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Reliability and Validation of the Children's Eating Attitudes Test among 10- to 14-Year-Old School Children in Turkey

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ABSTRACT

Introduction: Eating disorders (ED) onset occurs commonly during adolescence and this is a very critical period of life in the context of developmental perspectives because adequate nutrition is necessary for optimal growth and development. Nutritional disorders can be harmful and cause extreme and potentially permanent physical and psychological consequences. Therefore, defining the eating disorder in its early stages is important.

Objective: The goal of this study was to translate the Children's Eating Attitude Test (CHEAT) into Turkish and establish its validity and reliability among Turkish schoolchildren.

Methods: The study was conducted on students from two private and two public primary schools. After delivering invitations to suitable classes, informed consents that had been written by participants and parents were collected.

Results: The research comprised 352 children between the ages of 10 and 14, including 222 females and 130 boys. Minimum factor loading is 0.597 and total percentage of explained variance is 58.04 The CFA supported these findings, since the 15-item scale had a greater goodness-of-fit and exploratory component analysis generated four factors.

Conclusion: Analysis of data showed that the ChEAT scale is a valid and reliable measurement tool available in Turkey. It is thought that the ChEAT scale will contribute to studies on eating disorders in children aged between 10-14 years.

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KEYWORDS

ChEAT, eating disorders, reliability, Turkish children, validity.

INTRODUCTION

The development of eating disorders (ED) is most frequent during adolescence, especially in girls, but it can happen at any age[1]. Obesity and eating problems are becoming more common among youth, posing a public health risk. Eating disorders are characterized by unhealthy eating attitudes and behaviors such as dieting, vomiting, and food avoidance[2,3].

Eating disorder habits can develop into an eating disorder or a weight problem (overweight, obese) that is dangerous to one's health. Eating disorders are psychiatric conditions with diagnostic criteria based on psychological, behavioral, and physiological features. Anorexia nervosa (AN), bulimia nervosa (BN), and other eating disorders are examples of eating disorders. The Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM V) has a detailed categorization of eating disorders as well as treatment options[4].

The prevalence of ED is continously increasing worldwide and is found higher in females than in males. According to a study published in 2017, it has been shown that burden of eating disorders correlates with socioeconomic level and it is high income regions such as Australia, Western Europe and high-income North America. The burden of ED are still highest in the western countries. However, an increasing trend was observed in worldwide, especially in Asian regions[5]. Cultural change may be linked to greater sensitivity to eating disorders, according to historical and cross-cultural evidence[6]. Turkey is a developing country that culturally affected by both western and asian societies. Although studies on this subject are limited in Turkey, the prevalence of ED is based on a few studies. Unal et al., found the prevalence of ED 13% in Turkish high

school students[7]. Uzun et al. revealed a lower BN prevalence rate than the previous study, but a larger AN rate, with two AN and two BN cases in a population of 414 people[8]. In a cohort of 951 college students, Kugu et al. found that the prevalence of BN and binge eating disorder was 1.57 percent and 0.63 percent, respectively, but no instances of AN were found[9].

Anorexia nervosa was reported as 0.034 percent, bulimia nervosa was 0.79 percent, eating disorder not otherwise described was 1.51 percent, binge eating disorder was 0.99 percent, and any ED was 2.33 percent among high school students in a research done by Vardar and Erzengin in Turkey[10].

Adolescence is a difficult developmental period that includes the transition from childhood to adulthood and causes many physical, psychological, hormonal, and social changes. The increase in growth and development rate during this period increases the need for nutrients and energy[11]. Nutritional disorders can be harmful, especially during sensitive brain and physical development periods, and cause extreme and potentially permanent physical and psychological consequences. Defining the eating disorder in its early stages is difficult, especially because of the misleading nature of the disease, -as it does not show any symptoms in its appearance. In addition, lack of awareness that eating disorders may occur in children and men may lead to delay in orientation, diagnosis, and treatment[12]. For this reason, it is important to detect the presence of an eating disorder at an early stage with help of practical tools to provide the necessary intervention. Tools for screening eating disorders in children in our country are rare.

The current study's goal is to verify and define the factor structure of the children's version of the Eating Attitudes Test (ChEAT) among Turkish schoolchildren aged 10 to 14.

