

Analysis of the EAT-26 in a non-clinical sample

Radosław Rogoza, Anna Brytek-Matera, David M. Garner

Summary

The Eating Attitudes Test (EAT) is one of the most commonly used measures of abnormal eating habits; however, it has been criticized for its unstable factorial structure. Different studies proposed different solutions, but as yet there is no consensus whether the three-, five- or seven-factor solution is appropriate. We examined the cues provided by previous studies that investigated the EAT structure, and tested our expectations on a non-clinical group of 617 women. Based on bi-factor confirmatory factor analysis, we demonstrated that the EAT measures general eating pathology as well as more specific factors, such as 'Social pressure', 'Food awareness', 'Food preoccupation' and 'Purging behaviors'. Among distinguished specific factors, 'Social pressure' seems to be a promising scale to be used for screening purposes. The 'Food awareness' factor could be interpreted in terms of orthorexia nervosa; however, further evidence is required to support this conclusion. We also provided evidence that 'Bulimia' and 'Food preoccupation' factors should be maintained within the EAT-26 as important behavioral aspects of eating pathology. These results shed new light on this measure and provide the basis for a discussion of its psychometric issues.

EAT-26 structure/EAT-26 assessment

It is well known that eating disorders (EDs) are prevalent and constitute significant health problems among young women [1]. There is evidence that effective eating disorder treatment does exist; however, findings from community studies indicate that only a minority of patients are in treatment [2]. This is a factor leading researchers to employ various screening strategies in order to estimate the prevalence of eating disorders as well as to detect cases for the purpose of earlier interventions [3]. One of the most widely used screening measures for eating disorders is the abbreviated version of the Eating Attitudes Test – EAT-26 [4]. Three factors were distinguished: dieting, bulimia and food preoccupation, and oral control. Following the devel-

opment of the EAT-26, screening studies of abnormal eating habits have proliferated [5], and this has raised questions regarding its psychometric properties.

Although many studies of the psychometric properties of the EAT-26 exist, researchers have not been able to reach an agreement concerning its factor structure. Therefore, different versions of the EAT exist in the literature: comprising three factors [6–8], four factors [9–11], five factors [12,13] or seven factors [14]. Second, researchers often encounter items that do not load on any factor [7,8], items that cross-load on other scales [13], or items that weave between scales [10]. Third, the intercorrelations between distinguished factors are extremely high [11], which could be interpreted in terms of a general abnormal eating habits factor whose reliability estimates have been reported in numerous studies [15]. Failure in replication of the factor structure may be the result of sample selection, since the EAT was originally developed on a clinical sam-

Radosław Rogoza¹, Anna Brytek-Matera², David M. Garner³:

¹Cardinal Stefan Wyszyński University in Warsaw; ²SWPS University of Social Sciences and Humanities, Faculty in Katowice; ³River Centre Clinic, Sylvania, Ohio, USA

Correspondence address: rogoza.radoslaw@gmail.com

ple. In non-clinical samples, the EAT items are of limited relevance to most individuals, which results in negatively skewed item scores. Although the interpretation of the factor structure is not without merit, the inherent differences between clinical and non-clinical samples must be taken into account.

Despite the fact that researchers using both exploratory [10,14] and confirmatory [8,11] factor analyses have reported different factorial structures of the EAT-26, several repeating patterns have been observed. First, the same three items ('Feel that others would prefer if I ate more', 'Other people think that I am too thin', and 'Feel that others pressure me to eat') are commonly grouped into factors labeled 'Perceived social pressure to eat' [12,14], 'Others' perceptions' [13], 'Important others' [7], or simply 'Social pressure' [6,9]. Second, some items ('Aware of the calorie content of foods that I eat', 'Particularly avoid food with a high carbohydrate content', 'Avoid foods with sugar in them', and 'Eat diet foods') are either grouped into an independent factor labeled 'Awareness of food content' [10,11] or are part of the 'Dieting factor' [6,7,9,13]. Third, the 'Food preoccupation' factor is separated from the 'Bulimia factor' [10,13,14]; however, the items that comprise these factors vary from study to study [7,9]. This may be due to the non-clinical character of the sample, since two out of three items from the bulimia scale concern purging behaviors that are very uncommon in non-clinical population, while the third item concerns binge eating. Despite the fact that both binge eating and purging are the core elements of bulimia nervosa, in non-clinical population they are likely to occur in separation due to behavioral similarity.

