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Psychometric properties of the Turkish version of the behavior assessment for children (BAC) scale

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Abstract
Behavioral problems are seen in one out of four school-age children. There are difficulties in evaluating children's behavior in Turkish culture and therefore a valid and reliable measuring tool is needed for assessing behavioral problems in this age group. The aim of this study was to evaluate the psychometric properties of the Turkish version of the Behavior Assessment for Children (BAC). The study was conducted using the cross-sectional data collection method to examine the content validity, factor structure, measurement invariance, reliability of BAC based on data from 495 parents and 14 teachers. The Content Validity Index (CVI) was used for testing content validity. Reliability analysis was carried out with Cronbach's alpha, MacDonald's omega test, item total correlations, Spearman Brown's and Guttman's split-half reliability coefficients, percent agreement and intraclass correlation coefficients (ICC). Construct validity was evaluated by confirmatory factor analysis (CFA). The measurement invariance was examined by multiple-group CFA. The CVI of the BAC was found to be .92. Three models were tested with CFA, and a 17-item, three-factor (attention, emotion, self-control) structure of the BAC was finally supported; this dimensional structure proved to be invariant across gender. Factor loadings varied between .56 and .83. Cronbach's alpha was .93; ICC was .60. Percent agreement varied between 41.6%–63.1%. It was determined that the BAC scale is a valid and reliable instrument that can be used to assess the behavioral problems of Turkish children. Its results can moreover contribute to the cross-cultural study of behavior problems and add to worldwide discussions.

Keywords Behavior assessment for children · Validity · Reliability

Introduction

The main characteristic of conduct disorders seen in children is the tendency to infringe upon others' basic rights and to continuously and repeatedly act in breach of age-appropriate social norms and rules. Children with behavioral disorders are observed to display aggression towards people and animals, be involved in theft, damage to property, violations of regulations, and lying (AACAP, 2018; APA, 2013). Conduct Disorder criteria are described in the Diagnostic and Statistical Manual of Mental Disorders, 5th ed. (DSM-5) as conditions causing destructive behavior, impulse-control issues and violations of age-appropriate norms and rules, and are set forth under the heading, Disruptive, Impulse-control and Conduct Disorders (APA, 2013). Researchers in the literature have examined such behavioral issues under such headings as behavior or conduct problems, antisocial behavior, adaptation problems, and psychosocial issues (Kapısız & Karaca, 2018; NICE, 2017). At the same time, there are studies in which the authors have classified behavioral problems as internalized and externalized (Olivier et al., 2018; Olivier et al., 2020).

The prevalence rates of behavioral problems vary across age spans. In the general population of children, prevalence varies in the range of 1%–10% (Mohan et al., 2020; NICE, 2017; Tamam & Döngel, 2018). The authors of a study carried out in Turkey report the prevalence of conduct disorder as 4.4% (Gül et al., 2010). Similar problems of this nature include behavioral issues such as tics, stuttering, nail-biting, and thumb-sucking (Cannavale

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et al., 2015; Ocakçı & Karakoç, 2013; Roberts et al., 2015; Sisman et al., 2017). It has been indicated that aggression, defiance, obstinance, lying, stealing, developing tics, nail-biting and other behaviors tend to increase with age (Kapısız & Karaca, 2018).

Children who have behavioral problems have difficulty with self-esteem and with forming, developing and maintaining relationships with the people around them (Ocakçı & Karakoç, 2013). They may have problems controlling their behavior and emotions, and their social competence, school achievement, and healthy eating habits are adversely affected (Richards & Gross, 2000).

The Concept of Self Regulation

The elements said to explain the problems children have in their academic and social lives are a deficiency in impulse control or in Bandura's concept of self-regulation, which is grounded in social cognitive theory, namely, inadequacies in executive functioning when goal-oriented behavior, skills, emotions and cogitive planning skills are lacking (Bandura, 1986; Bandura, 1991; Barkley, 2010a, 2010b; Karoly, 1993; Nigg & Barkley, 2014; Posner & Rothbart, 2000). A meta-analysis has shown that children with behavioral problems are deficient in executive functioning (e.g., attention, working memory, inhibitory control, and behavioral regulation) and self-control processes (Schoemaker et al., 2013).

Self-regulation develops in early childhood and includes the skills of managing, planning and controlling cognitive, emotional and behavioral functions (Chuang et al., 2016; Denham, 2006; Montroy et al., 2016). These skills allow an individual to overcome personal barriers in order to be able to reach a particular goal and help the individual to adapt to the situation, environment and the individual's potential role to the fullest (Calkins, 2007; Chuang et al., 2016; Denham, 2006; Montroy et al., 2016). Self-regulation consists of three components. The cognitive component of self-regulation focuses on challenging the individual to do the right thing. The affective component involves expressing emotions in social situations, and the behavior component involves controlling one's impulses (Chuang et al., 2016; Denham, 2006).

