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Intuitive eating in light of other eating styles and motives: experiences with construct validity and the Hungarian adaptation of the Intuitive Eating Scale-2

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Intuitive eating in light of other eating styles and motives: experiences with construct validity and the Hungarian adaptation of the Intuitive Eating Scale-2

Abstract

Intuitive eating (IE), an adaptive eating approach, has been identified as a plausible positive determinant of physical and mental well-being. This cross-sectional survey study aimed to examine the construct validity of IE measured by the Intuitive Eating Scale-2 (IES-2). The conceptual network of different adaptive and maladaptive eating behaviors was also explored. Confirmatory factor analysis (CFA), measurement invariance testing, and correlation analyses were applied on the data from a sample of 732 Hungarian university students. Validating variables included several eating behavior styles (i.e., obesogenic eating behaviors, mindful eating [ME], and dieting practices) and motivational factors (i.e., autonomous, controlled, and amotivational sources of healthy eating, and internalization of the thin and muscular body ideals). The results of the CFA supported the original four-factor structure of the IES-2 without a global second-order factor. The scale exhibited measurement invariance on the scalar level across sexes and BMI categories. The IES-2 subscales showed adequate reliability. IE and ME were found to be positively related but conceptually distinct constructs. Autonomous motivation for healthy eating, restrained eating, and current dieting exhibited different yet meaningful associations to IE on the subscale level. Undertaking subscale-level analyses is recommended when using the IES-2.

Keywords: intuitive eating, obesogenic eating behavior, healthy eating motivation, mindful eating, psychometrics

Highlights

- The Intuitive Eating Scale-2 showed good psychometric indicators on Hungarian data.
- The four-factor model of IES-2 without a general IE factor was replicated.
- Intuitive and mindful eating are separate but related via acceptance and awareness.
- IES-2 factors relate diversely to healthy eating motives, and restrictive eating.
- Subscale-level analysis of IES-2 is recommended.

In today's globalized environments, the unnecessarily large portion of meals served in restaurants and the abundant external stimuli of food advertisements pose a challenge to accommodate the body's self-regulatory processes concerning eating. Thus, eating behavior can easily become detached from hunger and satiety cues (Cohen & Farley, 2008). Extensive research has explored the psychological correlates of maladaptive eating behaviors that are strongly associated with overweight and obesity, such as emotional, restrained, uncontrolled, and binge eating (de Lauzon et al., 2004; Keski-Rahkonen et al., 2007). Restrictive dieting interventions are being offered primarily for controlling body weight. However, chronic dieting practices may also overwrite the body's innate regulatory compass and may hinder building a healthy relationship with food that is also necessary to change the obesogenic eating patterns, maintain a healthy weight, and avoid weight cycling (Bacon & Aphramor, 2011). Thus, research has recently focused on finding more adaptive ways of changing eating habits. Such attempts include studying the effects of intuitive eating (IE) and mindful eating practices, as well as ways to increase intrinsic motivation for healthy eating (e.g., Carrière et al., 2018; Schaefer & Magnuson, 2014; Silva et al., 2008).

IE is an adaptive eating behavior that fosters a positive relationship between food and the body. It is characterized by rejecting labeling foods as "good" or "bad", observing and reacting to the sensations of fullness and hunger, conscientiously avoiding eating for emotional reasons, promoting the acceptance and respect for all body shapes and sizes, encouraging physical activity, and choosing foods that are good for the body and satisfying at the same time (Tribole & Resch, 2020).

The Intuitive Eating Scale (IES) was developed to operationalize the construct of IE (Tylka, 2006). The original measure contained three subscales: Unconditional Permission to Eat (UPE), Eating for Physical rather than Emotional Reasons (EPR), and Reliance on Hunger and Satiety Cues (RHSC). According to the UPE factor, individuals who allow themselves to eat unconditionally do not try to restrict their food choices, nor do they ignore the bodily signs of hunger. Intuitive eaters who score highly on the EPR subscale refrain from using food to cope with emotional distress. Finally, the RHSC subscale describes the awareness of internal hunger and satiety cues as a central factor that regulates the timing and amount of food consumed by intuitive eaters (Tylka, 2006). After addressing the limitations of the original IES, the Intuitive Eating Scale-2 (IES-2) was developed, which contains a fourth subscale called Body-Food Choice Congruence (BFCC; Tylka & Kroon Van Diest, 2013). This newer subscale intends to measure if respondents make food choices that also enhance the body's healthy functioning. The presence of the hypothesized four first-order factors, together with a general IE second-order factor, as well as the construct validity of the scale, were supported (Tylka & Kroon Van Diest, 2013).

