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The Meal Pattern Questionnaire: A psychometric evaluation using the Eating Disorder Examination

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ABSTRACT

Objective: Meal pattern is an important variable in both obesity treatment and treatment for eating disorders. Momentary assessment and eating diaries are highly valid measurement methods but often cumbersome and not always feasible to use in clinical practice. The aim of this study was to design and evaluate a self-report instrument for measuring meal patterns.
Method: The Pattern of eating item from the Eating Disorder Examination (EDE) interview was adapted to self-report format to follow the same overall structure as the Eating Disorder Examination Questionnaire. The new instrument was named the Meal Patterns Questionnaire (MPQ) and was compared with the EDE in a student sample ($n = 105$) and an obese sample ($n = 111$).
Results: The individual items of the MPQ and the EDE showed moderate to high correlations (*rho* = .63–89) in the two samples. Significant differences between the MPQ and EDE were only found for two items in the obese sample. The total scores correlated to a high degree (*rho* = .87/.74) in both samples and no significant differences were found in this variable.
Discussion: The MPQ can provide an overall picture of a person's eating patterns and is a valid way to collect data regarding meal patterns. The MPQ may be a useable tool in clinical practice and research studies when more extensive instruments cannot be used. Future studies should evaluate the MPQ in diverse cultural populations and with more ecological assessment methods.

1. Introduction

Meal pattern seems to have a general impact on health, weight gain and disordered eating (Nicklas, Baranowski, Cullen, & Berenson, 2001; Mattson, 2005). Both meal patterns and meal frequency are important factors in weight gain (Ma, Bertone, Stanek, et al., 2003) and in behavioral treatments of obesity (Bachman, Phelan, Wing, et al., 2011; Kulovitz, Kravitz, Mermier, et al., 2014). High meal frequency is associated with a lowered risk of developing obesity (Purslow, Sandhu, Forouhi, et al., 2008; Toschke, Thorsteinsdottir, & Kries, 2009) and experimental studies have further shown that increasing meal frequency may lead to weight loss (Palmer, Capra, & Baines, 2009). Observational studies suggest that breakfast is the meal most strongly correlated with weight, though more studies are needed (Szajewska & Ruszczyński, 2010). The underlying mechanisms are probably complex since eating more often is associated with both higher energy consumption and with lower weight (Purslow et al., 2008). While most interventions for weight loss focus on reductions in overall energy consumption, meal patterns are important for sustained weight loss in conventional obesity treatment (Elfhag & Rössner, 2005; Wing & Phelan, 2005) and after bariatric surgery (Mechanick et al., 2008). Interventions after surgery focusing on dietary control and establishing eating patterns show some promise to further increase the effect of bariatric surgery (Pontiroli, Fossati, Vedani, et al., 2007; Faria, de Oliveira, Lins, et al., 2010). In contrast, the major risk factor for inferior weight loss after surgery is disordered eating, characterized by recurrent binge eating and irregular eating intervals (Wimmelmann, Dela, & Mortensen, 2013). To establish regular eating is an important component in Cognitive Behavior Therapy for Bulimia Nervosa and Binge Eating Disorder (Fairburn, 2013; Murphy, Straebler, Cooper, et al., 2010). In such treatment, patients are encouraged to plan their meals each day and never to have longer intervals than four hours between meals (Masheb & Grilo, 2006).

Meal pattern is thus a variable that is important to assess in the general population, in the obese population and patients with eating disorders. Food diaries provide information about both food choices and meal patterns but are cumbersome to administer and there is no evaluated instrument that focuses on measuring meal patterns per se (Khani, Ye, Terry, & Wolk, 2004; Cade, Thompson, Burley, & Warm, 2002). For patients with eating disorders, the gold standard for assessment and measurement is the Eating Disorder Examination (EDE) (Cooper & Fairburn, 1987) and the shorter self-report version, the Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn & Beglin,

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1994). Overall, studies have shown that the two forms of assessment correlate to a high degree (Black & Wilson, 1996; Berg, Peterson, Frazier, & Crow, 2011). Unfortunately, the item regarding patterns of eating in the EDE was not included in the EDE-Q, and there is today no established self-report instrument to measure meal patterns (Berg et al., 2011). The aim of this study was to assess the validity of a new self-report questionnaire, The Meal Patterns Questionnaire (MPQ), based on the corresponding item from the EDE interview.

2. Methods

The Pattern of eating item from the EDE was transformed into a standalone questionnaire and tested in a student and an obese sample (Lindholm & Sewall, 2014). The study protocol was approved by the regional ethics committee.

2.1. Measurements

2.1.1. EDE interviews

To assess patterns of eating, interviews using only the EDE Patterns of eating item were conducted (Cooper & Fairburn, 1987). The EDE provides a score for each of six daily meals on a seven-point Likert scale between 0 and 6. The EDE has been evaluated in several studies and has shown adequate psychometric properties (Grilo, Masheb, & Wilson, 2001; Rizvi, Peterson, Crow, et al., 2000).

2.1.2. The Meal Pattern Questionnaire

The MPQ was designed to be as similar to the EDE-Q as possible. The result was a questionnaire with seven items, one for each meal or snack of the day plus nightly eating. Each item is scored on a seven point Likert scale from 0 to 6. Please see Appendix A for a full description of the final MPQ used in this study.

