



Psychometric properties of the screening tool of feeding problems (STEP) in Turkish children with ASD



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ABSTRACT

The purpose of this study is to determine the psychometric properties of the screening tool of feeding problems (STEP) in Turkish children with autism spectrum disorders (ASD). After providing linguistic equivalence of the scale, STEP was applied to 360 mothers on behalf of their children with ASD in order to determine the associated feeding problems. The scale which has 5 sub-domains and 3 Likert-type questions originally consisted of 23 items. Item-total correlations of the scale were acceptable, with the exception of item 8 and the differences between the item averages of the upper 27% and the lower 27% groups were significant ($p < 0.001$). The internal consistency coefficient ($\alpha = 0.81$) and the split-half reliability (Spearman's $\rho = 0.69^{**}$) were high. The STEP achieved criterion-related validity. The results of Confirmatory Factor Analysis ($\chi^2/df = 3.2$, RMSEA = 0.08, SRMR = 0.08, GFI = 0.85, AGFI = 0.81, CFI = 0.86) showed that the scale has an acceptable goodness of fit. This study suggests that the Turkish version of the STEP could be a useful assessment tool when it comes to measuring feeding problems in children with ASD.

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1. Introduction

Autism spectrum disorders (ASD) are characterized by life-long neurodevelopmental disorders that affect all areas of child development and are defined as deficits in social interaction and communication, with restricted interests and repetitive behaviors (American Psychological Association-APA, 2000). Many children with ASD have associated behavioral symptoms that involve anxiety, obsessive/compulsive features, aggression, self-injurious, mood swings, hyperactivity and attentional issues and sleep disturbance, and these symptoms interrupt the daily functions of such children (McGrew et al., 2007). Although feeding and mealtime difficulties are not a core feature of children with ASD (Fodstad & Matson, 2008), this population has feeding problems (Ledford & Gost, 2006) such as sensibility to the hardness/consistency of the food, and food selectivity in choosing certain foods (Ahearn, Castrne, Nault, & Green, 2001; Bowers, 2002). Feeding problems are historically linked with ASD (Ahearn et al., 2001; Cornish, 1998; Kanner, 1943; Ritvo & Freeman, 1978). Feeding problems were reported as being more common in children with ASD compared to typically developing children (Schreck, Williams, & Smith, 2004) and children with other developmental disabilities (Kodak & Piazza, 2008). The feeding problems of children with ASD, particularly relate to consuming fewer foods and eating a narrow variety of foods (Shreck et al., 2004), food selectivity (Schreck & Williams, 2006), food refusal (Bandini et al., 2010), sensitivity to texture of the food (Schmitt, Heiss, & Campbell, 2008), all of which are different from the feeding behavior of typically developing children. In addition, children with ASD

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exhibit certain feeding problems such as food selectivity compared to those with other developmental disabilities (Field, Garland, & Williams, 2003; Fodstad & Matson, 2008; Schreck & Williams, 2006) possibly due to their difficulties in imitation, generalization, and communication skills, as well as their preferences with regard to eating a narrow range of food depending on the extension of repetitive behavior patterns (Seiverling, Williams & Sturmey, 2010). Notably, food selectivity might be derived from the diagnostic characteristics of ASD (Schreck & Williams, 2006) and sensitivity to texture could be related to a physiological component of the ASD diagnosis (Bartoshuk, 2000). Additionally, the presence of unusual eating behaviors such as food cravings and pica (i.e., eating inedible items) (Kerwin, Eicher, & Gelsinger, 2005; Raiten & Massaro, 1986) was reported for this population (Twachtman-Reilly, Amaral, & Zebrowski, 2008).

