Evaluating the psychometric properties of the mindful eating questionnaire: Turkish validity and reliability study

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Abstract

Mindful eating is a phenomenon to describe a nonjudgmental awareness of physical and emotional sensations while eating or being in a food-related environment. Nowadays, weight-related psychological and physiological health problems are gradually increasing. It is considered that mindful eating is one of the key components to struggle against dysfunctional eating patterns. The aim of the current study was to adapt the original five-factor structure of the MEQ and the abbreviated two-factor structure of the MEQ to Turkish culture and to determine its psychometric properties. The sample of the study was 362 university students aged between 18 and 27 ($M = 20.82$, $SD = 3.83$). Of the participants 249 (68.8%) were women, 110 (30.4%) were men, and three participants stated their sex as "other". Participants were asked to fill the Mindful Eating Questionnaire (MEQ), Eating Disorder Examination Questionnaire (EDE-Q), Intuitive Eating Scale (IES) and Brief Symptom Inventory (BSI). Results of confirmatory factor analysis showed an acceptable model fit for the correlated two-factor structure of the MEQ compared to its original five-factor structure. Internal consistency coefficient values for the overall MEQ and awareness and recognition subscales were .82, .71 and .82, respectively. The MEQ sub-scales' scores were found to be associated with EDE-Q, IES, and BSI scores, confirming the validity of the scale. The Turkish version of the two-factor MEQ could be evaluated as a valid and reliable measurement to assess mindful eating for further research and would also provide support to cross-cultural research.

Keywords Mindfulness · Mindful eating · Reliability · Validity · Cross-cultural utility

Mindfulness, an ancient concept originated from Buddhist practices, has recently started to receive attention in Western culture. The interest of psychology in mindfulness is probably associated with acknowledged benefits of mindfulness, which has been demonstrated to be linked with various aspects of psychological and physical well-being, such as reducing stress, depression, anxiety and substance use (Baer et al., 2006; Bowen et al., 2009; Davis & Hayes, 2011; Hofmann et al., 2010; Kabat-Zinn, 2003; Keng et al., 2011; Teasdale et al., 2000). Further, mindfulness is a learned skill,

possibly leading to many positive health outcomes including increased immune function and decreased anxiety and chronic pain (Davidson et al., 2003; Kabat-Zinn et al., 1992).

Mindfulness has multidimensional construct and several different definitions. According to Kabat-Zinn (2003), mindfulness is the awareness of the present moment experiences such as thoughts, feelings and bodily sensations, which emerges through paying attention intentionally and nonjudgmentally. Recent conceptualization of mindfulness has been focused on acceptance as well as awareness (Germer et al., 2005). Brown and Ryan (2003) have defined mindfulness as the open attention to present events and experiences and awareness of them. On the other hand, according to Segal et al.' (2002) conceptualization, mindfulness is the opposite of being on "automatic pilot" which is a state of mind where thoughts, emotions, and sensations are experienced without awareness. As such, the aim of mindfulness practices is to develop an attitude of mindfulness, put effort into generalizing mindful behaviors learned in the meditation and apply them to day-to-day activities (Hulbert-Williams

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et al., 2014). Formal and informal exercises can target mindfulness in daily life through awareness of walking, bathing, cleaning the house, eating, and driving (Baer & Krietemeyer, 2006; Goldstein, 2002). In parallel, according to Kabat-Zinn (1994), mindfulness can be assessed by measuring to what degree an individual can be mindful in point of daily activities. In this sense, eating can be considered as one of the significant daily activities.

