Turkish Adaptation, Validity and Reliability Study of the Bush Francis Catatonia Rating and KANNER Scales

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İbrahim Mert ERDOĞAN[1] , Aslı AYTULUN[2] , K. Burcu AVANOĞLU[3] , Özge TÜRKOĞLU[4] ,
Nilgün OKTAR ERDOĞAN[5] , Ş. Can GÜREL[6] , Sevilay KARAHAN[7] , M. Kâzım YAZICI[8] ,
A. Elif ANIL YAĞCIOĞLU[9]

ABSTRACT

Objective: Catatonia is a common syndrome which can be life-threatening due to its complications. The aims of the study were to translate the Bush Francis Catatonia Rating Scale (BFCRS) and the KANNER Scale into Turkish, conduct the validity and reliability analyses and to compare the two scales.

Method: During the study period extending over 20 consecutive months, the Turkish versions of the scales were administered to 84 patients who were hospitalized in the psychiatry ward or who were admitted to the hospitalization list. The clinical and sociodemographic characteristics of all patients were evaluated. The scales were administered to the patients by two raters, one of whom was permanently involved.

Results: Convergent and criterion validities revealed a high correlation between the screening instruments of both scales and between the BFCRS total score and 2nd and 3rd part scores of the KANNER Scale. BFCRS total score of ≥6, KANNER Scale 2nd part score of ≥15, or 3rd part score of ≥1 can be used with high accuracy in diagnosing catatonia according to DSM-5. Internal consistency for both scales was found to be high (Cronbach's alpha 0.902 for BFCRS and 0.9, 0.891, 0.806 for KANNER Scale subsections). Inter-rater reliability was also high for most of the scale items (mean Kappa coefficient: 0.885 for BFCRS and 0.904 for KANNER Scale).

Conclusion: In conclusion, the Turkish adaptations of both scales were found to be valid and reliable, showing strong psychometric properties. This study is the first validity and reliability study for the KANNER Scale.

Keywords: Catatonia, Rating Scales, Diagnosis, Validity, Reliability

INTRODUCTION

Catatonia, first described in 1874, is a psychiatric syndrome which is characterized by disturbances in mood and thought as well as motor functions (Fink 2009, Fink and Taylor 2009). It is characterized by signs and symptoms such as mutism, negativism, posturing, rigidity, staring, stereotype, mannerism, and automatic obedience (Francis 2010, Tandon et al. 2013). It can be seen in various psychiatric disorders, including depression, mania, schizophrenia, and organic disorders (Braunig et al., 2000, Francis 2010). Recognizing catatonia is vital as it may be associated with significant impairment in self-care, decreased oral intake, and unpredictable aggression that may threaten the patient himself or his relatives (Sarkar et al., 2016).

Various scales are used in the objective evaluation of catatonia. The most commonly used scale is the Bush Francis Catatonia Rating Scale, developed by Bush et al. (1996). This scale is based on the definitions of catatonia in the DSM and ICD and the views of authors such as Kahlbaum and Kraepelin on catatonia. Dr. Alp Üçok et al. from Istanbul University Faculty of Medicine, translated this scale into Turkish, but Turkish validity and reliability study was not conducted (Yazıcı 2018).

The most recently developed scale for the assessment of catatonia is the KANNER Scale. It was developed by Carroll et al. in 2008. While naming of the scale was inspired by the name of Leo Kanner, and the first letters of the words 'Katatonia, Autism, Neuropsychiatric, Neuromovement, Examination, Rating' were combined. The current area of

use of this scale, which was developed to evaluate catatonia in autism, is broader. It has been reported that it may help detect catatonia in other developmental disorders and neuropsychiatric diseases. Similar to BFCRS, the KANNER Scale also provides a screening section. Differently, however, in the KANNER Scale, a separate item was developed for each symptom, which is not the case for the BFCRS. In the KANNER Scale, motor symptoms are examined within a more comprehensive framework (Carroll et al., 2008), which is believed -due to such comprehensiveness, specificity and sensitivity- to provide clinical benefits for future catatonia-related studies (Sienaert et al., 2011). There is no Turkish translation of the the KANNER Scale nor any validity and reliability studies in Turkish.