Since its original development, the IES-2 has been adapted to different cultural contexts (i.e., Camilleri et al., 2015; da Silva et al., 2020; Swami et al., 2020). The analyses of the different language versions of the IES-2 provide evidence of adequate psychometric properties in adult samples overall. Data from Canada (French adaptation; Carbonneau et al., 2016), Portugal (Duarte et al., 2016), Brazil (da Silva et al., 2020), Germany (Ruzanska & Warschburger, 2017; van Dyck et al., 2016), and Turkey (Akırmak et al., 2021; Bas et al., 2017) fit the four-factor parent model well, with only minor modifications in the number of items kept in some cases. Among these studies, support for the presence of a second-order factor was mixed. The general IE factor could be distinguished in both the German and Turkish versions. Some studies, however, found greater structural divergencies from the original model. While a study conducted in France missed identifying the BFCC subscale and found that a three-factor structure with a general second-order IE factor was the best representation of the collected data (Camilleri et al., 2015), research results including a Hispanic-American sample could not detect the UPE factor, and the fit indices for the remaining three subscales with 11 items were also poor (Saunders et al., 2018). The Romanian and Malay adaptations as well as the original scale used in a sample of a low-income black American population did not uphold the parent factor structure, and the psychometric analyses in these cases identified three to six factors with varying item compositions (Khalsa et al., 2019; Swami et al., 2020; Vintilă et al., 2020). The Portuguese, Brazilian, Romanian, and Malay research demonstrated measurement invariance across sex, just like the original study on the IES-2 (da Silva et al., 2020; Duarte et al., 2016; Swami et al., 2020; Tylka & Kroon Van Diest, 2013; Vintilă et al., 2020).

Engaging in intuitive eating has been shown to relate positively to desirable mental, behavioral, and, to a lesser degree, physical health outcomes. Cross-sectional studies consistently found a

significant negative correlation between body mass index (BMI) and IE; nevertheless, interventional research revealed more compelling evidence for the role of IE in weight maintenance and stability than in weight loss (Tylka et al., 2019; Van Dyke & Drinkwater, 2014). Intuitive eaters also showed lower levels of disordered eating, food preoccupation, binge eating, dieting, rigid and flexible forms of restrained eating, and internalization of the thin ideal (Anderson et al., 2016; Bruce & Ricciardelli, 2016; Tylka et al., 2015). Furthermore, there is strong evidence that various good mental health indicators are significant positive correlates of IE (Bruce & Ricciardelli, 2016; Schaefer & Magnuson, 2014; Van Dyke & Drinkwater, 2014). The majority of research reports examining intuitive eating behaviors show a significant difference between sexes, with men typically scoring higher on the IES and IES-2 (i.e., Camilleri et al., 2015; Carbonneau et al., 2016; Duarte et al., 2016; Tylka & Kroon Van Diest, 2013).

Only a few studies have attempted to tap into the conceptual and practical differences and similarities between the different adaptive eating behaviors that promote healthy eating practices (Anderson et al., 2016; Kerin et al., 2019; Martin, 2019). Gaining more knowledge about the relationship of such constructs, however, would be useful in tailoring interventions to the differing needs of those wishing to maintain a healthy body weight and who would like to alter their disordered eating habits. Even though the conceptualizations of the constructs of mindful and intuitive eating share similarities (e.g., applying non-judgment, awareness, and acceptance in the food environment; Linardon et al., 2021), Anderson et al. (2016) uncovered weak to moderate correlations among intuitive, mindful, and restrained eating. The IES-2 Unconditional Permission to Eat subscale exhibited the strongest negative association with cognitive restraint, while mindful eating showed a non-significant negative correlation with IE. In the same study, hierarchical regression analyses revealed that IE and mindful eating were not significant predictors of BMI when included in the same model together with sex and restrained eating. However, the IES negatively predicted symptoms of disordered eating over and above the other included variables, but mindful eating did not (Anderson et al., 2016). Other research proposed that not only differentiating between the adaptive forms of eating behaviors might be challenging, but these could be considered as merely the inverse of maladaptive practices (namely overeating, emotional eating, and restrained eating). Similarly to Barrada et al. (2018), Kerin et al. (2019) found that some of the components of the measures of intuitive, mindful, emotional, restrained, and overeating indeed correlate rather strongly with each other, but each construct also adds a unique contribution to the features of the different eating patterns.