Finally, high intercorrelations between factors and high internal consistency of total scores suggest the existence of a general factor influencing all items [5,10,11]. In summary, the EAT-26 suffers from various structural problems and to date, no studies have been able to untie this Gordian knot.

CURRENT STUDY

Based on the literature review, we formulated three hypotheses: (1) that a general factor repre-

senting a tendency towards an ED that influences all of the items will emerge; (2) that two specific factors concerning social pressure and food awareness will be distinguished; and (3) that the 'Food preoccupation' and 'Bulimia' factors are related; however, it is possible to distinguish between them as separate factors. As our sample is non-clinical, we hypothesize that only two items concerning purging behaviors will group into a specific factor.

In order to verify our hypotheses, we used bi-factor confirmatory factor analysis (bi-CFA). The bi-factor is hypothesized to account for the commonality of items in the measure, while grouping factors accounts for a unique influence of specific domains. Therefore, in bi-CFA each item is allowed to load onto bi-factor and simultaneously items are assigned and allowed to load only on hypothesized grouping factors [16].

PARTICIPANTS

The study was conducted in a non-clinical sample of $N=617$ female high school and university students, and the data were collected in three major Polish cities. We decided to assess only females because most studies concerning the structure of the EAT-26 have reported results in this fashion [10]. The average age of the non-clinical study group was 22.46 years ($SD=3.85$). The average body mass index (BMI) was within the normal range ($M=21.10$ kg/m^2 ; $SD=3.24$). All participants gave verbal consent and were informed that the study was anonymous.

RESULTS

The bi-CFA was performed in Mplus version 7.2 [17] using maximum likelihood estimation with scaled-shifted correction. According to the repeating patterns found in literature review, we tested two bi-factor models that comprised: 13 items measuring four distinct eating pathology domains and an additional general factor influencing all items (Model 1) and an abbreviated version comprising only 13 items (Model 2). The items, grouped into hypothesized factors, are presented in Table 1.

Table 1. 13 selected items for bi-factor confirmatory factor analysis

Original number	Content	Hypothesized factor
8	Feel that others would prefer if I ate more	Social pressure
13	Other people think that I am too thin	
20	Feel that others pressure me to eat	
6	Aware of the calorie content of foods that I eat	Food awareness
7	Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)	
16	Avoid foods with sugar in them	
17	Eat diet foods	
9	Vomit after I have eaten	Purging behaviors
25	Have the impulse to vomit after meals	
3	Find myself preoccupied with food	Food preoccupation
4	Have gone on eating binges where I feel that I may not be able to stop	
18	Feel that food controls my life	
21	Give too much time and thought to food	

Since we hypothesize that the ‘Purging behaviors’ and ‘Food preoccupation’ scales are related, but possible to differentiate, we allowed those factors to co-vary. In model fit assessment we relied on the recommendations of Hu & Bentler [18]. Model 1 was at the boundary of good model fit ($\chi^2_{(285)}=850.90; p=0.000$; com-

parative fit index (CFI) 0.877; root mean square error of approximation (RMSEA) 0.057 (90%CI 0.052–0.061); $p=0.006$). To assess the hypothesized structure in more detail, we analyzed Model 2, whose standardized factor loadings and reliability estimates are presented in Figure 1.