2.2. Participants and procedure

For the student sample, potential participants were informed about the study and written consent was obtained from those willing to participate. Of a total of 105 participants, a majority ($n = 72$, 69%) were women, the mean age was 24.9 ($SD = 5.0$) years and the mean BMI was 22.8 ($SD = 3.0$). Participants were asked to complete the MPQ and then EDE by blind interviewers and with an intermediate dummy task to counter carry over effects (Cade et al., 2002).

For the obesity sample, patients at an obesity clinic were informed about the study and written consent was obtained from all who agreed to participate. A total of 203 patients were approached and 111 (55%) chose to participate. Of these, 82 (74%) were women, their mean age was 40.6 ($SD = 12.5$) years, and the mean BMI was 41.5 ($SD = 7.9$). Participants were asked to first complete the MPQ and then the EDE by blind interviewers about an hour later the same day.

2.3. Analyses

The distributions of several of the items of the questionnaires were skewed and non-parametric statistics were therefore chosen. Internal consistency was not calculated for the MPQ since it was not hypothesized to measure a single construct. Correspondence between scores on the MPQ and the EDE was assessed with correlation analysis (Spearman's *rho*) while differences were analyzed with Wilcoxon Signed Rank Test. For all analyses, a $p < .05$ was considered significant. *r* was used as a measure of effect sizes with <0.3 = small, <0.5 = medium and >0.5 = large effect sizes. Bayes factor (BF) using the Jeffrey–Zellner–Siow g Prior and scaled $r = 0.5$ was calculated for each comparison (Rouder, Speckman, Sun, et al., 2009). A higher BF corresponds to a higher probability of H0 being true, meaning there is no difference between the measured variables. Conversely, lower BF corresponds to a higher probability of H1 being true, corresponding to a real difference between the variables. As a guideline, a BF between 3 and 10 is considered "substantial", and >10 is considered "strong" evidence for H0 while a BF between 0.3 and 0.1 is considered "substantial" and <0.1 is considered "strong" evidence for H1 (Wagenmakers, Wetzels, Borsboom, et al., 2011). The Bayes factor can be used as evidence for, and not only rejecting, hypotheses (Wetzels, Matzke, Lee, et al., 2011) and put emphasis on large effects rather than small significant differences between variables (Johnson, 2013).

3. Results

Breakfast and Evening meal (dinner) were the most frequently eaten meals in both samples, followed by lunch. Nightly eating was the least common form of eating and only reported by 6 (6%) participants in the student sample and 9 (8%) in the obese sample. Median and mode values for each item are presented in Table 1.

The correlation between items on the MPQ and EDE ranged from *rho* = .64 to 89 across both samples, see Table 2. The total score correlated with *rho* = .87, $p < .01$, 95% *CI* = .82–.91 in the normal sample and *rho* = 74, $p < .01$, 95% *CI* = .64–.81, in the obese sample. The correlation for the total score was significantly higher ($p < .01$) in the student sample. No significant differences between item scores or the total score on the two measurements were found in the student sample. In the obese sample, the score of two items, Mid-morning snack ($Z = 2.86$, $p < .01$, $r = 0.20$) and Evening meal ($Z = 2.79$, $p < .01$, $r = 0.19$), were significantly different between the two measurements. The Bayes factor ranged from 1.22 to 6.65 in the student sample, thus indicating substantial support (BF > 3) for the H0 that the scores were not different in the two measurements for three of the items and the total score. In the obese sample, the analyses showed substantial support (BF < .3) for a difference in the scores for the Mid-morning snack and Evening meal while the evidence for all other items were in the opposite direction with again substantial support for H0 concerning the total score.

4. Discussion

This study provides preliminary support for adequate criterion validity between the MPQ and the EDE and that the MPQ can be used as an overall measure of eating patterns. The correlation on individual items ranged from *rho* = .63 to *rho* = .89 in the obese sample, which is similar to the correlations found in previous studies of the EDE-Q and the EDE (Black & Wilson, 1996; Berg et al., 2011; Grilo et al., 2001). It seems from these studies that purely behavioral variables, such as eating behavior or throwing up, can be measured with higher reliability than psychological variables. This would speak for the reliability of the MPQ, a questionnaire that focuses solely on behaviors.

The reliability of the MPQ seems to be on par, or perhaps slightly higher, than what is typically seen for food frequency questionnaires (Cade, Burley, Warm, Thompson, & Margetts, 2004). Unfortunately, there have been concerns about the validity of the nutritional data collected from food frequency questionnaires (Kristal, Peters, & Potter, 2005) and whether food frequency questionnaires could be used to reliably measure meal patterns has not been evaluated. Digital Momentary Assessment is a measurement method that shows promise as measurement of meal patterns and eating behavior but it is still somewhat unpractical in clinical settings (Glanz & Murphy, 2007; Martin et al., 2012). Like food frequency questionnaires, food diaries often focus on dietary intake rather than meal pattern and the MPQ may thus be used as a complement to these or to the EDE-Q.

While the correspondence between total scores on the MPQ and the EDE was high, the reliability of individual items varied. The evidence for real differences between mean values was assessed as substantial for Mid-morning snacks and Evening meal in the obese sample but not for any of the other meals or the total score. The reasons for these differences were not investigated further but scrutinizing the median values indicated two different mechanisms at work. The values of