Psychometric Properties of the Korean Version of Functioning Assessment Short Test in Bipolar Disorder

Hangoeunbi Kang[1], Bo-Hyun Yoon[1], Won-Myong Bahk[2], Young Sup Woo[2], Won Kim[3], Jonghun Lee[4], InKi Sohn[5], Sung-Yong Park[5], Duk-In Jon[6], Myung Hun Jung[6], Moon-Doo Kim[7], Young-Eun Jung[7], Hyung-Mo Sung[8], Young-Min Park[9], Jung Goo Lee[10], Sang-Yeol Lee[11], Seung-Ho Jang[11], Eun-Sung Lim[12], In Hee Shim[13], Kwanghun Lee[14], Sae-Heon Jang[15]

[1]Department of Psychiatry, Naju National Hospital, Naju, [2]Department of Psychiatry, College of Medicine, The Catholic University of Korea, Seoul, [3]Department of Psychiatry, Sanggye Paik Hospital, Inje University College of Medicine, Seoul, [4]Department of Psychiatry, Daegu Catholic University School of Medicine, Daegu, [5]Department of Psychiatry, Keyo Hospital, Keyo Medical Foundation, Uiwang, [6]Department of Psychiatry, Hallym University Sacred Heart Hospital, Hallym University College of Medicine, Anyang, [7]Department of Psychiatry, College of Medicine, Jeju National University, Jeju, [8]Department of Psychiatry, Soonchunhyang University Gumi Hospital, Soonchunhyang University College of Medicine, Gumi, [9]Department of Psychiatry, Ilsan Paik Hospital, Inje University College of Medicine, Goyang, [10]Department of Psychiatry, Haeundae Paik Hospital, Inje University College of Medicine, Busan, [11]Department of Psychiatry, Wonkwang University Hospital, Wonkwang University School of Medicine, Iksan, [12]Department of Psychiatry, Shinsegae Hyo Hospital, Gimje, [13]Department of Psychiatry, Cancer Center, Dongnam Institute of Radiological and Medical Sciences, Busan, [14]Department of Psychiatry, Dongguk University College of Medicine, Gyeongju, [15]Department of Psychiatry, Bongseng Memorial Hospital, Busan, Korea

Objective: The Functioning Assessment Short Test (FAST) is a relatively specific test for bipolar disorders designed to assess the main functioning problems experienced by patients. This brief instrument includes 24 items assessing impairment or disability in 6 domains of functioning: autonomy, occupational functioning, cognitive functioning, financial issues, interpersonal relationships, and leisure time. It has already been translated into standardized versions in several languages. The aim of this study is to measure the validity and reliability of the Korean version of FAST (K-FAST).
Methods: A total of 209 bipolar disorder patients were recruited from 14 centers in Korea. K-FAST, Young Mania Rating Scale (YMRS), Bipolar Depression Rating Scale (BDRS), Global Assessment of Functioning (GAF) and the World Health Organization Quality of Life Assessment Instrument Brief Form (WHOQOL-BREF) were administered, and psychometric analysis of the K-FAST was conducted.
Results: The internal consistency (Cronbach's alpha) of the K-FAST was 0.95. Test-retest reliability analysis showed a strong correlation between the two measures assessed at a 1-week interval (ICC = 0.97; $p < 0.001$). The K-FAST exhibited significant correlations with GAF (r = −0.771), WHOQOL-BREF (r = −0.326), YMRS (r = 0.509) and BDRS (r = 0.598). A strong negative correlation with GAF pointed to a reasonable degree of concurrent validity. Although the exploratory factor analysis showed four factors, the confirmatory factor analysis of questionnaires had a good fit for a six factors model (CFI = 0.925; TLI = 0.912; RMSEA = 0.078).
Conclusion: The K-FAST has good psychometric properties, good internal consistency, and can be applicable and acceptable to the Korean context.

KEY WORDS: Functioning assessment short test; Bipolar disorder; Psychosocial functioning; Validation.