Currently, DSM-5 criteria are used to diagnose catatonia, but DSM criteria are thought to be non-specific and contain repetitions. The lack of time criteria is considered a limitation (Taylor and Fink, 2003). It has been reported that the prevalence of catatonia is higher in studies conducted with rating scales than in studies using DSM-5 diagnostic criteria (Wilson et al., 2015, Sarkar et al., 2016).

It has been shown that 7-15% of patients treated in psychiatry clinics and emergency services and more than 10% of acute hospitalizations to psychiatry services have catatonia (Taylor and Fink 2003, Fink and Taylor 2009). Catatonia is most commonly associated with mood disorders, especially mania. The prevalence of catatonia in mood disorders and psychotic disorders is similar (Fink and Taylor 2003).

In light of this information, this study aims to translate the BFCRS and KANNER Scale into Turkish, conduct validity and reliability studies and compare the two.

METHOD

Sample

In this validity and reliability study in which catatonia symptoms were evaluated, it was decided to assess all patients hospitalized in the Psychiatry Service of Hacettepe University Faculty of Medicine (HÜTF), and for whom at least one psychiatrist indicated admission to the psychiatry service.

Patients were enrolled in the study between December 2019 and July 2021. The researchers explained the characteristics of the study, and 84 patients who signed the informed consent form were enrolled in the study.

The scales were administered to all patients on the same day by two separate members of the evaluator team (Dr.İME, Dr.AA, Dr.KBA, Dr.ÖT and Dr.ŞCG). One of the evaluators (Dr.İME) was present in all patient assessments.

The design and purpose of the study were evaluated by the HÜTF Non-Interventional Clinical Research Ethics Committee and approved on 05.07.2019 (Ethics committee registration number: GO 19/423).

Evaluation Tools

Sociodemographic and Clinical Information Form: A form including the patient's age, gender, primary diagnosis, and additional diagnoses was used.

Bush Francis Catatonia Rating Scale: Permission was obtained from one of the scale developers, Dr. Andrew Francis, to translate the BFCRS into Turkish. Two researchers translated the scale into Turkish. Two psychiatry faculty members reviewed the first translated text. The Turkish translation of the scale was translated back into English by two different researchers. The version which was back-translated into English was sent back to Dr. Andrew Francis. The translation was finalized in accordance with the revisions of the scale developers and the faculty members involved in the study (Dr.AEAY, Dr.MKY). The Turkish translation of the scale is presented as a supplement.

KANNER Scale: Permission was obtained from one of the scale developers, Dr. Brendan Carroll, to translate the KANNER Scale into Turkish. The scale was translated into Turkish by two researchers. Two psychiatry faculty members reviewed the first translated text. The Turkish translation of the scale was translated back into English by two different researchers. The version which was back-translated into English was sent to one of the scale developers, Dr. Brendan Carroll. The translation was finalized in accordance with the revisions of the scale developers and the faculty members involved in the study (Dr.AEAY, Dr.MKY). The Turkish translation of the scale is presented as a supplement.

DSM-5 Catatonia Diagnostic Criteria: In DSM-5, there are 12 symptoms for diagnosing catatonia, consisting of catalepsy, waxy flexibility, stupor, agitation, mutism, negativism, posturing, mannerism, stereotypy, grimace, echolalia, and echopraxia. It is stated that three or more of these 12 symptoms should be present to diagnose with catatonia.

Application

Sociodemographic characteristics and clinical information of the patients whose consent was obtained were noted with the sociodemographic information form prepared for this study. The patients included in the study were examined in terms of symptoms of catatonia and evaluated with the specified assessment tools.

During their psychiatry residency training, all of the five evaluators (Dr.ŞCG, Dr.İME, Dr.AA, Dr.KBA, and Dr.ÖT) who conducted the study were trained by the senior authors (Dr.AEAY, Dr.MKY) about the symptoms of catatonia. In addition, all evaluators benefitted from the training videos

about the KANNER Scale sent by Dr. Brendan Carroll and the IFFL training videos and articles available on the University of Rochester website (see www.bfcrs.urmc.edu). Within the scope of this study, an examination form for the evaluation of catatonia was developed by compiling the information present in the literature. Photographs containing examination methods and symptoms were also taken and added to the form to guide catatonia evaluations. This examination form is also presented as a supplement.