Mindful eating is a nonjudgmental awareness of physical and emotional sensations while eating or in a food-related environment (Framson et al., 2009). When emerging awareness on one's eating pattern, this awareness can help to recognize and respond to satiety in an appropriate way, or to recognize but not respond to inappropriate cues for eating, possibly resulting in losing or maintaining weight (Framson et al., 2009). Mindful eating also includes making deliberate food choices, improving awareness of internal cues related to food intake, attending to physical versus psychological cues to eat, and responding to these cues with an appropriate way (Kristeller & Wolever, 2010). Hirschmann and Zaphiropoulos (2012) has defined mindful eating as the connection between mind and body that permits awareness of what we are eating and how it makes us feel. According to Albers (2010), mindful eating is conceptualized as being aware in the present moment when one is eating, paying close attention to the physical and emotional sensations, and focusing on the process of eating but not focusing types of foods eaten. Accordingly, three basic steps about mindful eating involve noticing all of senses, tastes, smells, and textures to the food eaten; recognizing repetitive habits such as eating while multitasking and eating on autopilot without being aware consciously; and being aware of what triggers initiation and cessation of eating.

Although mindfulness is being helpful for dietary behavior changes (Mantzios & Wilson, 2014; Olson & Emery, 2015) and weight loss (Godsey, 2013; Mantzios & Wilson, 2015; Timmerman & Brown, 2012), a review suggested that mindfulness meditation has not consistently produced significant weight loss (Katterman et al., 2014). In addition, the second review investigating the effects of any form of mindfulness-based trainings on weight loss showed that they have no effects in adults with excessive weight (Ruffault et al., 2017). Results from another study has also demonstrated that people who have less awareness of their eating habits are generally more overweight, more anxious, have higher levels of negative affect and less control over their eating habits (Pintado-Cucarella & Rodríguez-Salgado, 2016). In relatively recent studies, lack of mindfulness was shown to be associated with distorted cognitions about eating, such as fear of weight gain, the importance of being thin/attractive to be socially accepted, and self-esteem based on controlled eating habits and weight gain (Masuda & Wendell, 2010) as

well as disordered eating behaviors (Lavender et al., 2009; Masuda et al., 2012).

On the other hand, mindful eating may be particularly effective in modifying the disrupted underlying process in food intake regulation (Finlayson & Dalton, 2012; Finlayson et al., 2007). In addition, enhancement of mindfulness has been associated with decreases in binge eating (Baer et al., 2005; Dalen et al., 2010; Godfrey et al., 2015; Kristeller et al., 2014; Smith et al., 2006), emotional and external eating (Kristeller & Wolever, 2010; O'Reilly et al., 2014). Studies have revealed a negative correlation between mindful eating and obesity (Framson et al., 2009; Hulbert-Williams et al., 2014; Kristal et al., 2005; Mantzios & Wilson, 2015). Furthermore, meditation practice and mindful eating skills reduced compulsive eating and depression symptoms, and improved self-regard in obese individuals (Kristeller, 2003). Moreover, some evidence indicates that mindfulness encourages healthier eating by helping to eat less impulsive, reduce calorie consumption, and select healthier snacks (Jordan et al., 2014).

Kristeller and Hallett (1999) reported significant increases in satiety awareness and decreases in levels of anxiety and depression among individuals with binge-eating disorder. Another study showed that mindfulness-based intervention resulted in reductions in body mass index (BMI) by reducing binge eating (Tapper et al., 2009). Similarly, more mindful individuals have reported that they consume smaller serving sizes of calorie-dense foods (Beshara et al., 2013). Moreover, studies also demonstrate that yoga and sport practice is highly related to mindful eating (Daubenmier, 2005; Kristal et al., 2005; McIver et al., 2009). One study which evaluated the effects of a multi-faceted 5-day yoga program on mindfulness, nutrition behaviors, physical activity, stress management and mood disturbance suggested significant improvement in all these outcomes after the program. Additionally, the changes in the outcome variables remained significant at the 3-month follow-up, except for physical activity and mood disturbance (Braun et al., 2012).