Children who have not developed self-regulation tend to exhibit negative or unwanted behavior (Barkley, 2010a, 2010b; Calkins, 2007; Graziano & Hart, 2016). In the later years of their lives, the risk of displaying behavioral problems is higher in these children (Choe et al., 2013; Sawyer et al., 2015). It has been reported that children with poor self-regulatory skills are at risk of being rejected by their peers, experiencing social problems, engaging in delinquency, and developing obesity (Trentacosta & Shaw, 2009). If there is no early intervention, these issues have the potential of leading to crime, substance abuse, deteriorating health, financial problems and other consequences in adulthood (AACAP, 2018; CDC, 2020; Moffitt et al., 2011). There are effective early intervention programs that have been developed in this area (Gamble & Crouse, 2020). Behavioral issues must be evaluated during childhood so that such problems may be prevented before the individual has grown older (Taner, 2011; Ursache et al., 2012). The measuring instruments that have been developed around the concept of self-regulation make it possible to inquire into and assess childhood behavioral problems (Chuang et al., 2016).

Measuring of Childhood Behavioral Problems

There are various measuring tools reported in the literature that are based on different approaches and models aimed at evaluating childhood behavior (Chuang et al., 2016; Glascoe, 2005; Lee, 2020; Weitzman & Leventhal, 2006). Some of these instruments have so many items included that filling out the questionnaires and calculating scores is quite time-consuming (Glascoe, 2005; Weitzman & Leventhal, 2006). Participants may not want to fill out such long questionnaires and this presents a barrier in the way of making an assessment of a child's behavior (Weitzman & Leventhal, 2006). It is for this reason that a shorter instrument is needed and that is why the Behavior Assessment Scale (BAC) was chosen as a tool in this study.

Chuang et al. (2016) have developed a short measure of only 17 items and a three-factor structure (cognitive, affective and behavioral factors) that is easily comprehensible and easy to apply. This scale, the original Behavior Assessment Scale, is based on the theory of self-regulation and aims at evaluating a child's behavior. The procedures of filling out the instrument and evaluation take a minute each. The tool encompasses all of the components of the concept of self-regulation (cognitive, affective and behavioral) that are at the foundation of children's behavior (Chuang et al., 2016).

A measure that assesses children's behavioral problems according to the components of self-regulation may be used not only by families in the home environment but also at schools by teachers (Bansal et al., 2019; Hart et al., 2019; Weisz et al., 2017). Since schools are where children spend the most time outside of their homes, they provide a setting where children's behavior can be monitored (Bansal et al., 2019). As part of their profession, teachers are aware of children's development and behavior and because of this, they have the means of observing their students' interactions in the classroom and in the school environment with peers. Teachers thus have the potential of playing an active role in the assessment of children's behavior (Arfasa & Weldmeskel, 2020; Bansal et al., 2019; Hart et al., 2019; Weisz et al., 2017). It can be seen in the literature that making a comparison of the assessments of parents and teachers can be

even more of an effective way of identifying behavioral issues (Bansal et al., 2019; Graziano et al., 2015; Hart et al., 2019; Sawyer et al., 2015; Weisz et al., 2017). The BAC scale that was employed in this study can therefore be an effective instrument in enlisting both parents and teachers to make behavioral evaluations.

The purpose of our study was to adapt the Behavior Assessment for Children (BAC) scale into Turkish and analyze the scale's validity and reliability. First, we hypothesized that the three-factor structure of the BAC would be repeatable in Turkish children. Secondly, we expected that the BAC would provide measurement invariance by gender. Finally, we hypothesized that the BAC scale is a reliable instrument.

This study will make it possible to work with a valid and reliable measuring tool in assessing the behavioral problems of school-age children. Identifying behavioral problems in childhood is important in terms of creating and evaluating interventional programs in collaboration with professionals in health and education.

The adaptation of the BAC scale into the Turkish culture will provide a means of eliminating the difficulties experienced in assessing behavioral problems in the absence of an effective measure. The fact that the BAC scale is based on the theory of self-regulation (Chuang et al., 2016) is a strong element of this study that must be emphasized. The theory-based nature of the scale differentiates the present study from other research carried out on behavioral assessment measures. The self-regulation-based BAC scale will be adapted to Turkish after confirmation of the factor construct of the original scale, thereby making a cross-cultural contribution to the field. At the same time, it has so far not been possible to assess the problems of Turkish children in the domains of attention, emotion and self-control using a single instrument. The Turkish adaptation of the BAC scale will enable the assessment of behavioral problems in these three domains. Our study will have thus made another contribution to the literature, one that will make it possible to make comparisons between the behavioral issues experienced by Turkish children and children around the world. It will also contribute to the cross-cultural study of behavioral problems and add to worldwide discussions.

Research Questions

Q 1: Is the Turkish version of the Behavior Assssment Scale (BAC) a valid instrument to use in assessing the behavior of Turkish children?

Q 2: Is the Turkish version of the Behavior Assssment Scale (BAC) a reliable instrument to use in assessing the behavior of Turkish children?

Method

Before beginning our research, which was conducted with the cross-sectional data collection method, the school and the ethics committee concerned granted permission for the conduct of the study. The consent of the students' parents was also received.

Participants

The study took place at nine randomly selected primary schools in the district of Sancaktepe, Istanbul. The recommendation for scale adaptation studies is that the number of participants be 10–20 times the number of items (Şencan, 2005). In studies in which confirmatory factor analysis is applied, the suggested size of a sample is 300–500 (Sousa & Rojjanasrirat, 2011). Data were ultimately collected from 495 parents and 14 teachers (for 356 students).