Few studies have utilized standardized assessment tools to assess feeding and mealtime behavior problems of children with ASD, even though using such tools may help to unify the literature regarding effective treatments, and provide an evaluation of the efficacy of interventions for feeding problems in children with ASD (Lukens & Linscheid, 2008). Despite the fact that feeding and mealtime behavior problems are common among children with ASD, the assessment of such difficulties has not received adequate attention. There are some tools such as the Brief Autism Mealtime Behavior Inventory (BAMBI: Lukens & Linscheid, 2008) and the Parent Mealtime Action Scale (PMAS: Hendy, Williams, Camise, Eckman, & Hedemann, 2009) on the assessment of feeding and mealtime problems in children with ASD (Seiverling et al., 2010). Assessing the feeding problems requires specific tools because those problems are differently characterized in individuals with other developmental disabilities apart from mealtime problems. Indeed, the PMAS that aims to assess parent mealtime practices is not specially designed to measure the feeding problems for the ASD population (Seiverling et al., 2010). None of the three studies related to the PMAS suggests psychometrically normative information on the feeding problems of children with ASD (Hendy et al., 2009; Hendy, Williams, Riegel, & Paul, 2010; Williams, Hendy, Seiverling, & Can, 2011). In addition, the BAMBI was not normed on children with feeding problems, and had some limitations such as reduced the reliability, validity and clinical usefulness of the scale (Hendy, Seiverling, Lukens, & Williams, 2013). Additionally, some items were eliminated because they had low item total correlations and factor loads in the adaptation study of the BAMBI with a Turkish cohort (Meral & Fidan, 2014).

In terms of assessment tools for atypical feeding behavior in children and adolescents with ASD, the screening tool of feeding problems (STEP) was found to be a useful questionnaire utilized with children and adults alongside with the BAMBI among 34 different tools in 19 relevant articles (Studnik & Simkiss, 2011). The STEP is a questionnaire that was designed to identify feeding problems among persons with intellectual disabilities (ID) (Matson & Kuhn, 2001) and it was used in various studies with ID populations. The STEP was applied to a cohort with ID and identified significant differences between feeding problems and behavior functions (Matson et al., 2005). To utilize the STEP for a child population, it was examined with a sample of feeding clinic children and was entitled STEP-CHILD. It consisted of 15 items and six subscales, and its internal reliability was acceptable and established convergent validity (Seiverling, Hendy, & Williams, 2011). A relationship was found between food refusal and the social skills of persons with ID in another study that used the STEP. The results supported the view that those people with ID who display food refusal have greater general negative and negative nonverbal social skills than a control group (Matson, Cooper, Mayville, & Gonzalez, 2006). In a recent study that established cutoff scores with regard to the STEP, it was proved that being male and having a greater severity of ID further increases the risk of feeding problems (Matson, Fodstad, & Boisjol, 2008). Another study demonstrated that significant differences in the STEP were found across feeding problems. In addition, individuals with depression scored significantly higher on the Nutrition subscale of the STEP than individuals without depression (Mayville, Matson, Laud, Cooper, & Kuhn, 2005). Additionally, the criterion-related validity of the STEP shows that there is an association between scores on the STEP and Diagnostic and Statistical Manual of Mental Disorders: DSM-IV (APA, 1994) diagnoses of pica and rumination (Kuhn & Matson, 2002).

Assessing the feeding problems of the ASD population on a standardized questionnaire is crucial because feeding problems are assumed to co-exist with a diagnosis of autism (Schreck et al., 2004). The STEP (Matson & Kuhn, 2001) is one of the most recent psychometric assessment tools to be developed in order to assess the feeding problems of persons with ID. However, it has not yet been validated with ASD groups (Seiverling et al., 2010). The association between the STEP and DSM-IV diagnoses of pica and rumination (Kuhn & Matson, 2002) is a conspicuous feature of the STEP. This feature of the STEP may improve the accuracy of the assessment of feeding problems in the ASD population, and it may help to overcome the limitations in the current definition of DSM-IV-TR and DSM V (Seiverling et al., 2010; Williams, Riegel & Kerwin, 2009) with regard to pediatric feeding problems in those with ASD. Even though the aforementioned adequacy of the STEP was proved for the ID population, it may be suitable for assessing the ASD population's comorbid behavior problems such as feeding problems (Rojahn & Matson, 2010). Additionally, the most common feeding problems were classified as food refusal, selectivity by texture, selectivity by type, oral-motor delays, and dysphagia, and are related to medical conditions or developmental disabilities (Field et al., 2003). In contrast, it was noted that just 19 of the 234 children studied (8%) met the DSM-IV-TR (APA, 2000) criteria on infant feeding disorders and those of early childhood in the hospital-based program (Williams et al., 2009) differently from the above-mentioned classification. This result proposed that the DSM-IV-TR (APA, 2000) diagnosis of feeding disorders does not adequately classify the problems experienced by the majority of children referred for intervention for feeding problems.

