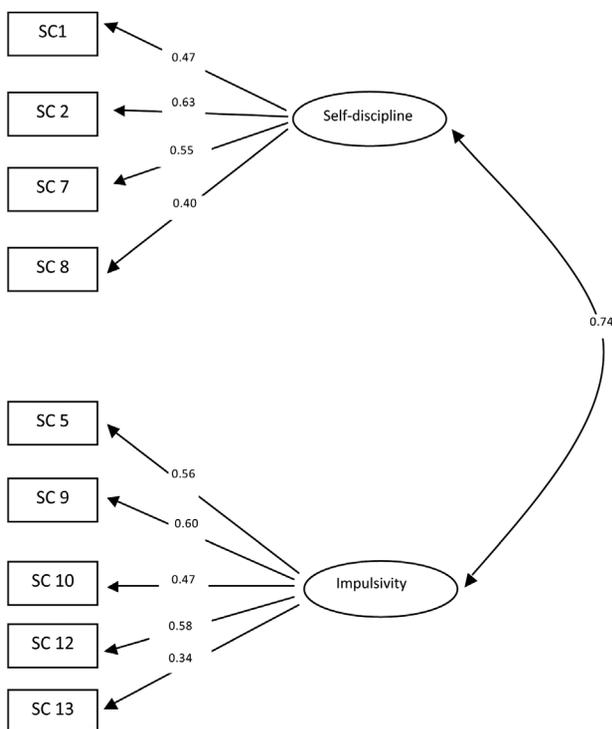
### Structural Validation

In order to evaluate the structural validity of the BSCS, the EFA and CFA were used. For the EFA, the primarily significance in relationships between the items was explored and significant relations were found to warrant factor analysis. The Principal Component Analysis Method was used for the determination of the factors. Compatibility of data for the EFA was evaluated with Barlett Sphericity, and the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy. If KMO was  $> 0.60$  and the Barlett test was significant, the data would be regarded as compatible for the EFA. Some studies, which aimed to establish the factor structure of original form of the BSCS, identified a single-factor structure (6), while others identified a two-factor structure involving self-regulation and impulsivity

**Table 1: Factor Structure of the BSCS, Explained Variance, Factor Loadings, Corrected Item-Total Correlations, and Internal Consistency**

Item No.	Eigen value	Explained Variance	Factor Load	Corrected item total correlations	Internal Consistency
<b>BSCS</b>		41.65%			0.83
<b>Self-Discipline</b>	1.158	18.70%			0.81
1. I am good at resisting temptation.			0.641	0.573**	
2. I have a hard time breaking bad habits.			0.704	0.681***	
7. I wish I had more self-discipline.			0.606	0.597**	
8. People would say that I have iron self-discipline.			0.530	0.519**	
<b>Impulsivity</b>	3.007	22.95%			0.87
5. I do certain things that are bad for me, if they are fun.			0.507	0.788**	
9. Pleasure and fun sometimes keep me from getting work done.			0.592	0.766**	
10. I have trouble concentrating.			0.686	0.676**	
12. Sometimes I can't stop myself from doing something, even if I know it's wrong.			0.494	0.774**	
13. I often act without thinking through all the alternatives.			0.684	0.645**	

\*\*p < 0.01



**Figure 1: Confirmatory Factor Analysis Results for the BSCS**

subscales (18). In this study, factor identification with the main components was primarily limited to a single-factor. At this stage, the KMO sample compatibility coefficient was found as 0.837 and the Barlett Sphericity test  $\chi^2$  value of 959.657 ( $p < 0.001$ ) was found to be significant. According

to the results of the EFA, which was limited to a single factor, the structure was explosive for 31.39% of the total variance and it was found that factor loadings of item 6 and 7 were lower than 0.30 (27). However, the results of factor analysis, which was limited to two factors, showed a structure that was explosive for 41.65% of the total variance. At this stage, the factor loading of item 6 was observed to be lower than 0.30 and the differences of factor loadings for items 3, 4, and 11 in two different factors were observed to be lower than 0.10 (27). The first dimension involving items 5, 9, 10, 12, and 13, which were associated with compulsive behaviors, was named impulsivity and considered to be explosive for 22.95% of the total variance. The second dimension involving items 1, 2, 7, and 8, which were associated with regulating and controlling the behaviors, was named self-discipline. This was observed to be explosive for 18.70% of the total variance. As the BSCS seemed to have two factors according to the EFA results, the CFA reliability and criteria-related validity studies were performed through two factors. The results of the two-factor structure are presented in Table 1.