Taken together, it can be suggested that measuring the concept of mindful eating is of critical importance. Thus, continuous efforts to operationalize mindful eating as a psychological concept are also present. As definitions of mindfulness are different or include a variety of components, each measurement tools aiming to assess mindful eating have emphasized different dimensions. A number of self-report measurements have been developed for the assessment of mindful eating (Clementi et al., 2017; Framson et al., 2009; Hulbert-Williams et al., 2014). Psychometric properties of these self-report measures vary to the extent that conceptual approaches to mindful eating differ. For example, Mindful Eating Scale (MES) which targets to measure of eating-related mindfulness is a 4-point Likert-type scale (Hulbert-Williams et al., 2014). The MES has six subscales, namely

acceptance, awareness, non-reactivity, routine, act with awareness, and unstructured eating, with Cronbach's alpha coefficients ranging from .60 to 89. Another measurement tool developed by Framson et al. (2009) is Mindful Eating Questionnaire (MEQ). The MEQ is composed of 28 items rated on a Likert-type scale ranging from 1 (never/rarely) to 4 (usually/always), with higher scores indicating greater degrees of mindful eating (Framson et al., 2009). Exploratory factor analysis (EFA) resulted in five-factor structure, showing that these factors had good internal consistency reliabilities: awareness (7 items, $\alpha = .74$), disinhibition (8 items, $\alpha = .83$), emotional response (4 items, $\alpha = .71$), distraction (3 items, $\alpha = .64$), external cues (6 items, $\alpha = .70$) and overall MEQ (28 items, $\alpha = .64$). The MEQ has adequate criterion validity, with positive associations with yoga practice and negative associations with BMI. Moreover, the abbreviated version of the MEQ (Clementi et al., 2017) was developed, reducing the scale to 20 items. Both EFA and CFA supported a two-factor model including awareness and recognition of hunger and satiety cues, with adequate internal consistencies ($\alpha = .75$ and .83, respectively).

To sum up, it is observed that there has been no comprehensive instrument to measure the construct of mindful eating in Turkish. A valid and reliable measurement tool for evaluating mindful eating would contribute to investigate whether and how mindful eating is associated with healthful dietary behavior and physiological and psychological health outcomes in a cross-cultural perspective. The aim of the present study is to adapt, investigate its psychometric properties, and revalidate both the long and abbreviated versions of the MEQ (Clementi et al., 2017; Framson et al., 2009) among Turkish university students. Prior research has confirmed that both versions are a valid measure in assessing mindful eating. In the present study, to elucidate which version is more effective in terms of utility, functionality, and practice, we examined the factor structure by including both versions and comparing them with each other. Thus, this study will provide a reliable and valid measurement tool for future clinical and research studies which could be held in Turkey, and other countries in a cross-cultural way.

Method

Sample

The sample of the study consisted of 362 university students between the ages of 18 and 27 years ($M = 20.82$, $SD = 3.83$). Of the participants 249 (68.8%) were women, 110 (30.4%) were men, and three participants stated their sex as "other". Participants were sampled through convenience sampling technique, which has some advantages of accessibility, cheapness, efficiency, and simplicity in terms of data collection (Dörnyei, 2007; Etikan et al., 2016; Given, 2008). Thus, the sample was consisted of undergraduate students from different departments at various universities in Ankara. A summary of the descriptive statistics of the participants is presented Table 1.

Measures

Mindful Eating Questionnaire (MEQ) The MEQ (Framson et al., 2009) is a self-report questionnaire to measure the concept of non-judgmental awareness about physical and emotional sensations associated with eating. It is composed of 28 items rated on a Likert-type scale ranging from 1 (never/rarely) to 4 (usually/always), with its five subscales, namely awareness, disinhibition, emotional response, distraction, and external cues. The original study of the scale demonstrated that the MEQ had sound psychometric properties, with Cronbach's alpha coefficients in the .64–.83 range and significant relations with yoga practice and

Table 1 Descriptive Statistics

Variables	M	SD
Age	20.82	3.83
BMI	22.49	3.89
Gender	N	%
Female	249	68.8
Male	110	30.4
Other	3	.80
Yoga Practice		
Yes	170	47
No	192	53
Physical Activity (Min)		
None	82	22.7
1–29	44	12.2
30–59	49	13.5
60–89	42	11.6
90–119	33	9.1
120–149	24	6.6
150 and more	88	24.3
Going on a walk (Min)		
None	15	4.1
1–29	44	12.2
30–59	50	13.8
60–89	45	12.4
90–119	42	11.6
120–149	46	12.7
150 and more	120	33.1

M = Mean, SD = Standard Deviation, BMI = Body Mass Index, Min = Minute

BMI (Framson et al., 2009). Higher scores indicate greater degrees of mindful eating.