To date, no studies have been conducted on a specific cohort of children with ASD involving using the STEP in order to measure the feeding problems in the Turkish population. The purpose of the present study was to add to the available measures for assessing the feeding problems of children with ASD by adapting the STEP that has a comprehensive measure

for the ID population. In accordance with this aim, we corroborated the factor structure, the reliability and validity of the STEP with regard to children with ASD in Turkey.

2. Methods

2.1. Participants

Valid data were obtained from 360 biological mothers on behalf of their children with ASD who go to ten autistic children education centers, one early childhood education center and three private special education centers providing a specialist service in 8 different provinces (Istanbul, Sakarya, Bursa, Denizli, Trabzon, Kutahya, Van, and Diyarbakır) of Turkey. In Turkey, children with ASD are diagnosed through educational assessment reports provided by Guidance and Research Centers (GRCs) which is the only authorized institutions offering diagnostic services for students in need of special education. These reports include the type and severity of the disability involved. They are given to the parents and also kept in school-based files. GRCs comply to the DSM-IV-TR criteria which are used to diagnose the individuals with ASD. As yet, in Turkey, none of the Guidance and Research Centers uses DSM-V.

Each survey requested demographic information about the child (including age, height in centimeters (cm), weight in kilograms (kg), body mass index (BMI): The height and weight of children were each used to calculate their body mass index), gender, severity of disability, and comorbidity). The average age of the children with ASD was 9.41 years ($sd = 4.46$), the average height was 131.29 cm (1.31 m) (4 feet, 3.69 inches) ($sd = 27.27$) and the average weight was 37.34 kg (82.1 lbs) ($sd = 20.14$), while the BMI mean was 14.25, identified as underweight. 280 of the children were male, and 71 were female (9 not reported). The severity of the children was determined as mild (66), moderate (146), severe (143) and profound (6) (9 not reported). While 66 children had comorbidity, 321 of them had not (39 not reported). All children lived with their families.

2.2. Measures

2.2.1. The screening tool of feeding problems (STEP)

The screening tool of feeding problems (STEP) was developed by [Matson and Kuhn \(2001\)](#) in order to identify the feeding problems of persons with ID in terms of (a) risk of aspiration, (b) food selectivity, (c) feeding skills deficits, (d) food refusal and associated behavior problems, and (e) nutrition-related behavior problems. The STEP consists of 23 items, each of which corresponds to a specific feeding problem in order to provide diagnosis, treatment and the evaluation of the treatment outcome. The Likert-type questions are directed to the cohort to obtain three possible responses for both frequency (0 = never occurs; 1 = occurs between 1 and 10 times, and 2 = occurs more than 10 times) and severity (0 = causes no harm or problems; 1 = causes minimal harm or problems, and 2 = causes serious injury or problems) in terms of the feeding problem within the last month. The STEP was originally normed on a sample of 570 adults with ID aged 10–87 years. STEP's test-retest reliability ($r = 0.72$) and inter-rater reliability ($r = 0.71$) were moderate; inter-item consistency (coefficient alpha) for the scale was a modest 0.68 and ranged from 0.27 to 0.70 for the categories and factors; internal consistency (Cronbach's alpha) was 0.48 for the adult version and ranged from 0.37 to 0.60 for subscales ([Matson & Kuhn, 2001](#)).

2.2.2. The Brief Autism Mealtime Behavior Inventory (BAMBI)

In this study, the Brief Autism Mealtime Behavior Inventory (BAMBI: [Lukens & Linscheid, 2008](#)) was used to test the criterion-related validity of the STEP in children with ASD. The BAMBI is the first assessment tool to address feeding and mealtime problems in the ASD population, and was developed by [Lukens and Linscheid \(2008\)](#). It was developed by comparing the eating behavior of 68 children with ASD and 40 children without ASD aged 3–11 years. The BAMBI is rated based on a parent proxy report, with a 5-point grading type scale (1 = Never/Very Rarely – 5 = At Almost All Mealtimes). It originally consisted of 18 items, with four of them (3, 9, 10 and 15) reverse coded. Three factors (limited variety, food refusal and features of autism) explained 45% of the total variance. The internal consistency coefficient was 0.88 and Cronbach alphas for the three subscales were 0.87, 0.76 and 0.63, respectively. Criterion-related validity was provided ($r_{108} = 0.77$, $p < 0.01$), test-retest reliability was 0.87, and for inter-rated reliability was 0.78 of BAMBI ([Lukens & Linscheid, 2008](#)).