MATERIALS AND METHODS

Participants and procedures

A descriptive cross-sectional design was used for this investigation. The data collection was conducted at a single or double point in time during the school days and under the supervision of class teachers and researchers. In all, 350 kids (222 females and 130 boys) ranging in age from 10 to 14 years old took part in the study. The participants came from four elementary schools in Istanbul (two public and two private), and the data was collected between November 2019 and January 2020. After delivering invitations to suitable classes, informed consents that had been written by participants and parents were collected. The Medical Research Ethics Committee of Acıbadem University gave its approval to the Project under protocol number 2020-23/23. There were no monetary rewards for the participants.. Participants responded to questionnaire, which includes demographic information and ChEAT questions; anthropometric measurements were also taken by researchers.

Turkish adaptation protocol

To show the Turkish equivalence of the ChEAT scale, the original form was translated into Turkish by three faculty members in the nutrition and dietetics department and a native English speaker at the beginning of the study. A common form has been developed by bringing the translations together. The form, which was translated into Turkish, was translated back into English by two academicians in the department of nutrition and dietetics. After the research group decided that the content validity of the original form and the form that was re-translated into English was compatible with five experts in their field, a pilot study was conducted with 100 children between the ages of 10-14, who constitute approximately 30% of the study group. After the validity and reliability of the pilot study were done, the questionnaire was conducted to whole study participants. The same questions were asked to a segment that made up 30% of the sample again 4-6 weeks later for the construct validity. At the end of the study, explanatory and confirmatory factor analysis were applied.

Measures

Demographic information

Participants' demographic information including age, gender, medical history, etc. were taken by a self-reported questionnaire at the beginning of the study.

ChEAT

ChEAT is a self-administered questionnaire based on the Eating Attitudes Test (EAT-26) for adults that assesses eating attitudes and behaviors in children[13]. Maloney et al. developed the ChEAT questionnaire, which is a 26-item self-report questionnaire that measures disordered eating attitudes and behaviors using a 6-point Likert scale ranging from 1 (never) to 6 (always) (always). Its score runs from 0 to 78 points, with a higher score indicating a greater likelihood of ED. In the original form of ChEAT, there are three subscales: "Dieting," "Bulimia and Food Preoccupation," and "Oral Control," with 13, 6, and 7 items, respectively[14].

Anthropometric measurements

Researchers used a standardized methodology to measure the individuals' weight and height. A portable electronic scale (Tanita SC 240) calibrated to 0.1 kg was used to measure weight. The competitors took off their shoes and bulky coats, among other things, before being weighed. A calibrated stadiometer was used to determine height (SECA 220). Hair ornaments were removed and subjects stood barefoot on the stadiometer with their heads positioned horizontally to assess height. Weight and height data were used to compute the body mass index (BMI), which was obtained using the formula weight (kg)/[height (m^2)]. The percentiles published by

the World Health Organization (WHO) for children and adolescents aged 5 to 19 were used to evaluate anthropometric measures.

Analytical Statistics

For categorical variables, frequencies and percentages were provided; for continuous variables, mean, standard deviation, median, and interquartile range (IQR) were provided. For construct validity, exploratory and confirmatory factor analyses were performed; for discriminant validity, item analysis and item discrimination index, also known as the lower-upper 27 percent group, were computed on 95+95=190 observations; and for reliability measurement, the Cronbach Alpha internal consistency coefficient was calculated. The KMO (Kaiser-Meyer-Olkin) sampling measure, Bartlett's Test of Sphericity, factor loadings for rotated component matrix using Principal Component Analysis (PCA) using Varimax rotation technique, and percentage of explained variance were produced as a result of the exploratory factor analysis. Standardized coefficient estimates, covariances of changes, and model fit indices were derived as a consequence of the confirmatory factor analysis. Maximum Likelihood was used as the estimate approach (ML). IBM SPSS Statistics for Windows (IBM Corp., Version 26.0) and the lavaan package (version 0.6-7) in R software were used for statistical analysis. The threshold of significance was set at 0.05.

RESULTS

In this study, totally 352 participants were involved; 222 (63.1%) of them were girls. The mean age of participant was 11.82 ±1.56 (min:10- max: 14 years-old).

Mean ChEAT scores were compared across genders and BMI categories as well.

The mean ChEAT score did not differ between genders (p=0.170), but did differ significantly across BMI groups (p 0.001): higher scores were associated with higher BMI values (Table 1).

Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) was constructed for 3, 4 and 5 dimensions and has been decided that the 4-dimensional structure is appropriate. Items 10, 5, 25, 19 and 15 were excluded from the scale one by one since factor loadings were close at least two dimensions. First dimension occurred with items 1, 2, 6, 7, 11, 12, 14, 16, 18, 22, 23, and 24; second dimension occurred with items 3, 4 and 21; third dimension occurred with items 8, 13 and 20; fourth dimension occurred with items 9 and 26. Then to get good fit indices in Confirmatory Factor Analysis (CFA) items 1, 2, 11, 14, 18 and 22 were excluded from first dimention.