Procedure

The data collection forms were given to the students to take to their parents to fill out. The students brought back the forms the following day. Students forgetting to bring back the forms were reminded to do so and it was ensured that they brought them in within 1 week. Parents who did not know how to read or write were invited to the school to fill out the data collection forms with the help of the researchers. The parents were taken into an empty room one by one to provide their data. The researchers read out the questions and the parents responded. It is pointed out in the literature that it is important that teachers and parents make an assessment of the behavior of a child (Dowdy et al., 2011). The study pertaining to the original scale also recommends that the behavior of children is assessed by both parents and teachers (Chuang et al., 2016). The assessments of the children in our study were accordingly made by both parents and teachers.

The classes in the schools taken into the sample each comprised an average of 20–30 pupils. A single teacher (class teacher) was responsible for each class. In the Turkish educational system, class teachers are teachers who teach the same group of students from Grade one to four of elementary school. It is this class teacher who evaluates each student in the class in terms of achievement, development and behavior throughout the 4 years of elementary school. It was because of this that the class teachers in the study filled out the BAC forms for the students in their own class. The teachers were given 2 weeks to fill out the forms. Each teacher made evaluations of an average of two students per day. At the end of the 2 weeks, 356 students had been evaluated by 14 teachers.

Instruments

Descriptive Questionnaire This form consists of 11 questions on the child's age, gender, class, parents' ages, the parents' level of education, state of employment, their economic staus and the number of children in the family.

Behavior Assessment for Children Scale (BAC) BAC, developed by Chuang et al. (2016), is a 17-item measuring tool that evaluates the cognitive, affective and behavioral components of a child's behavior. The scale has three subscales: attention (six items), emotion (four items), and self-control (seven items). The attention subscale assesses the child's behavior with regard to how well the child can control his/her flow of thought to facilitate concentration (e.g., daydreaming, inability to concentrate, even without external interference, inability to listen to others). The emotion subscale assesses emotional weaknesses such as disappointment or depression (e.g., stubborn, depressed, and irritable, easily frustrated, unpredictable mood swings), while the self-control dimension evaluates how the child avoids impulsive behavior and puts limits on his/her behavior (e.g., frequently interrupt when others speak, impatient and struggles to take turns, inability to complete defined tasks). The tool is assessed on a 3-point Likert scale and is scored between 0 and 2, where 0 = no match, 1 = moderate match, and 2 = relatively strong to strong match. A higher score denotes poorer performance. The CVI score was .98. The result of the confirmatory factor analysis (GFI = .90, RMSR = .03, RMSA = .06, and CFI = .94) supported the construct validity of the BAC. The intraclass correlation coefficient between the parents and teachers ranged from .31 to .44, and the joint probability of agreement ranged from 31.4% to 92.2%. Cronbach's alpha coefficients for the subscales varied between .78–.82 (Chuang et al., 2016).

Language Adaptation

The scale was independently translated from English into Turkish by two native Turkish-speaking faculty members who were also fluent in English. Additionally, a separate linguist translated the text. The authors then evaluated the translations and agreed upon the items to be included in the scale. Later, two other independent experts were given the task of back-translating the scale into its original language (Sousa & Rojjanasrirat, 2011). This back-translated version was sent to Hsiao-Ling Chuang, the author of the scale, for permission.

Content Validity

After the completion of the linguistic adaptation of the scale, 12 experts (one public health nurse, one nursing fundamentals nurse, three pediatric nurses, three psychiatric nurses, two psychologists, one child developmental specialist, one teacher) having at least one child were enlisted to assess the instrument and offer their opinions. Each of the experts rated the statements in terms of content and assigned each a score of 1–4 (1 = inappropriate; 4 = very appropriate).

Pilot Test

After it was determined that the content of the scale was validated, a pilot study was conducted with 10 families outside of the sample in order to assess the comprehensibility of the statements. The Turkish and the English forms of the BAC are presented in the Appendix.

Psychometric Analyses

The content validity analysis, internal consistency analysis and interrater reliability analysis were assessed using the SPSS 21 (Statistical Package for Social Sciences Inc., IL, USA) package program.

The Content Validity Index (CVI) Was Calculated to Determine Content Validity.

For construct validity, the diagonally weighted least squares (DWLS) method was used in the confirmatory factor analysis (CFA) using the Lisrel 9.30 package program. Multiple fit indices were used for the confirmatory factor analysis: the chi-square test, comparative fix index (CFI), standardized root mean square residual (SRMR) and root mean square error of approximation (RMSEA). These indices should meet the standard that the value of CFI should be greater than .90, and the values of SRMR and RMSEA should be less than .10 (Brown, 2015; Hooper et al., 2008; İlhan & Çetin, 2014; Marsh et al., 2006).

Measurement invariance of the scale with regard to gender was examined by multiple-group confirmatory factor analysis. Alternative measurement models such as configural, metric and scalar invariance were tested for multiple-group confirmatory factor analysis. The configural invariance model aims to inspect whether each group has the same factor structure. Testing for metric invariance is for estimating whether the relation of each observed variable and its corresponding latent attribute is invariant. Testing for scalar invariance involves constraining all factor loadings and intercepts to be invariable (Kong, 2017; Li et al., 2015). In assessing measurement invariance, Comparative Fit Index differences (ΔCFI) of a value less than .01were taken into account (Cheung & Rensvold, 2002).