The BAMBI was adapted to Turkish children with ASD by [Meral and Fidan \(2014\)](#). In that study, after the check for validity and reliability, 4 items were eliminated and 14 items remained. The results of the confirmatory factor analysis ($\chi^2/sd = 3.6$, RMSEA = 0.09, SRMR = 0.07, GFI = 0.89, AGFI = 0.84, IFI = 0.90, CFI = 0.90) showed that the scale has an acceptable goodness of fit. The internal consistency coefficient ($\alpha = 0.79$) and the value of the split-half reliability (Spearman's rho = 0.83^{**}) ($p < 0.01$) were good. Item-total correlations of the scale were acceptable, and t -tests between the items' means of upper 27% – lower 27% points were significant.

2.3. Procedure

The data are based on parent-proxy reports which include obtaining information on the target individual. The data were collected by mail survey ([Dillman, Smyth, & Christian, 2009](#)) from the mothers with the consent of the participants. We did not target particular parents in order to prevent selection bias. Surveys for all 730 children with ASD in the 14 schools chosen

were then sent to the school principals for distribution to teachers, who distributed the surveys to parents to fill in on behalf of their children with ASD. Of the possible 730 parents, 360 (49.31%) valid surveys were returned. Prior to applying the Turkish form of the STEP, permission was obtained from John L. Matson (Department of Psychology, Louisiana State University) who had developed the scale. Translation and cultural adaptation studies of STEP were conducted in accordance with the International Test Commission's principles of translation and adaptation of education and psychology tests (Tanzer & Sim, 1999).

In order to provide the linguistic equivalence of the STEP, the document was translated into Turkish by two professionals and an English teacher, all of whom were competent in English. Three independent translations were combined into a single Turkish form by making the related comparisons. Finally, the Turkish form and the original English form were compared by a professional from the English Teaching Department, and necessary corrections were made until the scale took its final form. The data were collected over a three month period and were analyzed using the PASW Statistics 18.0 (SPSS, 2009) and the LISREL (2004) 8.71 programs. Only frequency responses with regard to the STEP items were assessed for this study. Confirmatory Factor Analysis (the following model fit indices were used to assess the model fit: chi-squared difference test χ^2/df , Root Mean Square Error of Approximation-RMSEA, Standardized RMR-SRMR, Goodness of Fit Index-GFI, Adjusted Goodness of Fit Index-AGFI, Non-Normed Fit Index-NNFI, and Comparative Fit Index-CFI), criterion-related validity (criterion-related validity of the STEP was tested with the BAMBI), Cronbach alpha correlation coefficients, split-half reliability (Spearman Brown rho.), corrected item-total correlations and the differences between item averages of the upper 27% – the lower 27% groups were examined in order to prove the reliability and validity of the STEP.

3. Results

3.1. Item total correlations and item averages of upper and lower 27% groups

Item total correlations of the STEP ranged from 0.18 to 0.51 (see Table 1). With the exception of item 8, items 7, 10, 14 and 15 were in the acceptable range of above 0.20 (Crocker & Algina, 2008), whereas all other items were above 0.30. In other words, items distinguish individuals at a good level in terms of the measured characteristic (Buyukozturk, 2004).

We used *t*-test to compare item scores of the 27% upper–lower groups in order to examine the item's discrimination power of the STEP. The 27% upper – 27% lower *t*-values (*sd* = 193) varied between 3.99 and 12.42 and all differences between item averages of upper and lower 27% groups ($p < 0.001$) were significant (see Table 1). This means that the representiveness of similar behaviors and item's discrimination power of the STEP were good.

3.2. Internal consistency reliability and split-half reliability

The Cronbach's alpha (α) internal consistency coefficient of the STEP was calculated as 0.81, and for subdomains ranged from 0.49 to 0.66. It was observed that the scale has an acceptable internal consistency (see Table 2).

In order to determine the split-half reliability values of the STEP, the split-half test correlation was calculated between odd numbered items (1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23 = 12 items) and even numbered items (2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 = 11 items) of the scale. The split-half reliability (Spearman Brown rho) of the STEP was calculated as 0.69** ($p < 0.01$). Findings indicated that the split-half reliability of the STEP is at a good level (see Table 2).