Translation of the MEQ After the permission to translate the MEQ was obtained from its original developers, two clinical psychologists who are experts in both Turkish and English, translated the questionnaire from original language to Turkish, independently. Then, in terms of grammar, language, and comprehensibility of the items (face validity), the adequateness of the both translations were evaluated by another four psychologists advanced in English. Based on their feedback, the Turkish version of the MEQ was finalized.

Eating Disorder Examination Questionnaire (EDE-Q) The EDEQ (Fairburn & Beglin, 1994) is a 36-item self-report questionnaire to measure symptom occurrence associated with eating disorder, with four subscales (i.e. restraint, eating concern, weight concern, shape concern). The items are rated on 7-point rating scale and scores of four or higher are considered to be in a clinical severity. Previous research suggested that the scale provides a good measure of eating disorder in clinical samples (Fairburn & Beglin, 1994; Mond et al., 2004), with the evidence of acceptable test-retest reliability (Luce & Crowther, 1999; Mond et al., 2004). In the Turkish version of the EDE-Q, the items were categorized into four factors as in its original version and the scale was a valid and reliable measure with Cronbach's alpha coefficient of .93 for the overall EDEQ and in the range .63–.86 for the subscales (Yucel et al., 2011). Higher scores on the questionnaire indicate greater symptom severity of eating disorder. In this study, total BSI score was used and Cronbach's alpha coefficient for this score was .91.

Intuitive Eating Scale (IES) The IES (Tylka & Kroon Van Diest, 2013) is a 23-item self-report measure, rated on a 5-point Likert type scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The scale has four dimensions: eating for physical reasons, unconditional permission, reliance on hunger and satiety, and body-food choice congruence, with a total intuitive eating score. The original version of the scale was found to be valid and reliable among male and female college students, indicating evidence of internal consistency reliability in the range between .81 and .93 (Tylka & Kroon Van Diest, 2013). The Turkish version of the scale has confirmed a 23-item structure and four factors as in the originals study with Cronbach's alpha coefficient of .88 for the overall scale (Bas et al., 2017). Higher scores indicate higher levels of eating or its dimensions. In this study, total IES score was used and Cronbach's alpha coefficient for this score was .67.

Brief Symptom Inventory The BSI (Derogatis, 1993) is a 53-item self-reported inventory (also known brief form of Symptom Checklist [SCL-90]) to assess psychological symptom severity of individuals. The items are answered on a Likert-type scale ranging from 1 (not at all) to 5 (extremely). In the Turkish version of the BSI, five subscales or symptom dimensions have defined: depression, anxiety, negative self, somatization, and hostility (Durak-Batıgün et al., 2002; Şahin & Durak, 1994). Higher scores indicate greater increases in the level of psychological symptoms. Previous evidence suggests that the BSI has yielded good validity and reliability in a sample of university students, with Cronbach's alpha coefficients ranging from .75 to .88 (Şahin & Durak, 1994). In this study, total BSI score was used to measure psychological symptom severity of the participants and Cronbach's alpha coefficient for this score was found to be .96.

Procedure

The current study was approved by Ankara University Ethics Committee (Registration No: 85434274–050.04.04/36590). Informed consent involving the aim of the study was obtained from all individual participants included in the study. Those who voluntarily to participate in the study were told that they were free to leave study any time and were not given any payment for your participation. Data collection was conducted via internet based survey from different departments at various universities in Ankara and it took about 20 min to complete the questionnaires. Data collection was terminated when 362 participants were reached within the specified time interval for data collection, taking into account the sample size calculation based on criteria of the total sample size and a ratio of the number of cases to the number of variables (Kline, 2011; Tabachnick & Fidell, 2001). According to those criteria, the minimum sample size should be 300 and above in total or 5–15 participants per variable (Kline, 2011; Tabachnick & Fidell, 2001).