Principal component extraction with varimax rotation was used to conduct a factor analysis. The Kaiser-Meyer-Olkin (KMO) value of 0.702, as well as the result of Bartlett's sphericity test (2 = 1404.435, df=105, p0.001), demonstrated sufficient sample adequacy and the model's suitability for factor analysis (Hair, et al, 2010; Tabachnick, & Fidell, 2013). The rotating factor loadings and % of explained variation for each dimension are shown in Table 1. The overall percentage of explained variation is 58.04 percent, and the minimum factor loading is 0.597.

Confirmatory Factor Analysis

Standardized estimates obtained confirmatory factor analysis are statistically significant as seen in Table 2 (p<0.001). The lowest R-square is 0.193 for item 16. The result of confirmatory factor analysis was well-fitted. Fit indices obtained by measurement model could accept (χ2 (df=80) = 145.99,

Table 1. Comparison of Children's Eating Attitudes Test (ChEAT) score by gender and body mass index (BMI) categories for all children

	Gender			BMI			
	Girls (n=222)	Boys (n=130)	*p*	Under weight (n=69)	Normal weight (n=175)	Overweight (n=108)	*p*
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	Mean±SD	
F1:Dieting	2,7±3,42	2,5±3,1	*0,271*	1.6±2,3	1,2±2,8	4,2±3,9	*<0,001*[a]
F2:Food preoccupation	0,1±0,6	0,1±0,5	*0,388*	0.0±0,0	0,1±0,7	0,1±0,6	*0.779*[a]
F3:Oral control	1,6±2,4	0,8±0,1,6	*<0,001*	1.1±1.9	1,0±1,9	1,9±2,6	*<0,001*[a]
F4: Purging	0,9±1,8	0,9±1,8	*0,573*	0,7±1,2	0,9±1,7	1,3±2,2	*0.024*[a]
Total	5,4±5,1	4,2±4,4	*0,170*	3,4±3,2	3,9±4,5	7,5±5,5	*<0,001*[a]

[a]Multiple comparison between overweight and other groups p < 0.001.

Table 2. Results of Scale Adaptation Procedure (n=352)

Factor	Item Analysis						EFA[a,b]	CFA[c,d]	R²
	Mean±SD	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Factpor Loadings	Std. Est.	
F1: Dieting									
CHEAT-17	0.17±0.57	2.719	11.644	0.531	0.346	0.715	0.702	0.598	0.358
CHEAT-23	0.28±0.71	2.611	10.939	0.551	0.379	0.703	0.673	0.688	0.474
CHEAT-7	0.31±0.78	2.580	10.820	0.511	0.291	0.709	0.671	0.53	0.28
CHEAT-12	0.9±1.21	1.989	8.906	0.509	0.290	0.718	0.650	0.631	0.398
CHEAT-16	0.26±0.67	2.631	11.556	0.445	0.245	0.724	0.625	0.439	0.193
CHEAT-6	0.75±1.13	2.136	9.611	0.451	0.231	0.730	0.603	0.479	0.23
CHEAT-24	0.22±0.65	2.670	11.709	0.423	0.220	0.728	0.597	0.482	0.232
Total of Factor1	2.61±3.31	Min=0 Max=17 Q1=0 Q3=4				CA=0.774	EV=19.75%		
F2: Food preoccupation									
CHEAT-3	0.47±0.94	0.489	1.225	0.541	0.318	0.461	0.824	0.71	0.504
CHEAT-21	0.2±0.63	0.750	1.932	0.511	0.284	0.527	0.761	0.73	0.533
CHEAT-4	0.28±0.74	0.670	1.885	0.390	0.153	0.649	0.684	0.466	0.217
Total of Factor2	0.95±1.8	Min=0 Max=9 Q1=0 Q3=1				CA=0.664	EV=12.42%		
F3: Oral control									
CHEAT-20	0.36±0.86	0.960	2.483	0.602	0.365	0.585	0.832	0.785	0.616
CHEAT-8	0.52±1	0.798	2.196	0.564	0.335	0.631	0.823	0.696	0.484
CHEAT-13	0.44±0.87	0.878	2.683	0.497	0.251	0.703	0.743	0.594	0.352
Total of Factor3	1.32±2.2	Min=0 Max=9 Q1=0 Q3=2				CA=0.731	EV=12.73%		
F4: Purging									
CHEAT-9	0.03±0.27	0.048	0.120	0.790	0.624	-	0.931	0.927	0.859
CHEAT-26	0.05±0.35	0.031	0.070	0.790	0.624	-	0.927	0.852	0.726
Total of Factor4	0.08±0.58	Min=0 Max=6 Q1=0 Q3=0				CA=0.883	EV=13.15%		
Total of Scale	4.96±4.9	Min=0 Max=28 Q1=1 Q3=8				CA=0.724	EV=58.04%		

a Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization (in 5 iteration).
b KMO=0.702 and Bartlett's Test of Sphericity: $\chi2=1404.435$, df=105; p<0.001.
c Estimator: Maximum Likelihood; Fit-statistics: ¬ $\chi2$ (df=80) = 145.99, p < 0.001; $\chi2$/df=1.825; RMSEA = 0.048; SRMR=0.047; NFI = 0.898; NNFI = 0.935; CFI = 0.950; GFI = 0.948.
d Covariance Estimation of Model Modification between Cheat17 and Cheat23 is equal 0.048 (SE=0.02, p=0.015); between Cheat7 and Cheat16 is equal 0.078 (SE=0.023, p<0.001); between Cheat16 and Cheat24 is equal 0.055 (SE=0.02, p=0.006);between Cheat7 and Cheat6 is equal 0.096 (SE=0.04, p=0.016).
SD: Standard Deviation; EFA: Exploratory Factor Analysis; CFA: Cofirmatory Factor Analysis; Std. Est= Standardized Factor Loadings; EV: Percentage of Explained Variance; CA:Cronbach's Alpha Based on Standardized Items.

$p < 0.001$; $\chi 2/df=1.825$; RMSEA = 0.048; SRMR=0.047; NFI = 0.898; NNFI = 0.935; CFI = 0.950; GFI = 0.948; n = 352). Also some modifications were done. Covariance estimations of model modification between Cheat17 and Cheat23 is equal 0.048 (SE=0.02, p=0.015); between Cheat7 and Cheat16 is equal 0.078 (SE=0.023, p<0.001); between Cheat16 and Cheat24 is equal 0.055 (SE=0.02, p=0.006); between Cheat7 and Cheat6 is equal 0.096 (SE=0.04, p=0.016).

Reliability

Cronbach's alpha coefficients for the entire scale and four subscales were calculated separately. Table 2 shows the alpha values for the overall scale (15 items) and the CHEAT subscales for Factor1 (7 items), Factor2 (3 items), Factor3 (3 items), and Factor4 (2 items). The scale's Cronbach's alpha coefficients exceed the minimal internal consistency criteria of 0.7021.The reliability coefficient of Factor 2 is less than 0.70, despite the fact that the Cronbach's alpha coefficients of Factor 1, Factor 3, and Factor 4 surpass the minimal criteria of 0.70. However, the adjusted item-total subscale correlations for each subscale were all within the acceptable range of r = 0.30 to r = 0.70[22]. The CHEAT overall and subscale scores are, in the end, internally reliable.

Test-retest

The F1 subscale score has a test-retest reliability of 0.863, 0.846 for the F2 subscale score, 0.868 for the F3 subscale score, 0.876 for the F4 subscale score, and 0.986 for the ChEAT total score.