INTRODUCTION

Bipolar disorder (BD) is characterized by biphasic mood episodes of mania or hypomania and depression. BDs include several disorders of emotion, energy and thought. Patients with BD experience repeated episodes of changes in energy levels and behavior [1]. While the neurobiological etiology of bipolar disorder is multifactorial, it can be estimated from an integrated point of view that mood episodes and treatment responses resulting from the sequelae of bipolar disorder might originate from the neuromolecular pathophysiology of bipolar disorder [2]. The estimated lifetime prevalence rates of BD-I, BD-II, and subthreshold BD were 0.6%, 0.4%, and 1.4%, respectively [3].

With optimal management, patients with BD might be able to achieve full remission and have symptom-free periods, during which the disorder is assumed to be latent [1]. However, functional difficulties often persist beyond the acute phases of the illness, while functional recovery after mood episodes is not always achieved (or is achieved with a significant time-lag behind remission of mood symptoms), even for patients receiving adequate mood stabilization treatment [1].

Traditionally, the outcomes in randomized controlled trials have been defined in a context of reduction of symptoms (response/partial response/non-response). However, in recent years, the focus has also moved from clinical remission to functional recovery [4,5]. BDs are associated with reduced quality of life that can be more severe than that which occurs in other mood or anxiety disorders [6]. Quality of life depends not only on clinical remission but also on functional recovery [4].

An important issue related to functional recovery is how to define and measure it in a standardized way [7]. The Global Assessment Functioning (GAF) and the adult self-administered version of the World Health Organization Disability Assessment Schedule 2.0 (WHODAS-2.0) are widely used tools to assess functioning [8,9]. However, the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5)'s authors dropped GAF from DSM-5 for several reasons, including its conceptual "lack of clarity" and "questionable psychometrics" [10]. The American Psychiatric Association now temporarily recommends WHODAS-2.0 as a more objective, disease non-specific assessment of patient functioning [9]. But the WHODAS-

2.0 is not specific to mental health and does not clearly consider the severity of mental illness symptoms [11]. Although several different tools have been used to assess psychosocial functioning, the Functional Assessment Short Test (FAST) is probably the first scale to specifically examine the difficulties experienced by patients with BD [12] and has been recommended for clinical research in BD [13]. FAST is a short simple interviewer-administered instrument with easy and quick (6 minutes) application. It comprises 24 items, which are divided among 6 specific areas of functioning: autonomy, occupational functioning, cognitive functioning, financial issues, interpersonal relationships, and leisure time [12]. Validation studies in Turkish, Italian, Brazilian Portuguese, Finnish, and Chinese have confirmed the good psychometric properties of the FAST for BD patients [12,14-19]. And the FAST has been validated in patients with Schizophrenia, major depressive disorder, and adult attention-deficit hyperactivity disorder [20-22].

Thus, the aim of this study was to evaluate the validity and reliability of FAST in Korean patients with BD.

METHODS

Participants

The study was conducted between 1 January and 31 July, 2021. Patients included in the study were between the ages of 18 and 65 years and had diagnoses of Bipolar and Related Disorders according to DSM-5 criteria. A total of 209 patients were recruited from 14 hospitals throughout the territories in Korea. All patients were receiving standard medications for bipolar disorder, including mood stabilizers (lithium, valproate, carbamazepine, or lamotrigine), atypical antipsychotics or antidepressants.

The study protocol was approved by an independent ethics committee or an institutional review board at all study sites (NNH-HR-2021-5). All patients received extensive information about the study and provided written informed consent before they were enrolled in the study.

Measures and Procedures

Socio-demographic and clinical variables of all subjects were obtained during a clinical interview. The severity of depressive and manic/hypomanic symptoms were measured using the Young Mania Rating Scale (YMRS) [23] and the Korean version of the Bipolar De-

pression Rating Scale (BDRS) [24], respectively. Functional impairment was measured using the GAF [8] and the FAST [12]. Quality of Life was assessed using the World Health Organization Quality of Life Assessment Instrument Brief Form (WHOQOL-BREF) [25]. All investigators and raters involved in this study were clinical psychiatrists with more than 10 years of clinical experience in bipolar disorder, and had received formal training in the use of all rating scales.

The FAST was developed for the clinical assessment of functioning in patients with mental disorders. This scale is a simple interview-administered instrument that takes a very short time (6 minutes) to be administered. It is a structured interview with 24 items divided into six specific areas of functioning: (1) autonomy, (2) occupational functioning, (3) cognitive functioning, (4) financial issues, (5) interpersonal relationships, (6) leisure time. All items are rated using a 4-point scale, where 0 = no difficulty, 1 = mild difficulty, 2 = moderate difficulty, 3 = severe difficulty. The global score is obtained when the scores of each item are added up. A higher score means more difficulty in functioning [12].