3.3. Criterion-related validity

To evaluate the criterion-related validity of the STEP, correlation analysis was used with BAMBI (Lukens & Linscheid, 2008). Both assessments tools were applied to the same sample. The criterion-related validity calculation is based on the correlations between scores obtained from two scales, and it is expected that this correlation coefficients are high (Ozguven, 2000). In the study, a significant and positive relationship ($p < 0.01$) was determined between total and subdomains scores between the two scales. The STEP achieved criterion-related validity (see Table 3). Findings showed that the Turkish version of the STEP is significantly associated with BAMBI in terms of criterion-related validity, and is adequate when it comes to measuring the similar structures in children with ASD.

3.4. Construct validity – confirmatory factor analysis

Confirmatory factor analysis (CFA) was run to demonstrate the construct validity of the STEP. The critical *N* value (CN), which includes the minimum number of participants for CFA, was calculated as (CN) = 136.00 in this research. In addition, the fact that the sample size is over 300 is considered good (Tabachnick & Fidell, 2001). Accordingly, the study group consisting of 360 participants was suitable for running the CFA.

Many fit index values used to determine the sufficiency of the examined model have certain interims in CFA (Anderson & Gerbing, 1984; Byrne, 2006; Cole, 1987; Hu & Bentler, 1999; Jöreskog & Sörbom, 1993; MacCallum, Browne, & Sugawara, 1996; Marsh, Balla, & McDonald, 1988; Schermelleh-Engel, Moosbrugger, & Muller, 2003). Related fit index values and the fit values of the STEP were demonstrated in Table 4. CFA results showed that the Chi-square value ($\chi^2 = 698.94$, $N = 360$, $df = 212$, $p = 0.000$) was significant. In the research, it was observed that the STEP model has an acceptable goodness of fit

Table 1

Item total correlations and 27% upper-lower group item averages of STEP-Turkish Form (N = 360).

Items (English and Turkish)	r_{jk}	t
<i>Aspiration Risk sub-domain (Soluk Tıkanması Riski alt alanı)</i>		
18. He/she regurgitates and re-swallows food either during or immediately following meals/Yemek sırasında ya da yemekten sonra yediklerini geri çıkarıp/öğürüp tekrar yutar.	0.36	5.75***
21. He/she vomits either during or immediately following meals/Yemek sırasında ya da yemekten hemen sonra kusar.	0.30	4.56***
<i>Food Refusal Related Behavior Problems sub-domain (Yiyecek Reddetme alt alanı)</i>		
2. Problem behaviors (e.g., aggression, SIB) increase during meal times/Problem davranışları (saldırganlık, kendine zarar verme, eşyaları fırlatma) yemek esnasında artar.	0.36	7.40***
13. He/she spits out their food before swallowing/Yiyecekleri yutmadan tükürür.	0.44	7.82***
19. He/she pushes food away or attempts to leave the area when food is presented/Yiyecek sunulduğunda yiyeceği iter ya da ortamı terk etmeye çalışır.	0.39	9.26***
<i>Selectivity sub-domain (Seçicilik/Yiyecek ayırt etme alt alanı)</i>		
6. He/she will only eat selected types of food (e.g., pudding, rice)/Yalnızca belirli türdeki yiyecekleri yer (puding, pilav gibi).	0.47	10.63***
10. He/she prefers a certain setting for eating (e.g., bedroom, dining room)/Yemek için belirli ortamları tercih eder (yemek odası ya da mutfak gibi).	0.24	7.05***
20. He/she will only eat foods of a certain temperature/Yalnızca belirli ısıdaki yiyecekleri yer (sadece soğuk, sadece sıcak ya da sadece ılık yiyecekler gibi).	0.33	7.33***
22. He/she prefers to be fed by a specific caregiver, or prefers to be fed rather than feed him/herself/Belirli bir kişi tarafından yedirilmeyi ister ya da bunu kendi başına yemeye tercih eder.	0.41	11.20***
23. He/she eats foods only of certain textures/Yalnızca belirli dokudaki (kıvama ya da sertlikteki) yiyecekleri yer.	0.47	10.04***
<i>Nutrition Related Behavior Problems sub-domain (Beslenmeyle İlişkili Davranış Problemleri alt alanı)</i>		
7. He/she steals or attempts to steal food from others during meals/Yemek sırasında başkasının yemeğinden alır/aşırmaya çalışır.	0.24	6.78***
9. He/she eats or attempts to eat items that are not food/Yiyecek olmayan/yenmeyen şeyleri yer veya yemeye çalışır (pamuk, kum, kağıt gibi).	0.37	8.63***
11. He/she only eats a small amount of the food presented to him or her/Önüne koyulan yemeğin çok azını yer.	0.46	11.27***
12. He/she will continue to eat as long as food is available/Önünde yiyecek olduğu sürece, yemeye devam eder/yemeyi kesmez	0.34	9.44***
14. He/she steals or attempts to steal food outside of mealtime./Yemek vakitleri/ öğünler dışında yiyecek aşırıya/yemeye çalışır.	0.25	7.44***
<i>Skills sub-domain (Yeterlikler/beceriler alt alanı)</i>		
1. He/she cannot feed him/herself independently/Yemeğini kendi başına/bağımsız olarak yiyemez.	0.36	8.95***
3. He/she does not demonstrate the ability to chew/Yediklerini çiğneyemez.	0.51	9.84***
4. He/she chokes on food/Yiyecekler boğazına kaçır/yerken tıkanır.	0.46	7.11***
5. He/she does not demonstrate the ability to swallow/Lokmasını yutamaz.	0.37	5.76***
8. He/she requires special equipment for feeding (e.g., G-tubes, scoop dishes)/Beslenmek için özel araç gerece ihtiyaç duyar (gastronomi tüpü, kepeç tabak, özel üretilmiş çatal-kaşık gibi).	0.18	3.99***
15. He/she eats a large amount of food in a short period of time/Çok miktarda yiyeceği, kısa bir süre içerisinde yer.	0.25	6.76***
16. He/she requires special positioning during meals/Yiyecek yerken belirli şekil/pozisyonlara ihtiyaç duyar (dik oturarak yeme, yatarak yeme, arkaya yaslanarak yeme gibi).	0.40	8.11***
17. He/she swallows without chewing sufficiently/Lokmasını yeterince çiğnemedi yutar.	0.49	12.42***