In order to determine the adequacy of the model,  $\chi^2 / df$ , CFI (comparative fit index), RMSEA (Root Mean Square Error of Approximation) and GFI (Goodness of Fit Index) were used in the CFA, which was done in order to test the factor structure of the BSCS obtained from the EFA. Suggested acceptable and excellent fit indices were

**Table 2: Correlation Results of the BSCS with the EMSS-CNBR, EMSS-AM, BIS, TSIS-SS**

Variables	No of Items	Average	Standard Deviation	1	2	3	4	5
1 Impulsivity	5	16.31	3.64					
2. Self-Discipline	4	14.80	3.64	-0.68**				
3. EMSS-CNBR	4	15.67	3.92	-0.42**	0.59**			
4. EMSS-AM	3	11.91	2.13	-0.34**	0.63**	0.58**		
5. BIS-11	30	36.66	11.93	0.64**	-0.49**	-0.39**	-0.43	
6. TSIS-SS	6	22.83	5.13	-0.11*	0.19*	0.30**	0.17*	-0.09*

\*\*p<0.01, \* p<0.05

Note: EMSS-CNBR: controlling negative body responses subscale of the EMSS; EMSS-AM: anger management subscale of the EMSS; BIS-11: Barratt Impulsiveness Scale-11; TSIS-SS: Social Skills subscale of the Tromso Social Intelligence Scale

5 and 2 for  $\chi^2 / df$ , 0.08 and 0.05 for RMSEA, 0.90 and 0.95 for CFI and GFI (28). In this study,  $\chi^2 / df$  was found to be 1.98; CFI was found to be 0.98; GFI was found to be 0.99, and RMSEA was found to be 0.043. These values suggest a perfect fit of the model. The results of the model are shown in Figure 1.

### Criterion-related validity

The criterion-related validity of the BSCS was evaluated through the correlations between the controlling negative body responses and anger management subscales of the EMSS, the BIS-11, and the TSIS-social skills subscale. The correlation of the BSCS was moderate to high positive with the impulsivity subscale of the BIS-11 ( $r= 0.64$ ,  $p<0.01$ ), weak to moderate with the controlling negative body responses ( $r=-0.42$ ,  $p<0.01$ ) and anger management ( $r=-0.34$ ,  $p<0.01$ ) subscales of the EMSS, and a low to negative with the social skills subscale of the TSIS ( $r= -0.11$ ,  $p<0.05$ ). Also the correlation of the self-discipline subscale of the BSCS was found to be low to moderate negative with the BIS-11 ( $r= -0.49$ ,  $p<0.01$ ), high to moderate with the controlling negative body responses ( $r= 0.59$ ,  $p<0.01$ ) and anger management ( $r= 0.63$ ,  $p<0.01$ ) subscales of the EMSS, and low positive with the social skills subscale of the TSIS ( $r= 0.19$ ,  $p<0.05$ ). The results are shown in Table 2.

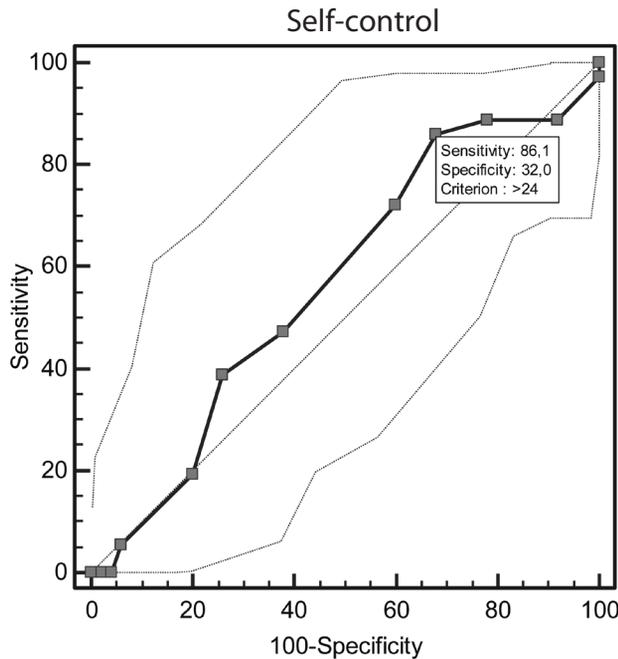
### Discriminant validity

Discriminant analysis was used for the determination of the discriminant validity of the BSCS. In order to test the differentiability of euthymic patients, diagnosed with bipolar I disorder and subjects without any psychiatric disorder by means of total scores on the impulsivity and