DISCUSSION

This study examines the validity of the ChEAT questionnaire in a representative sample of Turkish young adolescents. In our investigation, the ChEAT version included fewer items than the original version. Although the original Maloney et al. ChEAT version recommended 25 items, we used the 26 item version[14]. Some phrases on the ChEAT, such as "binges" (Item 4), "vomit" (Items 9 and 26), and "rich new meals" (Items 9 and 26), were troublesome for the middle school girls in Smolak and Levine's study (Item 25). In the Portuguese and Finnish investigations, items 19 and 25 were likewise inverted on the scale. The component analysis indicated, however, that item 26 or 25 had a negative association, resulting in a low Cronbach's alpha. We evaluated the internal consistency of the original 26-item scale and observed eleven items (1 'I am scared about being overweight'), (2 'I stay away from eating when I am hungry'), (5 'I cut my food into small pieces'), (9 'I vomit after I have eaten'), (10 'I feel very guilty after eating'), (11 'I think a lot about wanting to be thinner'), (14 'I think a lot about having fat on my body'), (15 'I take longer than others to eat my meals'), (18 'I think that food controls my life'), (19 'I can show self-control around food'), (22 'I feel uncomfortable after eating sweets') and (25 'I enjoy trying new rich foods') having an inverse association with all other items, showing that the statements were semantically inverted, implying that these things were not clear to all children. The scale's reliability was enhanced by removing these eleven items. The CFA confirmed these findings, with the 15-item scale having a higher goodness-of-fit. Others have also proposed the removal of one or both of these items, in contrast to our findings resulting in improved consistency[14,19,20]. Our study four factors explained 58.04% of the variance. The scale's dependability was enhanced by removing these eleven items. The CFA confirmed these findings, with the 15-item scale having a higher goodness-of-fit. In contrast to our work, others have proposed excluding one or both of these items, resulting in greater consistency[14,19,20]. Four factors explained 58.04 percent of the variation in our research. Previous research found this value to be greater[14,21,22,23]. Smolak and Levine indicated that the internal reliability (α=0.724) and the test-retest reliability coefficient (α=0.986) were higher that of the original version, and the ChEAT Spanish version[14,18,21]. The confirmatory factor analysis confirmed these findings, with the 15-item scale having a higher goodness-of-fit. In contrast to earlier research, it has also been proposed that one or more items be excluded[14,18,20,22,23]. Our exploratory factor analysis identified four factors or subscales that represent important attitudes and behaviors: "F1:Dieting," "F2: Food preoccupation," "F3:Oral control," and "F4:Purging." In the CFA, the factor structure was confirmed. In the four-factor model, the factor loadings for each item ranged from moderate to strong (0.597–0.931). Previous study has discovered that the average number of variables is four or five, which is consistent with our findings[20,23,24]. Several prior research used factor analysis to discover a component that indicated cleansing acts or beliefs. Although it was associated to behaviors related to controlling the amount of food consumed, purging ('I vomit after I eat' and 'I feel the need to vomit after a meal') did not stand out as an independent factor in our study[20,24].

Previous research has found higher scores on the ChEAT questionnaire and other measures of eating pathology in overweight children compared to normal weight children[33,34] and other measures of eating pathology in overweight children compared to normal weight children[25,27]. ChEAT total scores had strong internal consistency, comparable to other studies, indicating that the total score can be used to identify disordered eating attitudes in overweight children. Obese children are more likely to have disordered eating symptoms than normal weight children, according to previous research, and our findings of overweight children having higher ChEAT scores than normal weight children are consistent with these finding[27]. We also looked at gender variations in ChEAT scores and found no differences, which is consistent with earlier studies[21,22].Other studies have revealed that disordered eating symptoms are more prevalent in girls than in boys[28,29],

however this gender difference is likely to develop around the age of 13[30,31].

Participants' mean ChEAT scores were lower in our study than in some prior investigations[22,23,31], but also higher than in some others[20]. Our participants resided in a big city's urban regions. As a result, we anticipated better average scores. Previous research has found that average ChEAT scores in major cities are higher than in small and medium-sized cities, presumably due to larger cities' increased sensitivity to social pressure and media impact[32]. By the way, the disparities in our study's results might be attributed to social and cultural variations in our nation. The incidence of disordered eating symptoms has been linked to socioeconomic level[33], which might explain the low mean scores in our study. Because our individuals came from both private and public schools, the socioeconomic discrepancies may be explained. However, there was no information on the socioeconomic condition of the parents.

This research has a number of limitations. There may be some bias as a result of the low participation rate. Participants are more likely than non-participants to be health-conscious, which might explain the low overall mean ChEAT scores. Furthermore, the research relies on self-report evaluation questionnaires. Such measures aren't appropriate for assessing eating disorder characteristics since they tend to exaggerate psychopathology[34]. Despite the fact that all of the instrument's components were translated to reach conceptual equivalence in Turkish, the instrument's utility may be limited by minor linguistic and conceptual misunderstandings that were not apparent during translation. The measurements appear to have good psychometric characteristics and are valid within reasonable limitations.

The findings of this study have immediate consequences for diagnosis, prevention, and cross-cultural research in Turkey. Our country's health-care experts should devote more time and resources to the treatment of children. Studies examining eating patterns and behavior in developing nations such as Turkey might greatly advance our understanding of eating disorders and confirm the growing consensus that eating disorders are becoming a worldwide problem.

CONCLUSION

In conclusion, we employed a large enough sample size to investigate the ChEAT's consistency and reliability among Turkish children. The Turkish version of the ChEAT is a reliable and useful psychometric tool for assessing and triaging children with problematic eating habits. The ChEAT questionnaire is a reliable and useful tool for evaluating eating attitudes and habits among Turkish children aged 10 to 14. For future Turkish children study, we advocate using a 15-item ChEAT. This reduced version, we hope, will be more accessible and understandable to children in this age group.

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