Cronbach's alpha, MacDonald's omega test, Pearson's correlation analysis and Spearman Brown's and Guttman's split-half reliability coefficients were employed to test the reliability of the scale, Interrater reliability was assessed with percent agreement and intraclass correlation coefficients (ICC).

Results

Participants

The mean age of the participating children was 7.70 ± .90 years, the mean age of their mothers was 33.78 ± 5.07 years, and of their fathers, 37.70 ± 5.04 years. Of the children, 46.5% were girls and 53.5% were boys. All of the students were attending public schools; 36.8% were second-graders. Among the parents, 39.6% of the mothers and 32.1% of the fathers were primary school graduates. Among the mothers, 85.5% were unemployed while 92.3% of the fathers had jobs; the economic status of 45.5% of the families was somewhat adeqaute. A proportion of 47.3% of the students had one sibling (Table 1).

Content Validity

In line with the suggestions of the experts regarding content validity, the developer Chuang was consulted about items 7, 13 and 16, and revisions were made such that the original structure of the scale would not be altered. The content validity index (CVI) was .92 and the item mean was 3.67, varying in the range of 3.50–4.00.

Table 1 Characteristics of children and parents

Variables		Mean±Sd	Min-max
Children age		7.70±0.90	6–11
Mother age		33.78±5.07	24–50
Father age		37.70±5.04	25–60
Variables		n	%
Children' gender	Girl	230	46.5
	Boy	265	53.5
Class	1st	168	33.9
	2nd	182	36.8
	3rd	145	29.3
Mother education status	Not literate	22	4.4
	Literate	28	5.7
	Primary school	196	39.6
	Middle School	91	18.4
	High school	121	24.4
	University and above	37	7.5
Mother's working status	Had a job	69	13.9
	Unemployed	423	85.5
	Retired	3	0.6
Father education status	Not literate	15	3
	Literate	22	4.4
	Primary school	159	32.1
	Middle School	97	19.6
	High school	152	30.7
	University and above	50	10.1
Father's working status	Had a job	457	92.3
	Unemployed	29	5.9
	Retired	9	1.8
Economical situation	Enough	270	54.5
	Partially enough	225	45.5
Number of sibling	No sibling	64	12.9
	One sibling	234	47.3
	Two siblings	136	27.5
	Three siblings	37	7.5
	Four siblings and over	24	4.8

Pilot Test

No further revisions were made following the pilot test conducted with ten families since there was no item that could not be understood.

Construct Validity

To assess how much the factor construct of the original BAC fit the data obtained from the Turkish sample, a CFA was performed. Three models were tested for this: 1) theoretical, 2) a parent model with mother and father, 3) a parent model with only the mother. The chi-square value of the theoretical model was found to be χ^2_{1160} = 570.097, while $p < .005$ and the other goodness-of-fit indexes were CFI = .84; RMSEA = .10 and SRMR = .08 (Table 2). Since the fitness indexes found were unacceptable, the indexes were reviewed once again in line with the recommendations made to modify. In the second model with the modification "parent model with mother and father," it was observed that there was a decrease in the χ^2/df value (3.72; $p < .05$), and improvements in the CFI (.92), RMSEA (.089) and SRMR (.07) indices (Table 2).

In the CFA, correlating the error terms was attempted to improve the fit indices. Many studies in the literature, however, strongly oppose this practice (Hermida, 2015). Additionally, some scales indicate that data from the mother and father can be very different, and it is pointed out that this can adversely affect fit indices (Fung & Fung, 2020). Because of this, the third model, "parent model with only the mother" was tested. In this third model, it was observed that there was a decrease in the χ^2/df value (2.96; $p < .05$), and improvements in the CFI (.94), RMSEA (.080) and SRMR (.06) indices (Table 2). Thus, the third model was accepted without a modification as a result of the improvements in the fit indices. The CFA results showed that the Turkish adaptation of BAC confirmed the original three-dimensional construct to an acceptable degree (Fig. 1). The first factor, attention (six items), the second factor, emotion (four items), and the third factor, self-control (seven items), were defined in accordance with the original scale. Factor loadings of the items in the attention subscale (standard weights) were .68–.83; factor loadings of the items in the emotion subscale were .58–.71; and the factor loadings of the items in the self-control subscale were found to be between .56–.78 (Fig. 1).

The eigenvalue explained by the first dimension was 8.11; mean variance was 47.70%. The eigenvalue explained by the second dimension was 1.84, the variance explained was 10.83%, and the eigenvalue explained by the third dimension was 1.03 with 6.06% variance explained. Thus, the three-dimensional construct explained 64.60% of total variance. Additionally, KMO = .94; Bartlett Test of Sphericity χ^2_{1378} = 4988.02; $p < .01$.