Statistical Analysis

Statistical analyses were made in IBM SPSS for Windows Version 23.0 package program. Descriptive statistics are given as numbers and percentages for categorical variables and mean±standard deviation and median [25-75th percentile] for numerical variables. The comparison of independent groups in terms of categorical variables was made with the chi-square test. Mann Whitney U test was used to compare numerical variables. ROC curve analysis was applied to find the scale cut-off points that separate the catatonia groups. Sensitivity and specificity values for the best cut-off point were determined. Convergent and criterion validity were evaluated. The Kappa coefficient gave an Inter-rater agreement of scale items. Inter-rater compatibility was evaluated with the intra-class correlation coefficient (ICC). Item analysis of the scale items was performed, and item-total correlations and Cronbach's alpha coefficients were examined to show internal consistency. The significance level was specified as $p<0.05$.

RESULTS

As mentioned in the method section, 84 patients were included in the study. The primary diagnoses of the patients were mainly mood disorder (48.8%) and psychotic disorder (22.6%), particularly schizophrenia.

It was observed that 28 (33.3%) of the 84 patients included in the study screened positive for catatonia in at least one scale evaluation. Catatonia was diagnosed according to DSM-5 Catatonia Diagnostic Criteria in 23 (82.1%) of the 28 patients who screened positive for catatonia in at least one scale evaluation. It was observed that all of these patients screened positive for both the screening part of the BFCRS and the KANNER Scale. A ROC curve was drawn to evaluate the ability of the BFCRS in distinguishing people diagnosed with catatonia according to the DSM-5 Catatonia Criteria. It was determined that the total score of the BFCRS had a high ability to distinguish patients diagnosed with catatonia according to the DSM-5 Catatonia Criteria (area under the curve= 0.983, p<0.005). The best cut-off point was when the total score of BFCRS was 5.5 (sensitivity=1, specificity=0.934). When the ROC curve is drawn for the KANNER Scale, both the KANNER Scale 2nd part score

Table 1. The Sociodemographic and Clinical Characteristics of the Patient Sample

	N	(%)
Patient Group		
Psychiatry inpatient	63	75.0
Psychiatry inpatient waiting list	21	25.0
Gender		
Female	40	47.6
Male	44	52.4
Main Diagnosis		
Mood disorders	41	48.8
Psychotic disorders	19	22.6
Other	24	28.6

(area under the curve=0.986, p<0.005) and the KANNER Scale 3rd part score (area under the curve=0.926, p<0.005), it was found that the ability to distinguish people diagnosed with catatonia according to the DSM-5 Catatonia Criteria was high. The best cut-off point was determined as 15 (sensitivity=0.826, specificity=0.984) for the KANNER Scale 2nd part score and 0.5 (sensitivity=0.913, specificity=0.902) for the 3rd part score.

Some authors state that two or more symptoms in the BFCRS are sufficient to diagnose catatonia (Bush et al., 1996a; Wilson et al., 2015). A ROC curve was drawn to evaluate the ability of the KANNER Scale to differentiate the diagnosis of catatonia from the BFCRS, and the distinguishing ability of both the KANNER Scale 2nd part score (area under the curve=0.998, p<0.005) and the KANNER Scale 3rd part score (area under the curve=0.939, p<0.005) was found to be high. The best cut-off point was 5 points (sensitivity=1, specificity=0.982) for the 2nd part of the KANNER Scale and 0.5 points (sensitivity=0.893, specificity=0.964) for the 3rd part of the KANNER Scale.

Patients with and without a diagnosis of catatonia according to DSM-5 Catatonia Diagnostic Criteria were compared in terms of BFCRS total score and KANNER Scale 2nd and 3rd part scores. A statistically significant difference was found on all scales. The mean, median, and standard deviations are given in Table 2.