Statistical Analyses

First, a confirmatory factor analysis (CFA) was employed in order to test psychometric properties of the MEQ using Analysis of Moment Structures (AMOS) 22 statistical packaged software. All items and scores of the MEQ and the other measurements were within the acceptable range of normality (Tabachnick & Fidell, 2001). To test the factor structure of the MEQ, CFA was conducted with robust maximum likelihood estimation (which is more appropriate for the ordinal data; Li, 2016) and covariance matrices. In the analysis, the following criteria were used for acceptable model fit: Chi-square (χ^2)/degrees of freedom (*df*) lower than 3, Comparative Fit Index (CFI) and Goodness of Fit Index (GFI) greater than or equal to .90 and Root Mean Square Error of Approximation (RMSEA) of .08 or less (Byrne, 2016; Hu & Bentler, 1999; Kelloway, 1998;

Kline, 2011; Shevlin & Miles, 1998). In order to compare the nested models, chi-square difference test was used (Steiger et al., 1985; Tabachnick & Fidell, 2001). Second, internal consistency reliability coefficients of the MEQ total score and its subscales were calculated to assess reliability. Finally, a correlation analysis was conducted to investigate relationships between MEQ scores and other measures of eating patterns and psychological symptoms.

Results

Factor Structure of the MEQ

The original five-factor structure (i.e. awareness, distraction, disinhibition, emotional, and external/28 items; Framson et al., 2009) and the two-factor structure (i.e. awareness, recognition/20 items; Clementi et al., 2017) of the MEQ were tested. For the five-factor structure, CFA results indicated that the initial model did not fit the data well, $\chi^2(df = 340, N = 359) = 1209.232$, $\chi^2/df = 3.55$, CFI = .75, GFI = .79, RMSEA = .08. Items 14 and 25 were excluded from the model because of low factor loadings (< 0.30). After dropping two items, a better five-factor model (26 items) was obtained, $\chi^2(df = 289, N = 359) = 1025.044$, $\chi^2/df = 3.55$, CFI = .77, GFI = .81, RMSEA = .08. Based on the modification indices, error variances of the items under the same factor were correlated. χ^2 difference test showed that four correlated errors (items 2–12, 5–11, 5–15, and 17–27) made significant difference in the model (p for $\Delta\chi^2 < .05$), leading to a better fit to the data, $\chi^2(df = 285, N = 359) = 815.168$, $\chi^2/df = 2.86$, CFI = .84, GFI = .84, RMSEA = .07.

As for the two-factor structure of the MEQ, CFA results indicated that the initial model did not fit the data as well, $\chi^2(df = 169, N = 359) = 859.589$, $\chi^2/df = 5.08$, CFI = .71, GFI = .77, RMSEA = .11. Items 10, 14, 16, 21, and 22 were excluded from the model because of low factor loadings (< 0.30). After dropping five items, a better two-factor model (15 items) was obtained, $\chi^2(df = 89, N = 359) = 469.634$, $\chi^2/df = 5.27$, CFI = .81, GFI = .84, RMSEA = .11. Based on the modification indices, error variances of the items under the same factor were correlated. χ^2 difference test showed that three correlated errors (items 5–15, 12–20, and 2–3) made significant difference in the model (p for $\Delta\chi^2 < .05$), resulting in an excellent fit to the data, $\chi^2(df = 86, N = 359) = 259.165$, $\chi^2/df = 3.01$, CFI = .91, GFI = .91, RMSEA = .07. Factor loadings of the items for both five and two-factor structure of the scale are presented in Table 2. These results suggest that two-factor solution for the MEQ yielded more sound psychometric properties to measure patterns of mindful eating. The

subsequent analyses were conducted using the two-factor structure of the MEQ.