The original English version of the FAST scale and its manual were translated into Korean by two psychiatrists (HGEBK and BHY), and then back-translation was performed by a bilingual psychiatrist unaware of the original FAST. A preliminary translated version was modified until the back-translated version was comparable with the original English version. Three authors of the study (HGEBK, BHY, and WMB) reviewed the results before producing the final version.

The YMRS consists of 11 items and is the most widely used measure for assessment of the severity of manic symptoms [23]. The Korean version of YMRS has been confirmed as valid and reliable [26]. The BDRS is a semi-structured, observer-rated scale for clinical assessment of bipolar depression [27]. The Korean version of BDRS has good psychometric properties and may be a reliable and valid tool [24].

The GAF scale is used to assess global functioning on the basis of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Axis V criteria. The assessment is based on patient behavior in the previous month and uses a continuous scale ranging from 1 to 100; a score of 1 indicates the worst functioning, and higher scores indicate better functioning and fewer symptoms

[28].

The WHOQOL-BREF is a scale developed by the World Health Organization, Quality of Life Group [25]. The Korean version of the WHOQOL-BREF used in this study was validated by Min *et al.* [29]. Twenty-six items are rated on a five-point frequency of experience rating scale ranging from 1 (not at all) to 5 (completely), based on the past two weeks. This scale is composed of four domains: physical health, mental, social, and life environment. Higher scores indicate higher quality of life.

Statistical Analysis

To analyze the data, IBM SPSS version 21 and IBM AMOS version 21 (IBM Co., Armonk, NY, USA) were used. The Internal consistency was acceptable where the Cronbach's alpha $\geq$ 0.70 [30]. The concurrent validity was determined using Pearson's correlation coefficient to compute the strength and direction of the relationships between scores on the Korean version of FAST (K-FAST), GAF and WHOQOL-BREF.

Test-retest reliability was assessed using the Intraclass correlation coefficient (ICC) with a 95% confidence interval between K-FAST, GAF, YMRS, and BDRS total scores at baseline and week 1 assessments. p values less than 0.05 were considered significant [30]. Test-retest reliability was assessed in a subsample of patients (n = 39) who had remained stable for at least one week, according to GAF, YMRS and BDRS. These 39 subjects then participated in a Test-retest reliability assessment one week later.

To verify the construct validity, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were utilized. The EFA with the maximum likelihood and oblique rotation (Direct Oblimin) methods were performed to test the internal structure of the FAST at week 0. CFA was used because it can test a specific hypothesis, as well as determining a priori the structure of the instrument as theoretically designed [31,32]. For the best test of goodness of fit, more than one index should be used, so along with the ratio of chi-square to degrees of freedom (df), root mean squared error of approximation (RMSEA), comparative fit index (CFI) and goodness of fit index were used [33,34].

RESULTS

Sociodemographic and general characteristics of the

Table 1. Demographic and clinical characteristics of patients (n = 209)

Measure	Value
Age (yr)	39.9 ± 12.5
	39.0 (28.5−50.0)
Education (yr)	13.7 ± 2.7
	14.0 (12.0−16.0)
Onset age (yr)	26.4±9.5
	24.0 (19.5−33.0)
Duration of illness (yr)	13.5 ± 9.9
	11.0 (5.5−20.0)
Total episodes	6.5 ± 6.3
	5.0 (3.0−8.0)
K-FAST	23.7 ± 15.5
	23.0 (10.0−34.5)
GAF	61.1 ± 13.9
	65.0 (55.0−70.0)
YMRS	5.7 ± 7.9
	2.0 (0.0−8.0)
BDRS	11.7 ± 10.4
	8.0 (3.0−19.0)
WHOQOL-BREF	82.0 ± 17.1
	82.0 (71.0−94.8)
Sex	
Female	127 (60.8)
Male	82 (39.2)
Patients status	
Inpatients	66 (31.6)
Outpatients	143 (68.4)
Diagnosis	
Bipolar disorder I	167 (79.9)
Bipolar disorder II	31 (14.8)
Bipolar disorder, NOS	11 (5.3)
Employment status	
Employed	81 (38.8)
Unemployed	73 (34.9)
Sick leave	6 (2.9)
Homemaker	28 (13.4)
Student	21 (10.0)