*** $p < 0.001$.

(fit = 3.2) according to the $\chi^2/df = \text{fit}$ (698.94/212 = 3.2) calculation. Fit index values of the model based on CFA were calculated as RMSEA = 0.08, SRMR = 0.08, GFI = 0.85, AGFI = 0.81, NNFI = 0.83 and CFI = 0.86. The factor loads of the factor varied between 0.17 and 0.69. Fix index values indicated that the model has an acceptable fit with the data depicted in Fig. 1.

Table 2

Internal consistency and split-half reliability coefficients of STEP (N = 360).

Variables	Cronbach alpha (α) internal consistency	Spearman Brown rho. Split-half reliability
STEP (total)	0.81	0.69**
Aspiration risk	0.55	–
Food refusal relation behavior problems	0.61	–
Selectivity	0.59	–
Nutrition relation behavior problems	0.49	–
Skills	0.66	–

** $p < 0.01$.

Table 3
Criterion-related validity results of STEP with BAMBI ($N = 360$).

	1	2	3	4	5	6	7	8	9	10
1. STEP_total	–									
2. AR	0.47**	–								
3. FRRBP	0.66**	0.50**	–							
4. Se	0.76**	0.18**	0.39**	–						
5. NRBP	0.74**	0.22**	0.41**	0.39**	–					
6. Sk	0.83**	0.34**	0.52**	0.39**	0.48**	–				
7. BAMBI_total	0.97**	0.29**	0.66**	0.54**	0.73**	0.71**	–			
8. LV	0.81**	0.28**	0.53**	0.51**	0.63**	0.56**	0.82**	–		
9. FR	0.80**	0.23**	0.56**	0.39**	0.57**	0.62**	0.83**	0.42**	–	
10. FA	0.65**	0.12**	0.45**	0.32**	0.49**	0.50**	0.69**	0.33**	0.56**	–

STEP, screening tool of feeding problems, AR, aspiration risk, FRRBP, food refusal related behavior problems, Se, selectivity, NRBP, nutrition related behavior problems, Sk, skills; BAMBI, Brief Autism Mealtime Behavior Inventory, LV, limited variety; FR, food refusal; FA, features of autism.