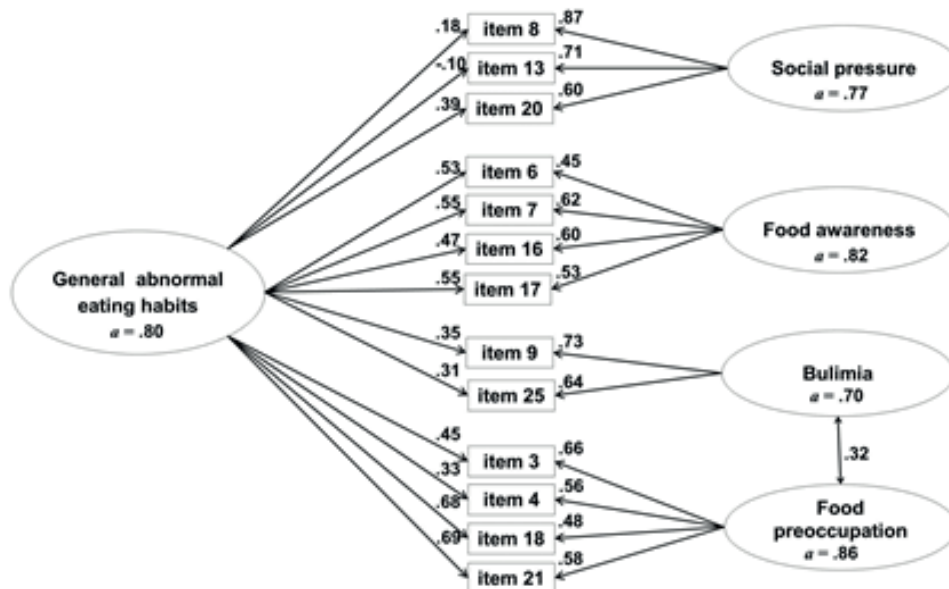


Figure 1. The reliability and standardized factor loadings the from bi-factor confirmatory factor analysis model of the Eating Attitudes Test (EAT-26).

The model's fit to the data was excellent ($\chi^2_{(51)}=107.89$; $p=0.001$; CFI 0.972; Tucker-Lewis index (TLI) 0.957; RMSEA 0.042 (90%CI 0.031–0.054); $p=0.861$) and all of the factors were reliable. All items with the exception of item 13 significantly loaded the bi-factor, which confirms the bi-factorial structure of the measure. Additionally, specific factor loadings were strong, which confirms that specific factors capture the unique domains of eating pathology.

DISCUSSION

Despite the fact that the EAT-26 is one of the most popular measures of abnormal eating habits, its factorial structure is questionable, particularly in non-clinical samples. In the current study, we attempted to clarify the existing confusion about its structure by examining the bi-CFA models.

First, we verified that, alongside specific factors, a general tendency towards an ED factor exists. Intercorrelations between the EAT-26 factors in other studies were moderate or strong [10,11]. Therefore, we concluded that a general tendency towards an ED factor is responsible for most of the commonalities between items observed in other studies [6].

Second, as predicted by theory, we replicated factors of 'Social pressure' and 'Food awareness'. Social pressure is an important risk factor for developing an eating disorder [19]; therefore, differentiation of this factor has broad practical applications for screening purposes. The 'Food awareness' factor concerns behaviors representing healthy eating. The meaning of this factor could be explained in terms of orthorexia nervosa – a fixation on eating healthy food [20], which is often present in patients with EDs [21,22]; however, further research is necessary to confirm this hypothesis.

Third, we verified that although 'Purging behaviors' and 'Food preoccupation' factors are related, they divide into two separate factors. In most studies, items concerning purging behaviors are excluded from the questionnaire [10]; however, they capture important behavioral aspects of eating pathology, especially in non-clinical population. Given that only two items comprise the 'Purging behaviors' factor, it should be used for screening purposes only. Items in the 'Food preoccupation' scale include binge eating,

loss of control over eating and subordination of thoughts and action to food; therefore, this factor could be used for screening purposes as an indicator of binge eating disorder.

To conclude, we verified the existence of a general abnormal eating habits factor as well as some specific factors that assess different eating attitude domains in a non-clinical population. The EAT could be especially useful for screening purposes because it captures specific elements of the most common EDs and is quick and easy to administer. It must be emphasized that factors do not yield a diagnosis but could serve as a cue for further investigation. Future directions should include an exploration of the bi-factorial structure of the EAT-26 in a clinical sample, and an assessment of the specific factors' validity with external measures.