Table 2 Overall concordance/discordance coefficients obtained result of confirmatory factor analysis of BAC

Model	χ^2	p	df	χ^2/df	CFI	RMSEA	SRMR	$\Delta\chi^2$	ΔCFI
Model 1 Theoretical	570.09	0.005	116	4.91	0.84	0.107 (0.098–0.116)	0.083		
Model 2 Parent form (with mother and father)	413.68	0.005	111	3.72	0.92	0.089 (0.080–0.098)	0.07	156.41	0.08
Model 3 Suggested Parent form (with only mother)	343.52	0.005	116	2.96	0.94	0.080 (0.072–0.088)	0.06	226.57	0.02
Teacher form	297.81	0.005	116	2.56	0.92	0.080 (0.075–0.085)	0.06	272.28	0.02
Girl	321.53	0.005	116	2.77	0.93	0.075 (0.070–0.080)	0.07	248.56	0.01
Boy	337.56	0.005	116	2.91	0.93	0.077 (0.072–0.082)	0.06	232.53	0.00
Measurement invariance across gender groups									
Configural	261.45	0.005	102	2.56	0.94	0.077 (0.070–0.084)	0.06	–	0.01
Metric	271.22	0.005	111	2.44	0.93	0.079 (0.072–0.086)	0.07	9.77	0.01
Scalar	301.20	0.005	111	2.71	0.92	0.078 (0.071–0.085)	0.06	29.98	0.01
* Perfect fit	–	>0.05	–	χ2/sd<3	0.95≤CFI≤1	0.00< RMSEA< 0.05	0.00≤SRMR≤0.05	–	
* Acceptable fit	–	>0.05	–	χ2/sd<5	0.90≤CFI≤0.95	0.05< RMSEA<0.10	0.05≤SRMR≤0.10	–	

Note. χ2: Chi-Square; df: Degrees of Freedom; RMSEA: Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Square Residual; CFI: Comparative Fit Index; ΔCFI: Comparative Fit Index Differences; Δχ2: Chi-Square Differences

*Reference: Marsh et al., 2006; Hooper et al., 2008; İlhan & Çetin, 2014; Brown, 2015

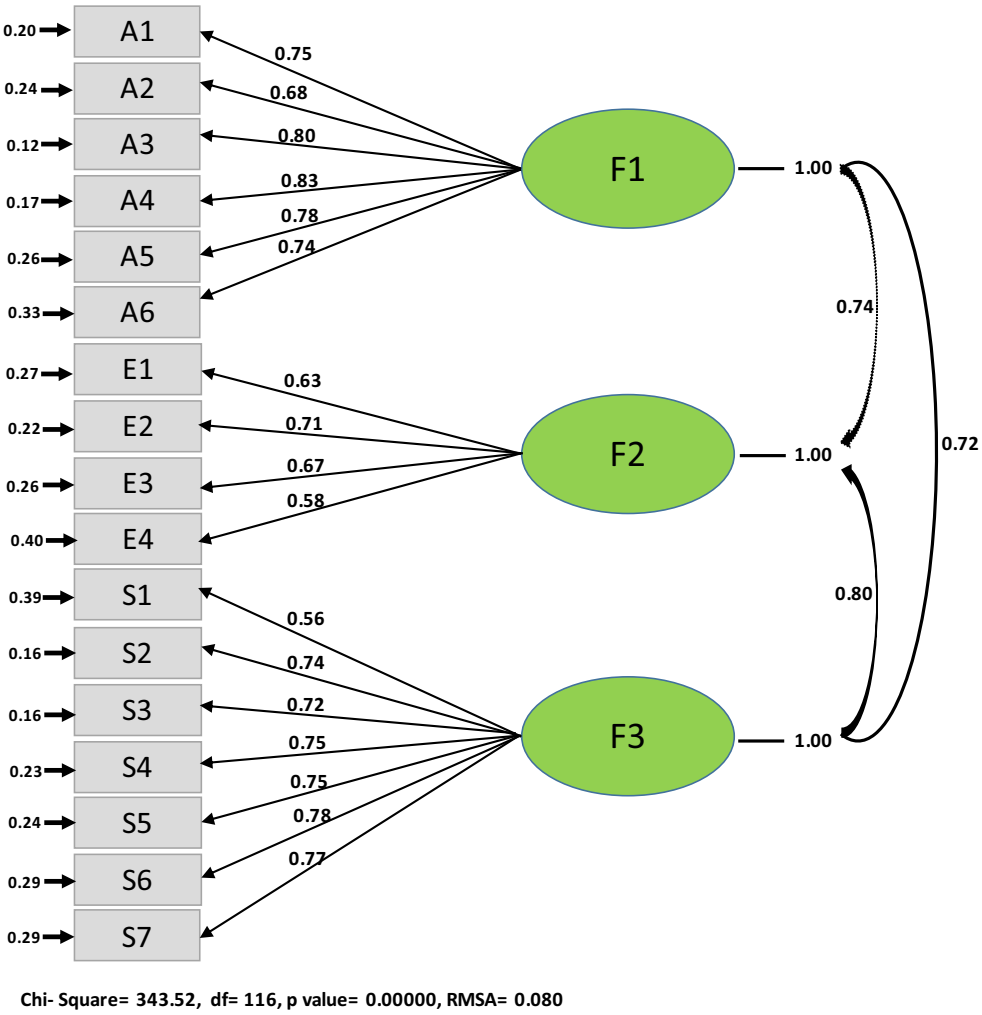

Fig. 1 Factor structure model for BAC

The goodness of fit indices for the groups of boys and girls were also explored in the invariance analysis by gender (girls: CFI = .93; RMSEA = .075 and SRMR = .07; boys: CFI = .93; RMSEA = .077 and SRMR = .06). The measurement invariance of the BAC, including configural (CFI = .94; RMSEA = .077 and SRMR = .06), metric (CFI = .93; RMSEA = .079 and SRMR = .07) and scalar invariance (CFI = .92; RMSEA = .078 and SRMR = .06), existed across gender groups. In examining the measure of invariance between the groups, it was found that the CFI differences (ΔCFI) were less than .10 (ΔCFI = .01), thus indicating acceptable levels (Table 2). This result showed that the groups of both boys and girls used the same conceptual perspective in responding to the scale items. It can be said therefore that BAC provides measurement invariance for gender.