Examining the different sources of motivation for healthy eating based on self-determination theory (SDT; Ryan & Deci, 2017) and inspecting their relation to IE may also help us paint a clearer picture regarding the web of applied healthy eating practices. Martin (2019) found that middle-aged women exhibiting higher levels of autonomous motivation (i.e., being driven by enjoyment and personal choices) relative to controlled forms of motivation (i.e., being driven by internal and external pressures) scored significantly higher on IE, providing support for the positive relationship of these two constructs. Complementing these findings, another study reported a negative relationship between controlled regulation of healthy eating behavior and IE (Carbonneau et al., 2015).

In light of the expanding empirical endeavors to better understand and successfully promote adaptive eating behaviors, the present study was undertaken to add clarity to the concept of IE by examining factor structure and other psychometric properties of the Hungarian adaptation of the IES-2 and to explore the relationship between different adaptive and maladaptive eating practices, and some of their underlying motivations. In 2016, 62.3% of the adult population of Hungary was at least overweight, and 30% was obese, which made Hungary the fifth most obese country among the members of the Organization for Economic Co-operation and Development (OECD; Organization for Economic Co-operation and Development, 2019, 2021). To take effective steps against the epidemic of obesity and develop well-working, empirically based prevention techniques, it is indispensable to have valid and reliable tools to measure adaptive eating behaviors, which are lacking in the current Hungarian context. Being able to measure intuitive eating practices will also allow us to do further explorative research and intervention studies on the effectiveness of weight-inclusive, non-diet approaches.

Thus, the present study's first aim was to investigate the factor structure of the IES-2 on a sample of Hungarian university students. Replicating the original four-factor model would confirm the psychometric validity of the measure in yet another culture. Second, we also wished to test the construct validity of IE by examining the relationship of the factors of the IES-2 with several covariates. In

general, we hypothesized negative relationships between IE and BMI, current and past-year dieting, obesogenic eating behaviors (restrained, emotional, and uncontrolled eating), amotivation for healthy eating, and the internalization of the thin ideal. On the other hand, positive associations among IE, autonomous healthy eating regulation processes, and mindful eating were also assumed. However, we expected subscale-level divergences regarding some of these relations, given the differences between the IES-2 factors' content. For instance, we anticipated to find positive associations among uncontrolled eating, amotivation for healthy eating, and the Unconditional Permission to Eat subscale, while we expected to see the inverse pattern regarding the relationship between controlled motivation for healthy eating, and the Unconditional Permission to Eat, Eating for Physical rather than Emotional Reasons, and Relying on Hunger and Satiety Cues IES-2 factors. Measurement invariance across sex and BMI categories would also support the psychometric validity of the scale. Third, the research also wished to clarify the relationship between different concepts of healthful eating practices. As researchers have only recently started to study adaptive eating behaviors more extensively, further careful exploration of the association of these eating practices is required. Hence, we examined whether IE, mindful eating, and autonomous motivation for healthy eating indeed exhibited significant, positive, and moderate interrelations, as suggested by previous literature.