REFERENCES

1. Hoek H. Incidence, prevalence and mortality of anorexia nervosa and other eating disorders. *Curr Opin Psychiatry*. 2006; 19(4): 389–394.
2. Mond J, Hay P, Rodgers B, Owen C. Health service utilization for eating disorders: Findings from a community-based study. *Int J Eat Disord*. 2007; 40(5): 399–408.
3. Austin S, Ziyadeh N, Forman S, Prokop L, Keliher A, Jacobs D. Screening high school students for eating disorders: results of a national initiative. *Prevent Chronic Dis*. 2008; 5(4): A114.
4. Garner D, Olmsted M, Bohr Y, Garfinkel P. The Eating Attitudes Test: psychometric features and clinical correlates. *Psychol Med*. 1982; 12(04): 871.
5. Garfinkel P, Newman A. The Eating Attitudes Test: twenty-five years later. *Eat Weight Disord*. 2001; 6(1): 1–21.
6. Ambrosi-Randić N, Pokrajac-Bulian A. Psychometric properties of the Eating Attitudes Test and Children's Eating Attitudes Test in Croatia. *Eat Weight Disord*. 2005; 10(4): e76–e82.
7. Douka A, Grammatopoulou E, Skordilis E, Koutsouki D. Factor analysis and cut-off score of the 26-item eating attitudes test in a Greek sample. *J Biol Exercise*. 2009; 5(1).
8. Engelsen B, Hagtvet K. The dimensionality of the 12-item version of the Eating Attitudes Test. Confirmatory factor analyses. *Scand J Psychol*. 1999; 40(4): 293–300.
9. Choudry I, Mumford D. A pilot study of eating disorders in Mirpur (Pakistan) using an Urdu version of the eating attitudes test. *Int J Eat Disord*. 1992; 11(3): 243–251.
10. Koslowsky M, Scheinberg Z, Bleich A, Mark M, Apter A, Danon Y, et al. The factor structure and criterion validity of the short form of the Eating Attitudes Test. *J Personal Assess*. 1992; 58(1): 27–35.

11. Ocker L, Lam E, Jensen B, Zhang J. Psychometric properties of the Eating Attitudes Test. Meas Phys Edu Exercise Sci. 2007; 11(1): 25–48.
12. Ahmadi S, Moloodi R, Zarbaksh M, Ghaderi A. Psychometric properties of the Eating Attitude Test–26 for female Iranian students. Eat Weight Disord. 2014; 19(2): 183–189.
13. Doninger G, Enders C, Burnett K. Validity evidence for Eating Attitudes Test scores in a sample of female college athletes. Meas Phys Edu Exercise Sci. 2005; 9(1): 35–49.
14. Park J, Beaudet M. Eating attitudes and their correlates among Canadian women concerned about their weight. Eur Eat Disord Rev. 2007; 15(4): 311–320.
15. Gleaves D, Pearson C, Ambwani S, Morey L. Measuring eating disorder attitudes and behaviors: a reliability generalization study. J Eat Disord. 2014; 2(1): 6.
16. Reise S, Moore T, Haviland M. Bifactor models and rotations: exploring the extent to which multidimensional data yield univocal scale scores. J Pers Assess. 2010; 92(6): 544–559.
17. Muthen L, Muthen B. Mplus User's Guide (7th edn). Los Angeles, CA: Muthén & Muthén; 2012.
18. Hu L, Bentler P. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equation Model. 1999; 6(1): 1–55.
19. Neumark-Sztainer D, Butler R, Palti H. Eating disturbances among adolescent girls: evaluation of a school-based primary prevention program. J Nutrition Edu. 1995; 27(1): 24–31.
20. Bratman S. Health food junkie. Yoga J. 1997; September/October: 42–50.
21. Segura-Garcia C, Ramacciotti C, Rania M, Aloï M, Caroleo M, Bruni A, et al. The prevalence of orthorexia nervosa among eating disorder patients after treatment. Eat Weight Disord. 2014; 20(2): 161–166.
22. Brytek-Matera A, Rogoza R, Gramaglia C, Zeppegno P. Predictors of orthorexic behaviours in patients with eating disorders: a preliminary study. BMC Psychiatry. 2015; 15(1).