Reliability of the MEQ

Internal consistency coefficients (coefficient omega; Dunn et al., 2014; McDonald, 1999; Raykov, 2001) were calculated for total and subscale scores of the two-factor MEQ. Omega coefficients were found to be .82 for total score, .71 for awareness, and .82 for recognition. Further, the split-half reliability for the overall MEQ was calculated. Accordingly, Guttman split-half coefficient was .83.

Validity of the MEQ

Correlation coefficients between the MEQ sub-scales scores and EDE-Q, IES, and BSI scores were calculated to examine the construct validity. To take into consideration the effects of correlated errors identified in CFA, we tested a structural equation model in which all study variables are included (such as measurement model) and calculated the correlation coefficients between these variables in the model. The results of the correlation analysis can be seen in Table 3. These results suggest that the MEQ is a valid and reliable measure for assessing mindful eating and utilizing clinical purposes.

Discussion

The purpose of the present study was to investigate the psychometric properties of the original version of the MEQ and its abbreviated version among a Turkish sample. Our findings suggested that the original five-factor structure of the MEQ (i.e. awareness, distraction, disinhibition, emotional, and external/28 items; Framson et al., 2009) did not fit the data very well in our sample. This result may be explained by the fact that mindfulness is understood differently in both cultures; thus, items developed to measure mindful eating may not have achieved the goal in our sample. For example, considering the excluded items (item 14 "When I eat a big meal, I notice if it makes me feel heavy or sluggish" and item 25 "When I'm at a restaurant, I can tell when the portion I've been served is too large for me"), it is clear that these items are related to the portion of a meal and discomfort caused by a big meal. It could be concluded that the perception of portions or expressing that they are large may be different in Turkish and American cultures. Even when two items were omitted, the confirmatory factor analyses of five-factor MEQ did not yield sufficient results. On the other hand, the CFA showed an acceptable model fit for the correlated two-factor structure of the MEQ. The two-factor structure of the MEQ (i.e. awareness, recognition/20 items; Clementi et al., 2017) had more promising psychometric

Table 2 Factor Loadings of the five and two factor MEQ

	Two-factor		Five-factor				
	Awareness	Recognition	Awareness	Distraction	Disinhibition	Emotional	External
1. I eat so quickly that I don't taste what I'm eating.*	–	–	–	.28	–	–	–
2. When I eat at "all you can eat" buffets, I tend to overeat.	–	.62	–	–	.64	–	–
3. At a party where there is a lot of good food, I notice when it makes me want to eat more food than I should.	–	.67	–	–	–	–	.67
4. I recognize when food advertisements make me want to eat.	.51	–	–	–	–	–	.52
5. When a restaurant portion is too large, I stop eating when I'm full.	–	.34	–	–	.33	–	–
6. My thoughts tend to wander while I am eating.	–	–	–	.71	–	–	–
7. When I'm eating one of my favorite foods, I don't recognize when I've had enough.	–	.70	–	–	.71	–	–
8. I notice when just going into a movie theater makes me want to eat candy or popcorn.	–	–	–	–	–	–	.39
9. If it doesn't cost much more, I get the larger size food or drink regardless of how hungry I feel.	–	.55	–	–	.56	–	–
10. I notice when there are subtle flavors in the foods I eat.	–	–	−.54	–	–	–	–
11. If there are leftovers that I like, I take a second helping even though I'm full.	–	.68	–	–	.67	–	–
12. When eating a pleasant meal, I notice if it makes me feel relaxed.	.52	–	.62	–	–	–	–
13. I snack without noticing that I am eating.	–	.66	–	–	–	.71	–
14. When I eat a big meal, I notice if it makes me feel heavy or sluggish.	–	–	–	–	–	–	–
15. I stop eating when I'm full even when eating something I love.	–	.45	–	–	.47	–	–
16. I appreciate the way my food looks on my plate.	–	–	.52	–	–	–	–
17. When I'm feeling stressed at work, I'll go find something to eat.	–	–	–	–	–	.63	–
18. If there's good food at a party, I'll continue eating even after I'm full.	–	.83	–	–	.84	–	–
19. When I'm sad, I eat to feel better.	–	–	–	–	–	.64	–
20. I notice when foods and drinks are too sweet.	.31	–	.59	–	–	–	–
21. Before I eat I take a moment to appreciate the colors and smells of my food.	–	–	.45	–	–	–	–
22. I taste every bite of food that I eat.	–	–	.63	–	–	–	–
23. I recognize when I'm eating and not hungry.	.75	–	–	–	–	–	.74
24. I notice when I'm eating from a dish of candy just because it's there.	.62	–	–	–	–	–	.64
25. When I'm at a restaurant, I can tell when the portion I've been served is too large for me.	–	–	–	–	–	–	–
26. I notice when the food I eat affects my emotional state.	.32	–	.44	–	–	–	–
27. I have trouble not eating ice cream, cookies, or chips if they're around the house.	–	–	–	–	–	.59	–
28. I think about things I need to do while I am eating.	–	–	–	.51	–	–	–