Method

Participants

A convenience sample of 732 Hungarian university students (80.2% women; $M_{\text{age}} = 22.7$ $SD = 4.81$ years) participated in this cross-sectional online research. To comply with the inclusion criteria, participants had to be at least 18 years old, be actively enrolled students at a Hungarian university, and speak Hungarian as the first language. Regarding residence, 51.8% of the students resided in Budapest, 35.2% in a country town, and the rest of the sample in a municipality or village. BMI ranged between 15.5 and 49.0 in the sample, with a mean value of 22.3 ($SD = 4.2$). Thirteen percent of the sample belonged to the underweight BMI category ($BMI \leq 18.49$, $N = 95$), 69% to the normal weight BMI category ($BMI = 18.5 - 24.99$, $N = 505$), and 18% to the overweight or obese category ($BMI \geq 25$, $N = 132$). A total of 172 participants (23.5%) reported that they were currently dieting, and 255 said that they had followed a diet during the past year (34.8%). The order of reasons for currently dieting was the following: body weight management ($N = 149$), following a healthier diet ($N = 117$), due to an illness or other health considerations ($N = 81$), in association with a sports activity ($N = 29$), other ($N = 19$).

Procedure

We recruited participants in person at the universities they attended and online by electronic announcements. Three of the questionnaires were adapted to Hungarian within the framework of this study (IES-2, Mindful Eating Scale [MES], and Sociocultural Attitudes Towards Appearance Questionnaire 4 [SATAQ-4]). The protocol of the cultural adaptation followed the suggestions of the International Test Commission (Gregoire, 2018) and Borsa et al. (2012), as detailed in Figure 1. The original measures were first translated by at least two of the authors independently. After reaching agreement on the first Hungarian versions of the questionnaires, back-translation of the questionnaires to English took place by professional translators and interpreters. Some of the original authors of the questionnaires also provided their input during the adaptation process. The suggested modifications resulting from pilot testing were also implemented in the final versions of the questionnaires.

Informed consent was obtained before filling out the questionnaires, which took about 30 minutes to complete. Anonymity and confidential handling of the data were assured. Some students received extra points in their classes for participating in the study. The Ethical Committee of Eötvös Loránd University approved the study protocol (reference number: 2018/313).

Measures

Intuitive eating was measured by the IES-2, which was adapted to Hungarian as part of the present research (Tylka & Kroon Van Diest, 2013). The 23 items of the scale cover 4 factors: Unconditional Permission to Eat (UPE), Eating for Physical rather than Emotional Reasons (EPR), Reliance on Hunger and Satiety Cues (RHSC), and Body-Food Choice Congruence (BFCC) (see Table 2 for the items of the subscales). Each statement is rated on a five-point Likert scale by the respondents (1- *Strongly disagree*, 5- *Strongly agree*). The internal consistencies of the factors are acceptable (see the Cronbach alpha values in Table 2).

The Hungarian version of the 28-item Mindful Eating Scale (MES) was also prepared as part of this study (Hulbert-Williams et al., 2014). The translational process required that we add an extra item due to cultural specificities in the timing when main meals are consumed, so the final version of this scale consists of 29 statements in total that can be grouped into the following six factors: Acceptance ($\alpha = .81$), Non-reactivity ($\alpha = .58$), Routine ($\alpha = .59$), Act with awareness ($\alpha = .72$), Awareness ($\alpha = .72$), and Unstructured eating ($\alpha = .50$). Those taking the survey can indicate how often each statement describes their behavior on a four-point response scale (1- *Never*, 4- *Usually*).

The six different regulatory styles of healthy eating (intrinsic motivation; integrated regulation, identified, introjected, and external regulation; and amotivation) were measured by the short version of the Motivation for Healthy Eating Scale (MHES), which contains 18 items (Kato et al., 2013, 2021; Román et al., 2020). The six factors can be grouped into three types of regulatory processes: Amotivation, Controlled motivation (introjected and external regulation), and Autonomous motivation (intrinsic motivation, integrated, and identified regulation). To each item, participants provide their answers on a six-point response scale (1- *Does not correspond at all*, 6- *Corresponds very well*). The internal consistencies of the subscales were acceptable in the present sample (Cronbach's $\alpha = .70 - .91$).

The Three-factor Eating Questionnaire (TFEQ-R21) is a 21-item scale measuring three different types of obesogenic eating behaviors: Uncontrolled Eating (UE; $\alpha = .81$), Cognitive Restraint (CR; $\alpha = .85$), and Emotional Eating (EE; $\alpha = .92$; Czegeledi & Urbán, 2010; Stunkard & Messick, 1985). For the first 20 statements, participants give their answers on a four-point response scale. The last item uses an eight-point scale.

The Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4) was used to quantify the extent of the internalization of thin and muscular body ideals among the study participants (Schaefer et al., 2015; Tóth-Király et al., 2021). The 22 statements of the scale measure the degree to which individuals internalize the thin/low body fat ($\alpha = .89$) and the muscular/athletic body ideals ($\alpha = .89$), as well as the appearance pressures coming from Family ($\alpha = .85$), Peers ($\alpha = .85$), and the Media ($\alpha = .93$), on a five-point scale (1- *Definitely disagree*, 5- *Definitely agree*).

Weight status was defined using BMI calculated from self-reported weight and height data. The WHO guideline (World Health Organization, 2000) was followed to establish the four main BMI categories: underweight (BMI < 18.5), normal weight (BMI 18.5 – 24.9), overweight (BMI ≥ 25), and obese (BMI ≥ 30).

Current and past-year dieting practices were measured with the following yes-or-no questions: “Do you currently follow a diet?” and “In the past year, did you follow any diet?”. The reasons for current dieting practices were measured by a multiple-choice question with the following answer options: body weight management, having a healthier diet, illness or other health considerations, due to a sports activity, and other.

Data Analysis

MPlus 7.4 and SPSS 25.0 statistical software were used to run the analyses. Confirmatory factor analysis (CFA) with a maximum likelihood method of estimation (robust version, MLR) was applied to inspect the original factor structure of the IES-2 and thus the validity of our *a priori* model (Brown & Moore, 2012; Muthén & Muthén 1998-2017). To determine the model's goodness of fit, we inspected several fit indices, such as the chi-square statistic, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR). For an acceptable model fit, the values of CFI and TLI had to be greater than .90 and those of SRMR and RMSEA below .08 (Hu & Bentler, 1999). Two separate CFA with covariate analyses were also run to map the significant determinants of each of the IES-2 subscales, which also allowed us to evaluate the convergent and discriminant validity of the scale using the validating variables. When CFA with covariates analysis is used, the latent factors of interest are regressed onto observed covariates. This makes examining the relationship between the factors and the covariate possible, while also controlling for the effect of the other covariates (Brown, 2006).

We applied multi-group analyses of measurement invariance to examine whether the scores obtained on the IES-2 were measurement invariant across sex and BMI categories. A change below the values of 0.01, 0.015, and 0.030 in the CFI, RMSEA, and SRMR fit indices, respectively, indicates model equivalence on a configural, metric, and scalar level (Chen, 2007). Estimated correlations were calculated to assess the in-between relations of the IES-2 subscales as latent variables, Cronbach's alpha, and McDonald's omega coefficients to test the internal consistency of the tools' subscales.

One-way analysis of variance (ANOVA) with bootstrapping was applied to identify possible differences in the scores reached on the IES-2 subscales by the different BMI groups (underweight, normal weight, and overweight or obese), and t-tests were performed to compare subscale mean scores by sex. Hochberg post hoc analyses were used to do pairwise comparisons between BMI groups where needed.

Results

Confirmatory Factor Analyses and Measurement Invariance

Four possible measurement models were inspected using CFA to examine their degree of fit to the collected data, including two that tested the four first-order factor solution (Models 1 and 3) and two examining a four-factor solution with a general, second-order IE factor (Models 2 and 4; see Table 1). Two of the models also allowed for three error covariances between items as suggested by the inspection of modification indices (Models 3 and 4; one on the UPE factor: *“If I am craving a certain food, I allow myself to have it.”* and *“I allow myself to eat what food I desire at the moment.”*; one on the EPR factor: *“When I am bored, I do NOT eat just for something to do.”* and *“When I am lonely, I do NOT turn to food for comfort.”*; and one on the RHSC factor: *“I rely on my fullness (satiety) signals to tell me when to stop eating.”* and *“I trust my body to tell me when to stop eating.”*). The fit indices revealed that the four first-order factor solution allowing for error covariance between items (Model 3) was the best representation of the data, showing an acceptable degree of fit (see Table 1). Table 2 presents the subscales of the IES-2 with their respective items and the corresponding item loadings, resulting from running the CFA.