self-discipline subscales of the BSCS, total BIS-11 impulsivity scores, controlling negative body responses, anger management and social skills, and discriminant analysis were performed. To test the equality of the variance-covariance matrix, Box's M test was performed. Box's M related F value was determined to be 2.69 and the probability value was found to be  $p>0.05$ . These values showed that the supposition of equality in the variance-covariance matrix was provided. All correlations between the independent variables were determined to be less than 0.70. These values indicate the applicability of discriminant analysis (27). The results of the analysis show a single descriptive function to predict bipolar I disorder group (Wilk's lambda= 0.035, Eigen value= 27.492, Canonical  $r= 0.982$ ,  $\chi^2 (264.619)= 6$ ,  $p= 0.000$ ). The provided model explains 96% of the variance in the dependent variables. The BIS-11 impulsivity scores seem to be the most important relative variable for the discrimination of euthymic patients with bipolar-I disorder and healthy subjects without any psychiatric disorder. Impulsivity was followed by total BSCS impulsivity sub-scores, social skills, total BSCS self-discipline sub-scores, anger management and controlling negative body responses. The discriminant analysis was found to have the correct classification results for 98.8% of the participants.

### ROC Analysis

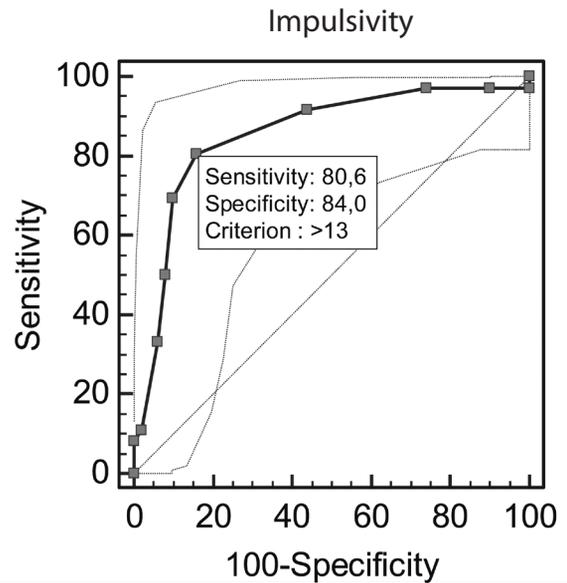
In the graph of Sensitivity and 1-Specificity (false positivity) values, how much the curve approaches the left corner or the area under the curve approaches a value of 1.0 indicates that the test can better discriminate between the two groups (29). Figures 2, 3, and 4 present the graphs from the total BSCS scores and the impulsivity and self-discipline scores.



**Figure 2:** Description of patients with a diagnosis of Bipolar I disorder and subjects without a psychiatric diagnosis by means of total BSCS scores

As shown by Figure 2, the area under the curve for the total BSCS score, 0.568 (0.457-0.675), is not statistically significant (29). This situation shows that the BSCS is not able to describe patients, diagnosed with bipolar I disorder, and subjects without any psychiatric disorders.

As shown in Figure 3, the area under the curve for the impulsivity sub-scores of the BSCS, 0.853 (0.761-0.92), is statistically significant (29). This situation shows that the impulsivity sub-score of the BSCS is able to describe the euthymic patients, diagnosed with bipolar I disorder and



**Figure 3:** Description of patients with a diagnosis of bipolar I disorder and subjects without any psychiatric disorder by means of the impulsivity sub-scores of the BSCS

subjects without any psychiatric disorders. Table 3 shows the information on sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios, and alternative cut-off scores when the impulsivity lower cut-off point is set to 13.