Note: All factor loadings were statistically significant ($p < .001$)

*Although factor loading of item 1 was below .30, it was not excluded to avoid Heywood cases (see McDonald, 1985)

Table 3 Correlations between MEQ and EDE-Q, IES, and BSI Scores

	1	2	3	4	5
1. MEQ-Awareness	–				
2. MEQ-Recognition	−.93***	–			
3. EDE-Q	.51***	−.43***	–		
4. IES	−.50***	.43***	−.46***	–	
5. BSI	.38***	−.31***	.36***	−.32***	–

***p < .001. MEQ = Mindful Eating Questionnaire, EDE-Q = Eating Disorder Examination Questionnaire, IES = Intuitive Eating Scale, BSI = Brief Symptom Inventory

properties to measure patterns of mindful eating. In other words, the items were better distributed to two factors, and the mindful eating construct was better explained by these two sub-scales, compared to the five-factor structure of the MEQ. This may be explained by the fact that much more items with low factor loadings were eliminated. Thus, we decided to continue further analyses with the two-factor MEQ. After omitted five items (items 10, 14, 16, 21, and 22) which have low factor loadings (<.30), the results of the reliability analyses confirm the internal consistency of the two-factor MEQ among our sample. Nevertheless, internal consistencies of the MEQ (Cronbach's α = .81 for total score, .70 for awareness, and .66 for recognition) are considered moderately sufficient for research purposes. Future research should evaluate whether these items are also problematic in other populations.

Another explanation of our results may be related to the differences between mindfulness and mindful eating phenomenon. Hulbert-Williams et al. (2014) suggested that the MEQ does not seem to agree closely with standard definitions of mindfulness, such as that of Kabat-Zinn (1994), and bares the factor structure quite different from those seen in generic mindfulness measures. The MEQ includes a behavioral disinhibition subscale, but does not consist of an acceptance or non-judgement subscale (Hulbert-Williams et al., 2014). Similarly, it is stated that acceptance and non-reactivity central to most definitions of mindfulness (Bishop et al., 2004). But these subscales and related items with these subscales were omitted from the MEQ. Hence, it is necessary to add more inclusive items or to review the structure of the MEQ with more deterministic items. As two-factor version of the MEQ has more powerful psychometric properties compared to the five-factor version of the MEQ, it should be preferred to obtain more accurate results. In addition to this, although the two-factor MEQ have sufficient psychometric properties for validity, it should not be overlooked that using sub-scales separately may be more beneficial and accurate to interpret the findings rather than using the total score of the scale.