Inter-rater reliability was evaluated separately for each item using the kappa statistic. The findings of the BFCRS can be seen in Table 3. It was observed that there was complete agreement between the raters in the items of gegenhalten, grasp reflex, combativeness, and autonomic disorder in the BFCRS (Kappa coefficient=1). An acceptable agreement between the raters (Kappa coefficient=0.75-0.796) for impulsivity, ambitendency, staring, grimace and mitgehen and a high agreement between raters for other items (Kappa coefficient=0.818-0.952) were determined. The intra-class correlation coefficient for BFCRS was 0.99 (F=199.371, p<0.005).

Table 2. Comparison of Patients Diagnosed and Not Diagnosed with Catatonia According to DSM-5 in Terms of Total ScaleScores

	Catatonia Not Present		Catatonia Present		p Value
	Mean±SD	Median [25-75%]	Mean±SD	Median [25-75%]	
BFCRS Total Score	0.89±2.69	0 [0 – 0]	15.6±8.8	13 [9 – 19]	<0.005
KANNER Scale 2nd Part Score	1.11±3.36	0 [0 – 0]	25.9±14.0	24 [16 – 44]	<0.005
KANNER Scale 3rd Part Score	0.18±0.72	0 [0 – 0]	2.97±2.12	3 [1 – 5]	<0.005

SD: Standart deviation

Table 3. Inter-rater Reliability for the Bush Francis Catatonia Rating Scale

BFCRS Items	Inter-rater Reliability (Kappa coefficient)
Gegenhalten	1
Grasp reflex	1
Combativeness	1
Autonomic abnormality	1
Excitement	0,952
Waxy flexibility	0,935
Mutism	0,934
Mannerism	0,933
Perseveration	0,927
Posturing/catalepsy	0,925
Immobility/stupor	0,922
Verbigeration	0,899
Rigidity	0,857
Automatic obedience	0,856
Withdrawal	0,855
Stereotypy	0,835
Negativism	0,824
Echopraxia/echolalia	0,818
Impulsivity	0,796
Ambitendency	0,794
Staring	0,776
Grimacing	0,769
Mitgehen	0,75
Positive scored catatonia screening	1

Table 4. Inter-rater Reliability for the Screening Part of KANNER Scale

Items	Kappa Coefficient
Waxy flexibility/catalepsy	1
Refusal to eat or drink	1
Excitement	1
Direct observation of catatonic features in nursing notes	1
Negativism	0,965
Mutism	0,965
Immobility	0,956
Staring	0,892
Echolalia/echopraxia	0,886
Rigidity	0,862
Impulsivity	0,844
Positive scored catatonia screening	1

It was observed that all items in the screening part of the KANNER Scale showed acceptable or high agreement between the raters (Kappa coefficient=0.75-1). It was found that the waxy flexibility, refusal to eat or drink, excitement, and the observation of catatonic properties in nurse records were in total agreement with these items. Among the items in the 2nd part of the KANNER Scale, magnetism, negativism, posturing, and immobility items were in acceptable or high agreement between raters (Kappa coefficient=0.779-0.808); laxity and grimace items were found to have a weak agreement (Kappa coefficient=0.497-0.563). Grimacing was present in 6 patients, and laxity was present in only one patient. The inter-rater reliability of the other items was found to be high or complete (Kappa coefficient=0.818-1). The inter-rater reliability of the nudity item, which was not observed in any of the evaluations made by the evaluators, was determined as complete. The intra-class correlation coefficient of the second part of the KANNER Scale was 0.983 (F=116.900, p<0.005).

In the third part of the KANNER Scale, the inter-rater reliability of the mitgehen item was acceptable (Kappa coefficient=0.75), and the inter-rater reliability of the other items was high or complete (Kappa coefficient=0.896-1). The intraclass correlation coefficient for the 3rd part of the KANNER Scale was 0.975 (F=80.092, p<0.005). Inter-rater reliability findings for the KANNER Scale are given in Table 4 and Table 5.