In addition to these analyses, CFA was also carried out on the teachers' form. The analysis revealed acceptably goodness of fit index values (CFI = .92; RMSEA = .080 and SRMR = .06) and similarity with the suggested model (Table 2). As a result, a 17-item, three-factor (attention, emotion, self-control) structure of the BAC was finally supported by model 3 (parent model with only the mother) and the teacher model, and this dimensional structure proved to be invariant across gender.

Internal Consistency

According to the data obtained from the parents, it was found that the item-total correlations for the items were in a range of .56–.71 and Cronbach's alpha was .93. The Cronbach alpha values for the subscales were .89 for attention, .76 for emotion and .88 for self-control. Item-factor correlations were between .43–.82.13 In terms of split-half reliability, Spearman-Brown and Guttman correlations were .79 and .78, respectively, while split-half reliability coefficients were .84 for the first part and .83 for the second part.

MacDonald's omega coefficient for the overall scale was determined to be .94. MacDonald's omega coefficients for the attention, emotion and self-control subscales were .89, .77 and .88, respectively.

The forms filled out by the teachers revealed a Cronbach alpha coefficient of .87 for the BAC-Turkish form, of .73 for

Table 3 Reliability and descriptive analysis values according to factors of BAC

Factors	Items	Parent Form				Teacher Form				Percent agreement+
		Mean	Sd	Item-factors r*	Item total r*	Mean	Sd	Item-factors r*	Item total r*	
Attention	1	.73	.66	.70	.62	.58	.57	.27	.24	55.5
	2	.71	.73	.74	.65	.68	.72	.49	.48	51.1
	3	.61	.70	.82	.71	.38	.61	.49	.49	55.8
	4	.61	.69	.79	.71	.45	.62	.49	.55	55.5
	5	.63	.71	.75	.68	.54	.67	.34	.41	50.7
	6	.58	.68	.50	.65	.51	.68	.33	.41	50.7
Attention total		3.87	3.38	**α=.89**		3.16	2.37	**α=.73**		
				ω=.89				**ω=.74**		
Emotion	7	.54	.66	.54	.61	.82	.67	.45	.49	41.6
	8	.61	.67	.64	.59	.78	.69	.47	.45	49.6
	9	.60	.69	.64	.57	.56	.69	.49	.52	50.7
	10	.56	.72	.43	.60	.47	.67	.29	.47	59.9
Emotion total		2.31	2.1	**α=.76**		2.63	1.86	**α=.71**		
				ω=.77				**ω=.71**		
Self-control	11	.58	.71	.57	.56	.76	.77	.37	.42	44.2
	12	.45	.65	.75	.68	.64	.67	.56	.51	53.6
	13	.44	.65	.74	.66	.37	.58	.55	.53	63.1
	14	.52	.69	.72	.66	.49	.66	.52	.44	55.1
	15	.46	.65	.69	.66	.31	.54	.48	.52	60.6
	16	.58	.68	.61	.70	.41	.6	.49	.54	55.8
	17	.48	.65	.60	.57	.36	.55	.49	.55	55.8
Self-control total		3.51	3.57	**α=.88**		3.34	2.80	**α=.77**		
				ω=.88				**ω=.77**		
Total BAC		9.69	8.00	**α=.93**		9.12	5.93	**α=.87**		
				ω=.94				**ω=.87**		

*Corrected ıtem-total correlation

+Percent agreement between parents and teachers

α = Cronbach's alpha

ω = MacDonald's omega

the attention subscale, .71 for the emotion subscale and .77 for the self-control subscale (Table 3).

Interrater Reliability

Percent agreement between parents and teachers varied between 41.6%–63.1%. The agreement was below 50% in only item 7 (41.6%) and item 11 (44.2%) (Table 3). The intraclass correlation coefficients (ICC) between parents and teachers were .60 for BAC and between .32–.46 ($p < .01$) for the subscales (Table 4).

Table 4 Intraclass Correlation Coefficients (ICC) in BAC

Name	Number of items	Total score	Score range in this study	ICC*
BAC	17	0–34	0-34	.60
Attention	6	0–12	0–12	.32
Emotion	4	0–8	0–8	.44
Self-control	7	0–14	0–14	.46

*Intraclass correlation coefficients between parents and teachers

Discussion

We tested three models to confirm the factor construct of BAC. The first model did not confirm the theoretical construct. In the second model, mothers and fathers were evaluated together and modifications had to be made in three items in the factor analysis. The testing of the third model consisted of a factor analysis of the data set for only mothers; an improvement was seen in the fit indices, thereby confirming the factor construct of BAC. Consequently, the Turkish version of BAC was found to be consistent with the three-factor construct with acceptable content validity. It was confirmed that BAC provides measurement invariance by gender. The results of reliability analysis (Cronbach's alpha, MacDonald's omega test, item total correlations, Spearman Brown's and Guttman's split-half reliability coefficients, percent agreement and intraclass correlation coefficients) showed that the Turkish BAC has a good level of reliability. Thus, all three hypotheses were confirmed. Based on the results, the Turkish version of BAC is a reliable and valid measure of child behaviors with acceptable content validity, construct validity, internal consistency, and inter-rater reliability. It was concluded that the scale could be used in evaluating the behavior of Turkish children.