Values are presented as mean ± standard deviation, median (interquartile range), or number (%).
K-FAST, Korean version of Functional Assessment Short Test; GAF, Global Assessment Functioning; YMRS, Young Mania Rating Scale; BDRS, Bipolar Depression Rating Scale; WHOQOL-BREF, The World Health Organization Quality of Life Assessment Instrument Brief Form; NOS, not otherwise specified.

sample are reported in Table 1. The internal consistency of K-FAST was 0.95. The internal consistency of the autonomy subscale of the K-FAST (Items 1−4) was 0.85, of the occupational functioning subscale of K-FAST (items 5−9) was 0.96, of the cognitive functioning subscale of K-FAST (items 10−14) was 0.91, of the financial issues subscale of K-FAST (items 15−16) was 0.76, of the interpersonal relationships subscale of K-FAST (items 17−22) was 0.87, and of the leisure time subscale of K-FAST (items 23−24) was 0.85.

The concurrent validity of K-FAST was assessed by examining the correlation through GAF, WHOQOL-BREF, YMRS and BDRS (Table 2). Concurrent validity based on functional impairment according to the GAF scale showed a highly significant negative correlation ($r = -0.771$; $p < 0.001$). The correlations between K-FAST and WHOQOL-BREF showed a negative correlation ($r = -0.326$; $p < 0.001$). The K-FAST was significantly positively correlated with YMRS and BDRS ($r = 0.509$; $p < 0.001$, $r = 0.598$; $p < 0.001$, respectively).

ICC was 0.97 ($p < 0.001$), as shown in Table 3. The YMRS, BDRS and GAF were assessed during test and retest to prove the stability of the patients' mood states.

Construct validity utilizing EFA and CFA is presented in Tables 4 and 5. First, it was found that factor analysis can be performed through Kaiser-Meyer-Olkin (KMO) values and Bartlett's test of sphericity (KMO = 0.930; χ^2 [df = 276, n = 209] = 4076.834, $p < 0.001$). The result of exploratory factor analysis showed that the 4-factor structure was the most valid. The four domains included autonomy (factor 1 with five items), interpersonal relationships and leisure time (factor 2 with eight items), cognitive functioning (factor 3 with five items), occupational functioning and financial issues (factor 4 with six items), which accounted for 69.1% of the variance. The results of the

Table 2. Correlation analysis of K-FAST with other scales for the concurrent validity

	K-FAST	GAF	WHOQOL-BREF	YMRS	BDRS
K-FAST	1				
GAF	−0.771*	1			
WHOQOL-BREF	−0.326*	0.277*	1		
YMRS	0.509*	−0.523*	−0.041	1	
BDRS	0.598*	−0.478*	−0.517*	0.379*	1

K-FAST, Korean version of Functional Assessment Short Test; GAF, Global Assessment Functioning; WHOQOL-BREF, The World Health Organization Quality of Life Assessment Instrument Brief Form; YMRS, Young Mania Rating Scale; BDRS, Bipolar Depression Rating Scale.
*$p < 0.001$ (2-tailed).

Table 3. Test-retest reliability of the K-FAST, GAF, YMRS, BDRS

Scale	First evaluation (n = 39)	Second evaluation (n = 39)	Intraclass correlation	p value
K-FAST total	31.4 ± 12.7	31.5 ± 12.4	0.973	< 0.001
GAF	51.7 ± 11.8	53.1 ± 10.6	0.964	< 0.001
YMRS	6.8 ± 8.0	5.4 ± 7.5	0.978	< 0.001
BDRS	8.5 ± 8.7	6.7 ± 7.0	0.938	< 0.001

Values are presented as mean ± standard deviation.
K-FAST, Korean version of Functional Assessment Short Test; GAF, Global Assessment Functioning; YMRS, Young Mania Rating Scale; BDRS, Bipolar Depression Rating Scale.