According to the Cronbach's alpha coefficient results, the internal consistency reliability of the BFCRS (Cronbach's alpha coefficient = 0.902) was determined to be high. It was observed that the Cronbach alpha coefficient increased when the automatic obedience and ambitendecy items were removed from the scale (Cronbach's alpha coefficient = 0.903 when the automatic obedience item was removed, and Cronbach's alpha coefficient = 0.904 when the ambitendecy item was removed). When the correlation between the items and the total score on the scale was evaluated, it was determined that the item-total correlation coefficient of the item was above 0.204 for the ambitendency item and above 0.25 for all items except this item. The internal consistency analyses for the BFCRS are given in Table 6.

Table 5. Inter-rater Reliability for the 2nd and 3rd Part of the KANNER Scale

KANNER Scale 2nd Part Items	Kappa Coefficient	KANNER Scale 3rd Part Items	Kappa Coefficient
Nudism	1	Catalepsy	1
Incontinence (psychogenic)	1	Echopraxia	1
Combativeness	1	Paratonia	1
Excitement	0.95	Grasp reflex	1
Mutism	0.938	Metronome test	1
Refusal to drink	0.92	Magnetism	1
Stupor	0.907	Echolalia	0.946
Rigidity	0.89	Perseveration	0.941
Stereotypy	0.889	Waxy flexibility	0.935
Refusal to eat	0.879	Verbigeration	0.917
Impulsivity	0.865	Command-verbal	0.896
Staring	0.845	Command-motor	0.75
Mannerism	0.808		
Negativism	0.8		
Posturing	0.784		
Immobility	0.779		
Grimacing	0.563		
Flaccidity	0.497		

Table 6. Internal ConsistencyAnalyses for the Bush Francis Catatonia Rating Scale

	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Excitement	4.7143	0.513	0.899
Immobility/stupor	4.5952	0.545	0.897
Mutism	4.4524	0.513	0.899
Staring	4.4881	0.733	0.892
Posturing/catalepsy	4.5952	0.698	0.894
Grimacing	4.7500	0.379	0.901
Echolalia/echopraxia	4.7262	0.579	0.897
Stereotypy	4.6786	0.559	0.897
Mannerism	4.7024	0.634	0.895
Verbigeration	4.6786	0.663	0.895
Rigidity	4.7381	0.489	0.899
Negativism	4.5714	0.723	0.893
Waxy flexibility	4.5476	0.623	0.895
Withdrawal	4.5238	0.655	0.894
Impulsivity	4.7619	0.528	0.899
Automatic obedience	4.6429	0.287	0.903
Mitgehen	4.6190	0.514	0.898
Gegenhalten	4.6905	0.365	0.902
Ambitendency	4.7619	0.204	0.904
Grasp reflex	4.6548	0.535	0.897
Perseveration	4.6190	0.456	0.900
Combativeness	4.7857	0.508	0.899
Autonomic abnormality	4.8214	0.260	0.902

Table 7. Internal Consistency Cnalyses for the Screening Part of the KANNER Scale

	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Waxy flexibility/catalepsy	0.5830	0.701	0.887
Immobility	0.5785	0.734	0.885
Refusal to eat or drink	0.5740	0.690	0.887
Excitement	0.5785	0.447	0.901
Staring	0.5561	0.800	0.880
Negativism	0.5516	0.776	0.881
Mutism	0.5516	0.730	0.885
Impulsivity	0.6009	0.496	0.898
Rigidity	0.5964	0.476	0.899
Echolalia/echopraxia	0.5919	0.554	0.895
Direct observation of catatonic features in nursing notes	0.6054	0.538	0.896

Table 8. Internal consistency analyses for the 2nd part of the KANNER Scale

KANNER Scale 2nd Part Items	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Excitement	7.4524	0.303	0.891
Immobility	7.1429	0.674	0.880
Stupor	7.2381	0.693	0.879
Mutism	6.7381	0.697	0.881
Staring	6.9048	0.820	0.873
Posturing	7.2381	0.776	0.877
Grimacing	7.4524	0.407	0.889
Stereotypy	7.4286	0.400	0.889
Mannerism	7.5238	0.335	0.891
Rigidity	7.3810	0.489	0.887
Flaccidity	7.6667	0.251	0.892
Negativism	6.9048	0.673	0.880
Refusal to eat	7.0238	0.779	0.875
Refusal to drink	7.0238	0.779	0.875
Impulsivity	7.4524	0.269	0.892
Nudity	7.7381	0.000	0.894
Incontinence	7.6905	0.308	0.892
Combativeness	7.5476	0.375	0.890