** $p < 0.01$.

Table 4
Fit values of STEP according to fit criteria and fit values ($N = 360$).

Fit criteria	Good fit values	Acceptable fit values	Fit values of STEP
χ^2/df	< 3	< 5	3.2
RMSEA	$0.00 < RMSEA < 0.05$	$0.05 < RMSEA < 0.08$ or 0.10	0.08
SRMR	$0.00 < SRMR < 0.05$	$0.05 < SRMR < 0.08$ or $.10$	0.08
GFI	$0.95 < GFI < 1.00$	0.85 or $0.90 < GFI < 0.95$	0.85
AGFI	$0.90 < AGFI < 1.00$	0.80 or $0.85 < AGFI < 0.90$	0.81
NNFI	$0.90 < AGFI < 1.00$	0.80 or $0.85 < AGFI < 0.90$	0.83
CFI	$0.95 < CFI < 1.00$	$0.90 < CFI < 0.95$	0.86

4. Discussion

The present study was conducted in order to demonstrate the psychometric properties of the STEP (Matson & Kuhn, 2001) in Turkish children with ASD. Although children with ASD display significant feeding problems (Ledford & Gost, 2006) and those problems have been more serious for children with ASD than for typically developing children and those with other developmental disabilities, very little research has described feeding problems related to the diagnosis of ASD (Shreck et al., 2004). This study contributes to the use of standardized assessment procedures for feeding problems of children with ASD. The item total correlations of the STEP were acceptable and the differences between item averages of upper and lower 27% groups ($p < 0.001$) were significant. Internal consistency reliability values of the STEP and split-half reliability were high. The STEP provided criterion-related validity. CFA results showed that the fit values of the suggested STEP model has an acceptable fit. Accordingly, the STEP could be used as a valid and reliable assessment tool with regard to measuring the feeding problems of children with ASD in Turkey.

There are a couple of limitations with regard to the current study which need to be considered when interpreting the study outcomes. It could be considered as a limitation that item 8 (he/she requires special equipment for feeding such as G-tubes, scoop dishes) has a low value under the acceptable range in item-total correlation calculations. This situation may be because by incomplete knowledge on the part of parents about these types of equipment. However, the researcher believes that the aforementioned item should remain in the scale because it is a relevant item that occurs in a single question that aims to assess the usage of modified equipment for food and fluid consumption in terms of feeding problems related to oral-motor delays. Another limitation is that it was not able to examine the test-retest reliability in the study. Therefore, a related step may be included in further studies. Future research is also needed to compare children with ASD with samples of children with ID and typically developing children in order to develop normative data in feeding problems.

Notwithstanding these limitations, the STEP was developed based upon the literature concerning feeding problems in persons with ID, but it may be an appropriate measure for children with ASD because ASD is often comorbid with ID (Seiverling et al., 2010). Many tools such as the BAMBI and the PMAS were not designed to measure all aspects of feeding problems, in that they are especially associated with mealtime and parent mealtime actions. However the STEP was normed with individuals with feeding problems. STEP differently assesses the feeding problems with a holistic aspect, not only mealtime behaviors. The STEP may also serve as an educational tool to guide researchers and clinicians together with parents, to help them understand the feeding problems most associated with children with ASD.

Despite the fact that research has shown feeding problems to be common among children with ASD (Ledford & Gost, 2006) and there is a need for a comprehensive diagnostic classification for childhood feeding disorders (Williams et al., 2009), the utility of the DSM-IV-TR diagnostic criteria for feeding disorders in infancy and early childhood are limited and inadequate when it comes to assessing the feeding problems of ASD population (Seiverling et al., 2010). While the STEP has a relation with pica and rumination of DSM-IV (APA, 1994), it proposes a framework for assessing the feeding problems of the