Table 4. EFA pattern matrix of the K-FAST

K-FAST	Factor 1: Cognitive functioning	Factor 2: Occupational functioning	Factor 3: Interpersonal relationships and Leisure time	Factor 4: Autonomy andfinancial issues
K-FAST13	0.860			
K-FAST11	0.836			
K-FAST10	0.810			
K-FAST14	0.805			
K-FAST12	0.789			
K-FAST8		−0.946		
K-FAST7		−0.943		
K-FAST6		−0.928		
K-FAST5		−0.927		
K-FAST9		−0.913		
K-FAST19			0.808	
K-FAST17			0.806	
K-FAST21			0.794	
K-FAST18			0.764	
K-FAST20			0.712	
K-FAST24			0.706	
K-FAST22			0.698	
K-FAST23			0.674	
K-FAST4				0.834
K-FAST3				0.820
K-FAST2				0.759
K-FAST1				0.758
K-FAST16				0.624
K-FAST15				0.494
Variance (%)	47.4	9.7	6.7	5.3
Accumulated variance (%)	47.4	57.1	63.9	69.1

EFA, exploratory factor analysis; K-FAST, Korean version of Functional Assessment Short Test.

Table 5. Model fit index of confirmatory factor analysis (n = 209)

Measure of fit	4-factor model	6-factor model	Acceptable value
χ^2 / df	2.832	2.267	< 3
RMSEA (90% CI)	0.094 (0.086−0.102)	0.078 (0.069−0.087)	< 0.08
CFI	0.887	0.925	> 0.9
TLI	0.873	0.912	> 0.9

χ^2, chi-square; df, degrees of freedom; RMSEA, root mean square error of approximation; CI, confidence interval; CFI, comparative fit index; TLI, Tucker-Lewis index.
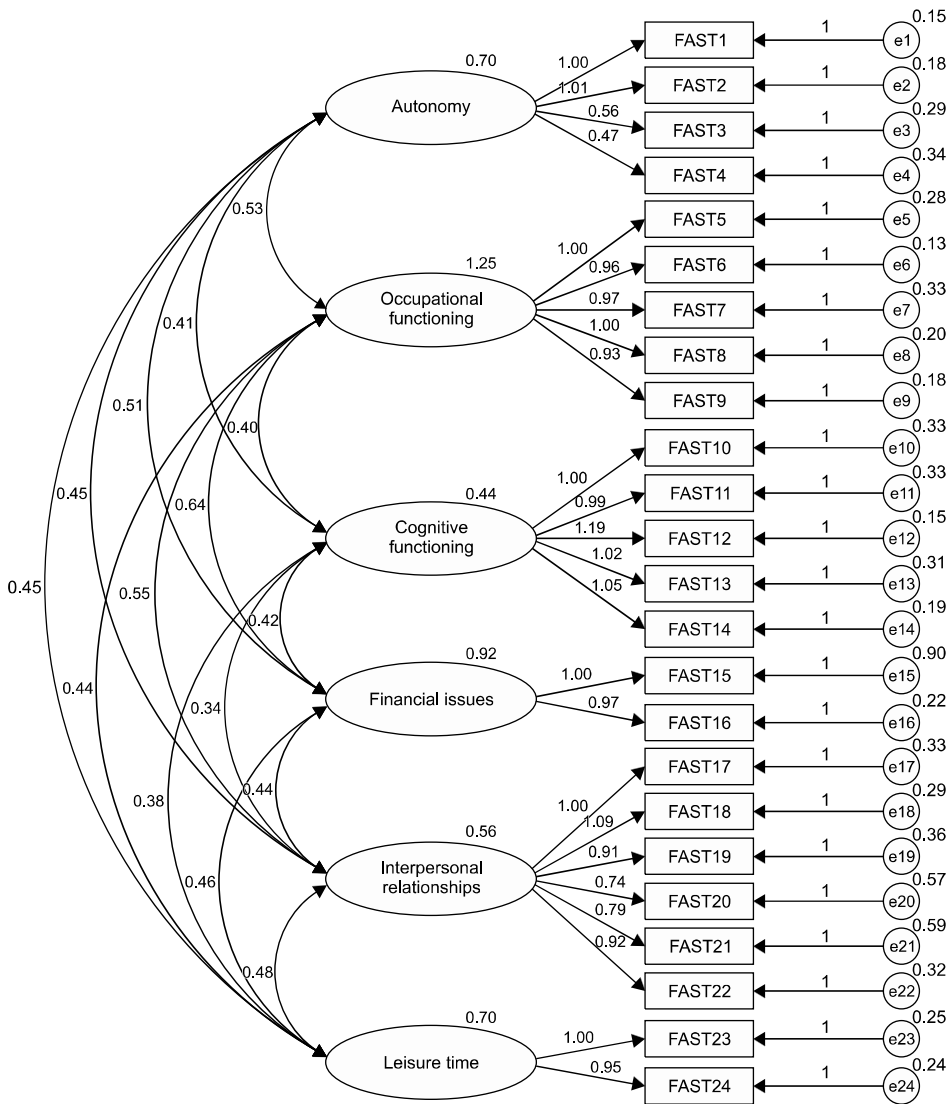
Fig. 1. K-FAST by 6-factor model. K-FAST, Korean version of Functional Assessment Short Test.