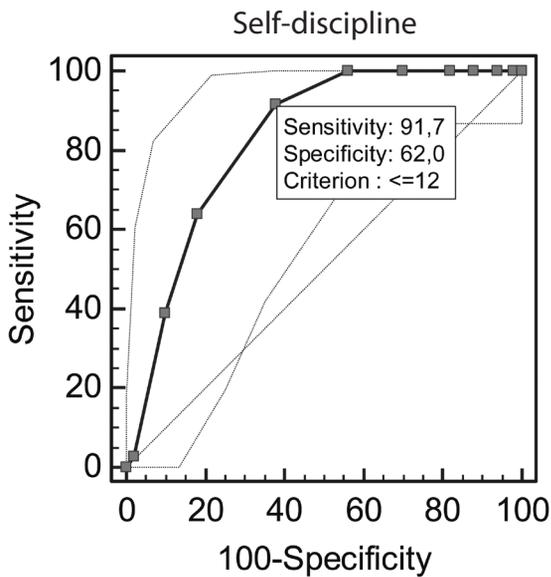
As shown in Figure 4, the area under the curve for the self-discipline sub-scores of the BSCS, 0.8526 (0.729-0.899), is statistically significant (29). This situation shows that the self-discipline sub-score of the BSCS is able to describe the euthymic patients, diagnosed with bipolar I disorder and subjects without any psychiatric disorders. Table 4 shows the information on sensitivity, specificity,

**Table 3:** Cut-off score for the Impulsivity Subscale of the BSCS, Sensitivity and Specificity Values, Positive and Negative Predictive Values, Positive and Negative Likelihood Ratios

Cut-off score	Sensitivity	Specificity	Positive Odds Ratio	Negative Likelihood ratio	Positive Predictive Value	Negative Predictive Value
≥ 8	100.00	0.00	1.00		1.0	
> 8	97.22	0.00	0.97		1.0	0.0
> 10	97.22	10.00	1.08	0.28	1.1	99.7
> 11	97.22	26.00	1.31	0.11	1.3	99.9
> 12	91.67	56.00	2.08	0.15	2.1	99.8
> 13*	80.56	84.00	5.03	0.23	4.8	99.8
> 14	69.44	90.00	6.94	0.34	6.6	99.7
> 15	50.00	92.00	6.25	0.54	5.9	99.5
> 16	33.33	94.00	5.56	0.71	5.3	99.3
> 17	11.11	98.00	5.56	0.91	5.3	99.1
> 18	8.33	100.00		0.92	100.0	99.1
> 19	0.00	100.00		1.00		99.0

**Table 4: Cut-off score for the Self-discipline Subscale of the BSCS, Sensitivity and Specificity Values, Positive and Negative Predictive Value, Positive and Negative Likelihood Ratios**

Cut-off score	Sensitivity	Specificity	Positive Odds Ratio	Negative Likelihood ratio	Positive Predictive Value	Negative Predictive Value
<9	0.00	100.00		1.00		99.0
≤ 9	2.78	98.00	1.39	0.99	1.4	99.0
≤ 10	38.89	90.00	3.89	0.68	3.8	99.3
≤ 11	63.89	82.00	3.55	0.44	3.5	99.6
≤ 12*	91.67	62.00	2.41	0.13	2.4	99.9
≤ 13	100.00	44.00	1.79	0.00	1.8	100.0
≤ 14	100.00	30.00	1.43	0.00	1.4	100.0
≤ 15	100.00	18.00	1.22	0.00	1.2	100.0
≤ 16	100.00	12.00	1.14	0.00	1.1	100.0
≤ 17	100.00	6.00	1.06	0.00	1.1	100.0
≤ 18	100.00	2.00	1.02	0.00	1.0	100.0
≤ 20	100.00	0.00	1.00		1.0	

**Figure 4: Description of patients with a diagnosis of bipolar I disorder and subjects without any psychiatric disorder by means of the self-discipline sub-scores of the BSCS**

positive and negative predictive values, positive and negative likelihood ratios, and alternative cut-off scores when the impulsivity lower cut-off point is set to 12.