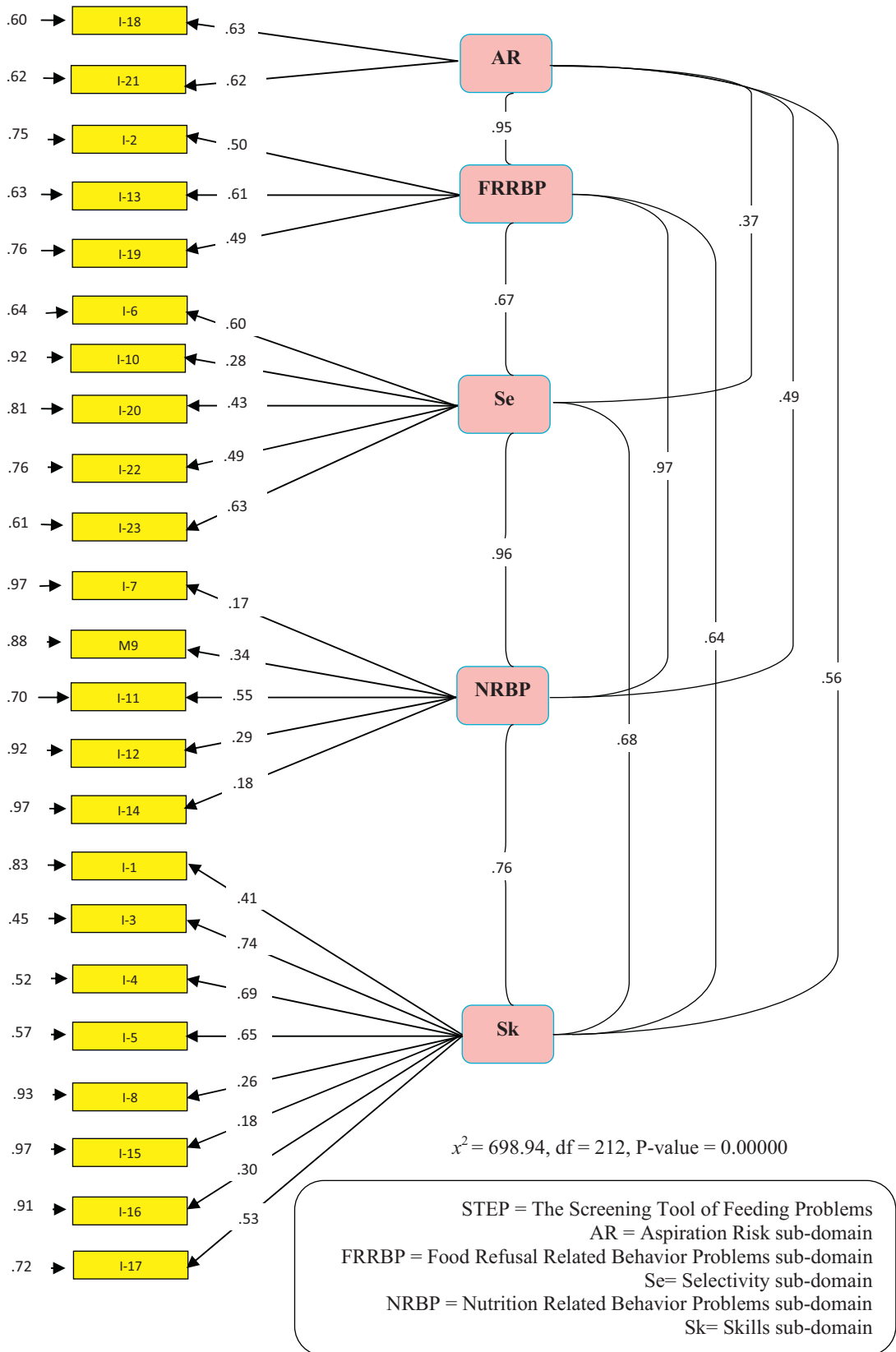


Fig. 1. CFA results of the screening tool of feeding problems (STEP) (path diagram).

ASD population which is far from the limitations of the DSM-IV-TR (APA, 2000) definition. Contextually, the STEP is adequate in terms of assessing feeding problems in the form of food refusal, selectivity by texture, selectivity by type, oral–motor delays, and dysphagia (Field et al., 2003) and unusual eating behaviors (i.e. pica: eating inedible items) of the ASD population (Kerwin et al., 2005; Raiten & Massaro, 1986).

5. Conclusion

Understanding the nature of feeding problems associated with ASD may be of considerable value in developing comprehensive interventions toward related deficits. This study suggests that the Turkish version of the STEP could be a useful assessment tool for the measurement of feeding problems in children with ASD. Given the potential of the STEP, if the diagnostic classification of the DSM-IV-TR (APA, 2000) feeding disorder fails to reflect the relational nature of feeding problems with an ASD diagnosis, the STEP may be of assistance in this respect.

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