Table 9. Internal consistency analyses for the 3rd part of the KANNER Scale

KANNER Scale 2nd Part Items	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Echolalia	0.8452	0.564	0.780
Verbigeration	0.8929	0.484	0.789
Perseveration	0.8690	0.547	0.782
Waxy flexibility	0.8690	0.653	0.770
Catalepsy	0.8095	0.535	0.785
Echopraxia	0.9762	0.000	0.813
Command-verbal	0.8333	0.528	0.785
Command-motor	0.8929	0.626	0.775
Paratonia	0.9167	0.363	0.799
Grasp reflex	0.9048	0.425	0.794
Metronome test	0.9762	0.000	0.813
Magnetism	0.9524	0.314	0.803

The internal consistency reliability of the screening part (Cronbach's alpha coefficient=0.900), the second part (Cronbach's alpha coefficient=0.891), and the third part (Cronbach's alpha coefficient=0.806) of the KANNER Scale were found to be high. When the excitement item in the 1st part of the KANNER Scale was removed from the scale, it was observed that the Cronbach alpha coefficient increased (0.901). When the correlation between the items and the total score on the scale was evaluated, it was observed that the item-total correlation coefficient of the item was at least 0.447 (for the excitement item). Internal consistency analyses for the screening part of the KANNER Scale are given in Table 7.

In the second part of the KANNER Scale, Cronbach's alpha value increased when flaccidity (Cronbach's alpha = 0.892), impulsivity (Cronbach's alpha = 0.892), nudism (Cronbach's alpha = 0.894), and incontinence (Cronbach's alpha = 0.892) items were excluded from the scale. The item overall correlation coefficient was found to be "0" for the nudism item and above 0.25 for the other items.

When the echopraxia and metronome test items were removed in the 3rd part of the KANNER Scale, it was observed that the Cronbach alpha coefficient increased (Cronbach's alpha = 0.813 when the motion imitation was removed; Cronbach's alpha = 0.813 when the metronome test was removed. It was observed that all correlation coefficients of the item were "0" for echopraxia and metronome test, and ranged from 0.314 to 0.653 for other items. Internal consistency analyses for sections 2 and 3 of the KANNER Scale are given in Tables 8 and 9.

DISCUSSION

In this study, the validity and reliability analyses of the Turkish translations of the BFCRS and the KANNER Scale, which were developed to evaluate the symptoms of catatonia, were performed. It was determined that both scales could significantly distinguish patients diagnosed with catatonia, even if they were not diagnosed according to DSM-5. Convergent and criterion validity revealed a high correlation between the screening parts of both scales and a high correlation between the BFCRS total score and 2nd part and 3rd part scores of the KANNER Scale. It has been found that a total score of ≥6 in BFCRS, ≥15 in the KANNER Scale 2nd part score, or ≥1 in the KANNER Scale 3rd part score can be used with high accuracy in diagnosing catatonia according to DSM-5. High agreement between raters was observed for both scales. The internal consistency reliability of both scales was found to be high.

In our study, 28 (33.3%) of the 84 patients in the sample screened positive for catatonia, and 23 (82.1%) of these 28 patients were diagnosed with catatonia according to the DSM-5 Catatonia Diagnostic Criteria. High agreement

between raters was observed for all items in the Turkish version of the BFCRS (mean Kappa coefficients for the screening section=0.87 and SD=0.06; mean Kappa coefficients for the whole scale=0.89; SD=0.08). In the original study by Bush et al. (mean of Kappa coefficients=0.83 and SD=0.09 in the screening section; an average of Kappa coefficients in the whole scale=0.73 and SD=0.18), agreement among raters was found at a higher rate (Bush et al. . 1996). Inter-rater agreement data in the Portuguese validity and reliability study of the BFCRS conducted by Nunes et al. in Brazil were found to be similar to the original research (mean Kappa coefficients=0.78 and SD=0.11 in the screening section; average Kappa coefficients in the whole scale=0, 82 and SD=0.12)(Nunes et al. 2017). The high inter-rater reliability rates in this study could be explained by the evaluator training regarding the symptoms of catatonia received during the psychiatry residency training.