## DISCUSSION

For validity and reliability study of the Turkish adaptation of the BSCS, the linguistic equivalence of the scale was first established. For the translation of the BSCS, the translation-back translation method was adopted. Despite its difficulties, the method is one of the most recommended methods for cross-cultural scale adaptations. However, even with similar translation results, it can still

be inadequate for cultural differentiations. Therefore, pre-application of the scales after translation is strongly recommended (30). In the pre-application, the Pearson correlation coefficients between the English and Turkish forms of the scale, were found to be 0.73 for the main scale, 0.72 for the impulsivity subscale and 0.76 for the self-discipline subscale. According to Akgül (31) a correlation coefficient in the range of 0.00-0.25 reflects a very weak, 0.26-0.49 reflects a poor, 0.50-0.69 reflects a medium, 0.70-0.89 reflects a high and 0.90-1.00 reflects a very high relationship. Accordingly, we may say that the correlation coefficients between the Turkish and English forms for the main scale as well as the impulsivity and self-discipline subscales are high. These results show that linguistic equivalence for the Turkish version of the BSCS has been achieved.

As a result of the exploratory factor analysis for the determination of the factor structure of the BSCS, a two-factor structure explaining 41.65% of the total variance was obtained. The dimension of impulsive behaviors was named impulsivity and it was determined to explain

22.95% of the total variance. The dimension of controlling behaviors involving items 1, 2, 7, and 8 was named self-discipline and appeared to explain 18.70% of the total variance. Items 6, 3, 4, and 11 were excluded from the scale as the factor load of item 6 was lower than 0.30 and the difference between both factor loads of items 3, 4, and 11 was lower than 0.10 (27) for the two factors. By considering the necessity in scale development studies that the determined variance rate should be more than 40% (27), we can say that our variance rate was sufficient. In other words, the contribution of the two-factor structure of

the BSCS for the total variance is sufficient. Maloney, Grawitch, and Barber have indicated that there was no satisfactory evidence regarding the single-factor structure of the BSCS (18) and similar to our study they found that the BSCS was comprised of two factors, impulsivity and self-regulation, and that these factors were able to explain 39% of the total variance. According to the findings of relevant research, 28% of the total variance can be explained by impulsivity and 11% of the total variance can be explained by self-regulation.

The results from the CFA, which was performed to determine if the two-factor structure from the results of the EFA could be confirmed or not, revealed the excellent compatibility of the model. According to the results of the CFA, the factor loads of the impulsivity and self-discipline subscales of the BSCS were between 0.34 to 0.60 and 0.40 to 0.63, respectively. All factor loadings indicating the relevance of items with the conceptual structure were found to be higher than 0.30 (32). Similar to our study Maloney, Grawitch, and Barber (18) have stated that a single-factor structure was not compatible, whereas a two-factor structure with self-suppression and impulsivity was compatible.

For criterion-related validity studies, relations between the BSCS subscales and the BIS-11, TSIS social skills subscale, and controlling negative body responses and anger management subscales of the EMSS were evaluated. The impulsivity subscale was found to have a moderate to high positive relationship with the BIS-11, a low to moderate negative relationship with the controlling negative body responses and anger management subscales of the EMSS and a low negative relationship with the TSIS-social skills subscale. The self-discipline subscale was found to have a low to moderate negative relationship with the BIS-11, a moderate to high positive relationship with the controlling negative body responses and anger management subscales of the EMSS and a low positive relationship with the TSIS-social skills subscale. These statistically significant correlation values show a substantial criteria-related validity of the BSCS, which has been already reported to have a negative relationship with aggressiveness, anger and impulsivity, and a positive relationship with social skills (6).

For the evaluation of discriminant validity, discrimination of the impulsivity and self-discipline subscales of the BSCS scores, total impulsivity scores of

the BIS-11, the controlling negative body responses and anger management and social skills in euthymic patients and subjects without any psychiatric diagnosis were tested. According to the results of the discriminant analysis a single discriminative function was obtained and this function explained 96% of the diagnosis of bipolar I disorder. By considering that impulsivity (17) and low self-discipline (33) are statistically significant predictors for bipolar spectrum disorders, it is evidence for the discriminative validity of BSCS that the total scores of the impulsivity and self-discipline subscales are considered to be the most important relative variables in this function.

Results of ROC analysis show that the impulsivity and self-discipline subscales of the BSCS are discriminative for patients diagnosed with bipolar I disorder according to the DSM-IV-TR diagnostic criteria and subjects without any psychiatric disorder. Moreover, as the main purpose of discrimination studies is confirmation of the diagnosis, should the diagnostic test indicates the disease, confirmatory positive predictive values become particularly important (34). However, very low levels of positive predictive values (4.8% for impulsivity and 2.4% for self-discipline) suggest that the impulsivity and self-discipline subscales will be insufficient for certain discrimination. In addition, it can be suggested that false positivity rates may increase in diagnostic studies using the BSCS, because the performance of the test and accuracy of the diagnosis depend on both the original rates of the test and the prevalence of the disease, as the prevalence of bipolar I disorder is low (1%). Therefore, it can be noted that it will not be appropriate to use the BSCS as the only diagnostic tool; however, it can be used as part of a screening process.