In the present study, similar sub-dimensions were formed between the original scale and the Turkish sample, and the same items were located in the same sub-dimensions. The validity and reliability coefficients of the Turkish scale were high, and they were similar to those of the original scale (Chuang et al., 2016). These results indicate that the features of the Turkish scale and the original scale were similar, and the cultural equivalence of the scales was achieved. Unlike the original study, measurement invariance, McDonald's Omega test and split-half reliability were performed for the Turkish sample, and conducting these analyses in the Turkish sample provided strong evidence for the reliability and validity of the Turkish version of the scale.

Studies conducted in the Turkish culture have indicated that there are no measures available that are adequate in defining behavioral problems in children (Ocakçı & Karakoç, 2013). There is thus a need for determining behavioral issues with research that leads to preventive early diagnosis and interventions (Sawyer et al., 2015). It is for this reason that we believe that the use of this scale in the Turkish culture will contribute to making possible the early identification of behavioral problems among Turkish children. This will support the efforts to protect the mental health of future generations in Turkey.

At the same time, the study contributes to the literature by presenting a measure that can be used to evaluate the effectiveness of future behavioral development programs and will be of help to teachers in their efforts to make an assessment of behavioral problems in the schools.

In the content validity testing of the scale, the views of the 12 experts pointed to the following result: CVI = .92, with an item mean of 3.67. The literature indicates that the CVI of 80% of scale items should be three or more (Grant & Davis, 1997) and that the minimum should be 0.83 (Lynn, 1986). The study revealed that CVI values indicated a high content validity and suitability to the Turkish culture. In the original study conducted by Chuang et al. (2016), CVI was found to be >.90, which is similar to our study.

It is suggested that a scale can be revised according to expert opinions and that permission for its use in a study must be obtained from the developer of the original instrument (Büyüköztürk et al., 2013; Çapık et al., 2018; Şencan, 2005; Sousa & Rojjanasrirat, 2011). The wording was revised in items 7, 13 and 16 on the basis of the experts consulted in our study in the context of content validity. The final version of the scale after revisions were made was presented to Chuang for approval. We believe that the revisions made to enhance the understandability of the items without changing the original meaning were beneficial.

CFA is considered an acceptable means of testing validity when a scale is being adapted to another culture (Çokluk et al., 2012). In the CFA performed in our study, the relationship between the construct and the variables observed, margins of error, to what degree the variables explained the construct and factor loadings were all tested. It is said that considering the χ^2/degree of freedom, CFI, RM SEA and SRMR goodness of fit indices are enough to confirm the model construct in the CFA (Kline, 2005). The literature says that even if a model is a good fit for the data, in samples of a size of over 250, the chi square value is of statistical significance (Hair et al., 2010). On the other hand, it is also said that a CFI of .90 or more, a SRMR of less than .08 and a RMSEA value of less than .08 is an adequate finding. Also, it is expected that the coefficient χ^2/sd should be between 1 and 5 (Brown, 2015; Hair et al., 2010; İlhan & Çetin, 2014; Marsh et al., 2006). In this study, three models were tested with CFA, and a 17-item, three-factor structure of the BAC was finally supported. The results of the CFA showed that the χ^2 /sd value and the CFI, RMSEA and SRMR indices were at acceptable levels (Brown, 2015; Hair et al., 2010; İlhan & Çetin, 2014; Marsh et al., 2006). In the original study (Chuang et al., 2016), CFI was higher than .90, the RMSEA was lower than .08. The CFA results of the current study and the original study (Chuang et al., 2016) were found to be consistent with each other. These results proved that the structure of the Turkish version of the BAC was similar to the original structure and that the scale had a good factor structure for the Turkish sample. Additionally, measurement invariance of the scale with regard to gender was examined by alternative measurement models such as configural, metric and scalar invariance with multiple-group CFA. The three-factor structure proved to be invariant across gender. In the original study, the multiple-group CFA was not performed and because of this the results could not be compared with original study. However, when the studies in the literature are examined, it is seen that the results are valid (Cheung & Rensvold, 2002; Kong, 2017; Li et al., 2015).

The literature indicates that item-total correlations must generally be >.30 (Cristobal et al., 2007; Kline, 2013) and that a value of >.21 is acceptable (Büyüköztürk, 2012; Şencan, 2005). A Cronbach alpha of $\alpha > .60$ represents modest reliability, and $\alpha > .70$ indicates good reliability (Nunnally, 1978). The data collected from the parents showed that item-total correlations in BAC and the Cronbach's alpha were at good levels of reliability. Additionally, Büyüköztürk (2012) reported Spearman Brown's and Guttman's split-half reliability coefficients of .70. Since BAC's guttman split half reliability coefficient values were > .70, it was concluded that the scale was reliable in split half tests. In the original study conducted by Chuang et al., 2016, the item-total correlations value was found to be >.21 and Cronbach's alpha values of the scale and subscales were found to be >.70, which is similar to our study. These results proved that the reliability of the Turkish version of the BAC was similar to the reliability values of the original scale. This demonstrates that the items could be used to measure the desired subject at a sufficient level, the items were related to the subject, and the scale had

good reliability. In the split-half reliability method used in this study, Cronbach's alpha values for both halves were > .70. Thus, there was a strong and meaningful relationship between the two halves; both the Spearman-Brown and Guttman split-half coefficients were > .70. These results demonstrate that the scale has a high level of reliability (Büyüköztürk, 2012). While these results show that the internal validity of the scale is high, the results could not be compared with the findings reported by Chuang et al. (2016) because a split-half reliability analysis had not been conducted in the original study.