Staring, ambitendency and mitgehen stand out as items with lower agreement between raters, both in our study and that of Nunes et al. Inpatients in two psychiatry clinics identified in the study of Nunes et al. were examined, and the Brazilian version of the BFCRS was administered to 30 patients diagnosed with catatonia according to DSM-IV and 30 control patients without catatonia. The impulsivity and grimace items, which had a lower agreement between raters in our study, were found to have a high agreement between raters in the study of Nunes et al. Conversely, the perseveration item, which had a very high inter-rater agreement in our study, is among the items with a lower inter-rater agreement in Nunes et al.'s study (Nunes et al. 2017). These contrasts may be related to the small number of patients with these symptoms in the studies.

When the KANNER Scale is examined, it is observed that there is a high agreement (Kappa coefficients=0.779-1) in items other than grimace and flaccidity. Both grimace and flaccidity are among the items observed at less than 25%; flaccidity was found in only one patient, and grimace was present in 6 patients. Studies with larger samples are needed to evaluate the agreement between raters on these items. There is no study in the literature investigating the inter-rater agreement of the items in the KANNER Scale, as a validity and reliability study of the KANNER Scale has not yet been conducted.

In this study, the internal consistency reliability of both the Turkish versions of the BFCRS and the KANNER Scale was high. When the internal consistency reliability analyses were evaluated, no item was found in the BFCRS that significantly reduced the scale's reliability. According to all the correlation coefficients of the item, it was found that the ambitendency item did not contribute to the entirety of the scale. This particular item also appears to be the least observed symptom.

When the sections of the KANNER Scale were examined separately, the internal consistency reliability of the screening

section was found to be high. No symptoms which significantly reduced the reliability of the screening section were observed. There are no items which do not contribute to the entirety of the scale according to all item correlation coefficients. The internal consistency reliability of the second and third sections of the KANNER Scale was also high. It is seen that the nudism item in the second part of the KANNER Scale is an item that reduces the reliability of the scale and does not contribute to the entirety of the scale. It should be noted that this item was not observed in any of the patients. In the third part of the KANNER Scale, it was found that the items of echopraxia and metronome test were items that reduced the reliability of the scale and did not contribute to the entirety of the scale. These symptoms were not observed in any of the patients. According to the analysis results, it is seen that the items that do not contribute to the entirety of the scale are observed less or not observed at all. To better understand the contribution of these items to the scale, studies with larger samples are needed. For this reason, we do not recommend removing the specified items from the Turkish scales without conducting studies with larger samples.

Test-retest reliability was not evaluated in our study due to the variable nature of catatonia symptoms and their transient nature. In the original study by Bush et al., it was stated that test-retest reliability was also not evaluated due to similar reasons (Bush et al. 1996).

This study has some limitations. This validity and reliability study emerged as part of a study aiming to evaluate catatonia in patients hospitalized in a university hospital's psychiatry and neurology services, and internal medicine intensive care unit using scales. Due to the COVID-19 pandemic that emerged during this study and affected the whole world, the number of patients in inpatient services was reduced, and fewer patients were included in the study than planned. Therefore, factor analysis could not be performed. Other limitations include the failure to evaluate drug side effects, the cross-sectional design of the study, and the absence of some scale items in the evaluated patients. The most important aspect of the study is that it has been shown that the Turkish adaptations of both the BFCRS and KANNER Scale are valid and reliable, with strong psychometric properties. The Turkish versions of both scales are able to detect the symptoms of catatonia and can distinguish patients from various diagnostic groups with and without catatonia. The evaluations can be made with semi-structured clinical interviews and examination forms specifically prepared for this purpose and be provided as supplementary material. The inclusion of all patients admitted to the psychiatry ward from the onset of the study can be considered as another strength of the study. It is thought that the adaptation of the scales to Turkish will make an important contribution to the evaluation of catatonia symptoms and the diagnosis of catatonia in our country.

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