Convergent validity of the MEQ sub-scales were explored with the EDE-Q, IES and BSI. The awareness sub-scale of MEQ showed significant positive relation with EDE-Q, while the recognition sub-scale showed significant negative relation with EDE-Q. This result was partially consistent with previous study (Hulbert-Williams et al., 2014). In addition, the awareness sub-scale of MEQ showed significant positive relation with BSI and negative relation with IES. On the other hand, the recognition sub-scale of MEQ showed significant negative relation with BSI and positive relation with IES. One study found that mindful eating is not significantly associated with intuitive eating (Anderson et al., 2016). Thus, to investigate the relationship between the concepts of mindful eating and intuitive eating comprehensively, future research should be undertaken. Studies also demonstrated that individuals with anorexia nervosa show decreased interoceptive awareness (Fassino et al., 2004; Pollatos et al., 2008). According to another study, there is a negative relationship between mindful eating and binge eating (Pintado-Cucarella & Rodríguez-Salgado, 2016). Our findings are considered to be partially consistent with the earlier findings. From this point of view, when it comes to psychopathology and particularly eating disorders, recognition is likely a more decisive factor than awareness. Studies also have showed that mindfulness-based interventions for eating disorders increased awareness (Kristeller et al., 2006; Proulx, 2007). In order to clarify these contradictory results and provide further evidence of the relationship between symptoms of eating disorders and mindful eating, it is clear that there is a need for studies conducted in clinical samples, particularly including interventions. Further, the subscales of the two-factor MEQ were also found to be inter-correlated in negative direction. This finding is in line with the original validation study (Clementi et al., 2017). Taken together, these correlations between these scores reveal that the MEQ has sufficient validity.

Limitations and Suggestions for Future Research

The current study suggests the MEQ has the potential to be useful to measure mindful eating; however, it has several limitations to acknowledge. First, the sample was composed of university students -and the BMI of the sample is relatively low. Using such a specific population to validation of the instrument, and the age bracket of the norm population could hinder the instrument from being used with general population. It could be not to forget when using MEQ in a different population will call for revalidation. Therefore, the results may not be generalized to other populations. For example, it could be suggested that individuals who are regular practitioners of meditation or mindfulness exercises tend to respond and interpret questionnaire items differently compared to those without

experience in meditation (Belzer et al., 2013; Hulbert-Williams et al., 2014). However, Baer (2011) does not see this pattern as problematic. Although discussions have continued, future research should seek to validate the Turkish version of the MEQ and confirm the factor structure of the MEQ in different populations. As for sample limitations, it should also be kept in mind that the findings of this study were obtained from a non-clinical sample and the scale has not been studied on a clinical sample yet. Second, the study was conducted based on cross-sectional and correlational design, limiting the ability to draw any causal conclusions. Third, the limits of self-report measurements must also be considered. The MEQ was significantly associated with social desirability and it could cause biased answers. The current study is based merely on self-reports which may overstate the correlations due to shared method variance. To avoid limitations of using self-report scales, using daily diaries, experimental designs, and peer-report methodologies will further support the construct validity of the scale. Fourth, in terms of reliability of the questionnaire, lack of test-retest procedure could be evaluated as another limitation. Finally, we used modification indices to identify which error variances of the items under the same latent construct are related with each other, which may lead to a misspecified model, especially when there is no theoretically sound theory or theoretical justification (see Balsamo et al., 2015; Saggino et al., 2017; Silvia & MacCallum, 1988).

Consequently, besides limitations, the results indicated that the Turkish version of two-factor structure of the MEQ appears to be a valid and reliable measure of mindful eating construct. The two-factor MEQ is a valuable questionnaire to assess the capacity of mindful eating skills. Moreover, this two-factor MEQ offers a brief and user-friendly measurement tool, reflecting in the subscales awareness and recognition. The adaptation of the MEQ is intended to lead additional research on mindful eating, especially with regard to increasing weight-related psychological and physiological health problems, such as eating disorders and obesity. We also suggest that the MEQ may be a useful measure to identify adaptive mindful eating skills within eating behavior interventions. The present study also offers possibilities to conduct research examining the utility of the two-factor MEQ for testing cross-cultural hypotheses regarding mindful eating and its outcomes. Finally, translating the MEQ into other languages would increase the accessibility of the questionnaire.

Declarations

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