CFA are described in Table 5. To evaluate the fit indices of K-FAST the following reference indices were used: CMIN / df of < 0.3 [33], chi-squared test of model fit with no statistical significance ($p > 0.05$), RMSEA near to or less than 0.8 (RMSEA < 0.08), and CFI and Tucker-Lewis index near to or greater than 0.9 [34]. The CFA showed 6-factor structure of K-FAST scale with adequate fit indices as well as good reliability and internal consistency (Fig. 1, Table 5).

DISCUSSION

The validity and reliability of the Korean version of FAST were evaluated based on information obtained from 209 BD patients from 14 different centers in Korea. The results of this study suggest that K-FAST has good psychometric properties and may be a reliable and valid tool for measurement of functioning in Korean patients with bipolar disorder.

The internal consistency coefficient was high, at a Cronbach's alpha of 0.95, for the total scale indicating item homogeneity. In this study, the concurrent validity of the K-FAST was demonstrated based on its correlations with the GAF. Concurrent validity with the GAF scale showed a highly significant negative correlation. This result indicates that patients with high functioning evaluated using K-FAST had higher scores on the GAF scale. Unlike the GAF, the K-FAST assesses specific domains of functioning and also identifies the level of impairment in each area; higher scores indicate higher disability thus a

negative correlation was actually expected [12]. Similarly, the correlation between K-FAST and WHOQOL-BREF was also a moderate negative correlation. Bipolar disorder can lead to a more severe decline in quality of life than other mood and anxiety disorders [6]. Quality of life also includes individuals' perceptions of their position in life in the context of their culture, value system, personal goals, expectations and standards [35]. Therefore, quality of life is associated with functional recovery as well as clinical remission [4]. In addition, we found moderate to strong positive correlations between K-FAST and YMRS, BDRS. These results are consistent with the findings of previous studies that residual mood symptoms are related to overall functioning [6,36,37].

The EFA reveals four factors in K-FAST, as shown in Table 4. The Spanish, Portuguese and Italian versions determined a five-factor structure consisting of autonomy, occupational functioning, cognitive functioning, financial issues and interpersonal relationships [12,18,19]. Our results are similar in that interpersonal and leisure time are loading on the same factor, but differ in that occupational functioning and financial issues are loading on the same factor. This result may be because people prefer to participate in leisure activities as a group, and through this they form or maintain interpersonal relationships. Differences between Korean and other versions may be due to different cultural contexts; i.e., Occupational functioning and financial issues are closely related because people are more concerned about finances while working and earning money. Occupation determines one's financial status and affects one's physical and mental health [38,39]. The Chinese version [16] also consisted of four dimensions: autonomy, occupational functioning, cognitive functioning and interpersonal relationships, perhaps due to China's commonalities with Korea as an East Asian culture. Other validation studies in different socio-cultural contexts also found good psychometric properties [12,14,16-18]. FAST is a structured interview with 24 items divided in six specific areas of functioning. In the EFA of our study, the 4-factor structure showed an adequate goodness-of-fit, but in the CFA verifying the goodness-of-fit of the entire model, its goodness-of-fit was not satisfied. The CFA showed 6-factor structure of K-FAST scale with adequate fit indices as well as good reliability and internal consistency. Therefore, the authors of this study judged that the 6-factor structure is adequate base on statistical

theories.