Also, in the present study, the omega reliability coefficient is evaluated as alpha and is recommended to be over .70 (Dunn et al., 2014; Green & Yang, 2015). When the items of a scale have a congeneric structure, experts recommend the use of the omega reliability coefficient (Green & Yang, 2015; Trizano-Hermosilla & Alvarado, 2016). For the Turkish version of the BAC, the omega coefficients of the whole scale and the subscales were determined to be higher than .70, and the omega and alpha coefficients were found to be very close to each other in the Turkish version of the BAC. This result proved that the scale had good reliability. Moreover, both the omega values and the alpha values above .70 revealed that the items were associated with each other. As the omega coefficient of the original scale was not available, no comparison was made with the results for the Turkish version.

The data collected from the teachers resulted in a Cronbach's alpha value that indicated good reliability; the item-total correlations were > .23 and acceptable. The intraclass correlation coefficients (ICC) in the study between parents and teachers were similar to the original scale; the overall scale and the subscales were found to indicate a moderate level of reliability (Chuang et al., 2016). Similarly, in studies using other behavior scales for children, ICC values between parents and teachers were found to indicate a moderate or poor level of reliability (Salbach-Andrae et al., 2009; Sollie et al., 2013). Furthermore, the percent agreement between the parents and teachers in this study were parallel to the values in the original scale and only two items revealed agreement of below 50% (Chuang et al., 2016). These were the statements "becomes stubborn, depressive or ill-tempered" (41.6%) in item seven and "can't be still and is hyperactive" (44.2%) in item 11. It was seen that the scores of the teachers in these items were higher than the parents' scores. This result may stem from the fact that children exhibit different behaviors at school and at home and also because parents and teachers may have different perceptions of children's behavior (Chuang et al., 2016). It may be that the position teachers assume in the school environment gives them the chance to observe many children simultaneously and thus enables them to compare the behaviors of different children (Bansal et al., 2019; Weisz et al., 2017). The result also suggests that teachers have a greater opportunity to observe children, as they are the ones who have to deal with aggressive, stubborn and disruptive, hyperactive children in the classroom (Chuang et al., 2016; Graziano et al., 2015; Hart et al., 2019; Sawyer et al., 2015).

Data belonging to parents who are unable to read or write were collected with the help of the researchers in line with the knowledge in the literature that maintains that children growing up in socioculturally disadvantaged households are more likely to exhibit behavioral problems (Mohan et al., 2020; NICE, 2017). An attempt was made in this way to include children from a disadvantaged socioeconomic background in the assessment provided by the valid and reliable scale.

Implications for Future Research

The Turkish version of the BAC scale will make it possible in the future to make evaluations of behavioral problems in the domains of attention, emotion, and self-control, using only a single measure. This will enable the referral of children identified in screenings with behavioral problems to appropriate health facilities. At the same time, the tool can be used in evaluating the effectiveness of school-based programs developed to reduce behavioral problems. The psychometric parameters of the measure will additionally serve to provide a basis for cross-cultural comparisons when adaptations are carried out in other cultures.

Limitations

The study may have some limitations. First, criterion validity analysis was not performed in the study; this may be considered a limitation. Criterion validity analysis can be executed in future studies. Secondly, although the researchers helped parents unable to read or write to provide the needed data, the indirectly collected data of illiterate parents may have had a partial effect on the final results. The researchers' reading speed, pronunciation, and tone of voice may have affected the parents' ability to understand the items correctly (although attention was paid to slow and clear reading to avoid this situation).

The BAC focuses on general behavioral problems of children in a school-based community. This scale cannot be used to screen students with severe mental disorders, such as obsessive and compulsive disorders. Additionally, only first, second and third graders were assessed, which may limit the generalizability of the findings to all school-aged children.

Conclusion and Recommendations

This study was the first piece of research to test the validity and reliability of BAC in the case of Turkish children. The reliability of the assessments made by both parents and teachers in the Turkish BAC was found to be high. Based

on this result, it has been shown that it is possible to evaluate children's behavior using data obtained from teachers as well as parents and to make an easy-to-implement and a short measuring tool available for this purpose. The scale in its present form has no cut-off score. Future studies may include analyses that will serve to determine a cut-off point for the instrument. The psychometric properties of the BAC were evaluated in a community of school-aged children. Future studies may be conducted to test the reliability of the instrument in clinical cases. Lastly, the effectiveness of the BAC should be evaluated in a wider population that consists of different grades so that the generalizability of this scale may be assessed.

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Data Availability The data that support the findings of this study are available on request from the corresponding author.

Declarations

Ethical Approval All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards (Ethical Approval No: 06.11.2017-212).

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare that they have no conflict of interest.

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