Cronbach's  $\alpha$  coefficient was calculated in order to examine the internal consistency coefficient of the BSCS. Cronbach's  $\alpha$  coefficients of the total scale and the self-discipline and impulsivity subscales were found to be 0.83, 0.81, and 0.87, respectively. An internal consistency coefficient value higher than 0.80 is regarded as sufficient for reliability (27). Accordingly, both the BSCS and the impulsivity and self-discipline subscales can be considered as reliable. In the development study for the scale, the internal consistency coefficient was found to be 0.85 (6). Evaluation of Dutch and German adaptation studies revealed the internal consistency coefficients to be 0.90 (35) and 0.85 (36), respectively. Time stability was

evaluated by test-retest reliability and the interclass correlation coefficients (ICC) for the total scale and the impulsivity and self-discipline subscales were found to be 0.88, 0.83, and 0.85, respectively between two tests, repeated at a 3-week interval. These results show that the test-retest reliability was achieved. Total scores of items in the impulsivity and self-discipline subscales of the BSCS were regulated in order to determine prediction and discrimination and corrected item-total correlations were calculated. The results of the corrected item-total correlation were between 0.519 and 0.681 for the self-discipline subscale and between 0.645 and 0.788 for the impulsivity subscale. Bearing in mind that a corrected item-total correlation value of an item, which is equal or higher than 0.30, is regarded as sufficient for the discrimination of measured parameters (27), it can be stated that the corrected item-total correlations of both scales are sufficient.

The results of our study show that the Turkish version of the BSCS is a valid and reliable measurement tool. However, this study has some limitations. First, the collection of data on the psychometric properties of the BSCS was done by using self-reported measurement tools. The use of self-reported measurement tools could cause recall bias as different individuals had different possibilities of remembering the scale items (37). The second limitation is the generalizability of the study data, as the validity and reliability studies of the BSCS were performed in subjects without any psychiatric disorders according to the DSM-IV-TR criteria (19). Therefore, reliability and validity studies in different samples are recommended. Particularly, validity and reliability studies of the BSCS in patients diagnosed with other psychiatric disorders will contribute to the screening of psychiatric disorders. Finally, conducting studies by using the BSCS will provide crucial information about its measurement capacity.

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**Appendix: Turkish version of the Brief Self-Control Scale**

Lütfen aşağıdaki ifadeleri okuduktan sonra kendinizi değerlendirip sizin için en uygun seçeneği işaretleyiniz.		Tamamen Aykırı	Oldukça aykırı	Kararsızım	Oldukça uygun	Tamamen uygun
1	İnsanların beni kötülüğe yönlendirmesine karşı koymada başarılıyım.	1	2	3	4	5
2	Kötü alışkanlıklarımı terk etmekte zorlanırım.	1	2	3	4	5
3	Tembel biriyim.	1	2	3	4	5
4	Uygun olmayan şeyler söylerim.	1	2	3	4	5
5	Eğlenceli olmaları durumunda benim için kötü olan bazı şeyleri yaparım.	1	2	3	4	5
6	Benim için kötü olan şeyleri redderim.	1	2	3	4	5
7	Daha fazla öz-disipline sahip olmayı isterdim.	1	2	3	4	5
8	İnsanlar güçlü bir öz-disipline sahip olduğumu ifade ederler.	1	2	3	4	5
9	Zevkli ve eğlenceli şeyler yapacağım işten beni alıkoyar.	1	2	3	4	5
10	Konsantrasyon sorunun var.	1	2	3	4	5
11	Uzun vadeli amaçlarıma ulaşmak için verimli biçimde çalışabilirim.	1	2	3	4	5
12	Bazen yanlış olduğunu bilsem de bazı şeyleri yapmaktan kendimi alamam.	1	2	3	4	5
13	Sıklıkla bütün seçenekler üzerinde düşünmeden hareket ederim.	1	2	3	4	5