Functioning affects quality of life and is an important predictor of remission in the acute treatment phase of mood disorder [4,5,40]. Therefore, accurate assessment of functioning is important for predicting treatment response and patient prognosis. The development of a Korean version of FAST is significant in several respects. The results of this study confirmed the psychometric properties of the K-FAST, which will enable both clinicians and researchers to use this instrument in the field to assess functioning in patients with BD. Patients with BD often stop taking their medication because they do not find that treatment sufficiently improves (or perceive that it has actually impeded) their functioning [41]. In order to maintain the treatment of BD patients, it is necessary to accurately assess the functioning and focus on functional remediation.

The main limitation of this study is that the data were only collected from patients with BD, without a healthy control. The cut-off points of K-FAST was not assessed. However, the cut-off point of 11 in the original Spanish version of FAST showed good discriminant ability in patients with BD [12]. The second limitation is that the study was conducted during the COVID-19 pandemic, so the possibility that this affected BD patients' quality of life and functioning cannot be completely excluded. Although social lockdown and stay-at-home orders were not enforced in Korea, the decline in psychiatric hospital utilization might be attributed to a reluctance to visit public places due to fear of infection, service limitations at community mental health centers, and the complicated process of psychiatric hospitalization due to quarantine-related measures [42]. Another limitation is that since most patients in this study were BD-I, a review of the functioning status of patients with other bipolar spectrum disorders such as BD-II will be needed in the future.

In conclusion, the Korean version of FAST has good psychometric properties. It is a reliable and valid instrument to evaluate functional impairment in bipolar disorder. Therefore, the use of FAST in BD patients will help to assess their functioning in various domains, and in developing more individualized treatment plans.

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■ Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

■ Author Contributions

Conceptualization: Hangoeunbi Kang, Bo-Hyun Yoon, Won-Myong Bahk. Study design and data collection: Hangoeunbi Kang, Bo-Hyun Yoon, Won-Myong Bahk, Young Sup Woo, Won Kim, Jonghun Lee, InKi Sohn, Sung-Yong Park, Duk-In Jon, Myung Hun Jung, Moon-Doo Kim, Young-Eun Jung, Hyung-Mo Sung, Young-Min Park, Jung Goo Lee, Sang-Yeol Lee, Seung-Ho Jang, Eun-Sung Lim, In Hee Shim, Kwanghun Lee, Sae-Heon Jang. Data analysis and interpretation: Hangoeunbi Kang, Bo-Hyun Yoon, Won-Myong Bahk. Writing—original draft: Hangoeunbi Kang. Writing—review & editing: Bo-Hyun Yoon, Young Sup Woo, Won-Myong Bahk. All authors reviewed the results and approved the final version of the manuscript.

■ ORCID

Hangoeunbi Kang   https://orcid.org/0000-0002-7106-2757
Bo-Hyun Yoon   https://orcid.org/0000-0002-3882-7930
Won-Myong Bahk   https://orcid.org/0000-0002-0156-2510
Young Sup Woo   https://orcid.org/0000-0002-0961-838X
Won Kim   https://orcid.org/0000-0002-5478-7350
Jonghun Lee   https://orcid.org/0000-0002-3581-5029
InKi Sohn   https://orcid.org/0000-0002-5724-5901
Sung-Yong Park   https://orcid.org/0000-0002-8685-620X
Duk-In Jon   https://orcid.org/0000-0002-1565-7940
Myung Hun Jung   https://orcid.org/0000-0003-2393-3930
Moon-Doo Kim   https://orcid.org/0000-0002-6441-630X
Young-Eun Jung   https://orcid.org/0000-0001-7608-0009
Hyung-Mo Sung   https://orcid.org/0000-0002-2396-3358
Young-Min Park   https://orcid.org/0000-0002-4993-1426
Jung Goo Lee   https://orcid.org/0000-0003-3393-2667
Sang-Yeol Lee   https://orcid.org/0000-0003-1828-9992
Seung-Ho Jang   https://orcid.org/0000-0002-3479-0552
Eun-Sung Lim   https://orcid.org/0000-0002-7727-0098
In Hee Shim   https://orcid.org/0000-0002-6968-7758
Kwanghun Lee   https://orcid.org/0000-0003-4531-8015
Sae-Heon Jang   https://orcid.org/0000-0002-4186-1101

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