Measurement invariance testing was used to see whether men and women as well as the respondents across different BMI categories interpret the items and use the scale in the same way. The results of these analyses can be found in Table 1. These results show that the IES-2 proves to be invariant across sex and across the three BMI categories (underweight, normal weight, and overweight or obese individuals) compared on a configural, metric, and scalar level as well.

Correlations between the IES-2 Subscales and their Associations with the Validating Constructs

Overall, most of the factors of the IES-2 exhibited significant positive correlations that were weak to moderate in strength ($r = .19 - .52, p \leq .05$). Exceptions were the relationship between the UPE and the BFCC subscales, which were negatively correlated to each other in the case of both sexes (men: $r = -.33$, women: $-.41, p \leq .05$), and the RHSC and BFCC subscales, which were independent of each other in the case of male participants ($r = .12, p \geq .05$) (see Supplementary Table 1).

Two CFA with covariates analyses were run separately for predictors representing different styles of eating behaviors and for those denoting motivational factors to further examine the construct validity of IE. Concerning the first group of predictors (see Table 3), current dieting and cognitive restraint were negatively related to the UPE factor and positively to the BFCC items. A weak, negative association between restrained eating and the RHSC subscale was also found. Regarding emotional eating, the most salient negative association was found with the EPR subscale. Most of the factors measuring the facets of mindful eating were unrelated to IE. Exceptions were the acceptance and awareness subscales of the MES that were both positively and weakly related to the IES-2 factors (see Table 3).

Among the motivational factors of eating (Table 4), both the autonomous and controlled types of healthy eating motivation were significant negative predictors of the UPE subscale. Besides, while autonomous motivation for healthy eating was positively related to RHSC and BFCC, controlled motivation exhibited a weak and negative association with the RHSC factor. Amotivation showed the most marked, significant, but still a faint positive relationship with UPE from the IES-2 subscales. Confirming expectations, participants who reported higher levels of internalization of the thin ideal tended to score lower on all IES-2 subscales.

Sex was weakly and inversely related to the EPR factor when included in the CFA with covariates analyses, but this association was not significant in the first group of validating variables that included the emotional eating subscale (Table 3). The t-test also confirmed that men scored higher on the EPR subscale compared to women ($t = 6.26, p < .001, d = 0.56$). No significant sex difference was found concerning the other factors of the IES-2.

Contrary to previous research findings, BMI did not show significant association with either of the IES-2 subscales when included in the regression model together with the eating styles (Table 3). However, when only motivational factors were added to the model (besides age and sex), BMI showed a

significant negative relationship with all four factors (Table 4; the results of the CFA with covariates analysis including BMI as dichotomous dummy variables can be seen in Supplementary Tables 2 and 3). Running one-way independent ANOVA revealed significant differences between BMI groups in the UPE, EPR, and RHSC factors (detailed results can be seen in Table 5). Post hoc pairwise comparisons showed that the UPE factor scores of all three BMI groups differed significantly from each other, with a decreasing linear trend from underweight to overweight/obese groups. The overweight/obese group scored significantly lower on the EPR and the RHSC factors than those belonging to the underweight and normal weight BMI categories, while the latter two groups' scores did not differ significantly. These results are supported by applying bootstrapping and nonparametric tests as well (detailed results are available upon request from the authors).

Discussion

The purpose of the present study was to contribute to the research on the psychometric properties of the IES-2 that measures intuitive eating, one of the most widely studied adaptive eating styles. By inspecting its validity, we also wanted to shed light on the extent that the different adaptive eating characteristics, such as IE, mindful eating, and autonomous motivation for healthy eating, are associated with each other, while also investigating the relationship of IE to other maladaptive eating styles and healthy eating motivations.

The findings of the CFA supported the presence of the original four factors of the IES-2 on the studied convenience sample of Hungarian university students, with acceptable fit indices after allowing for error covariance in the case of three pairings of items due to similar wording and content of these sentences within the same factors. However, the results of our analyses did not support the presence of a global, second-order IE factor. All subscales of the measure were found to be reliable. Thus, measuring IE with this adaptation of the tool seems applicable among Hungarian university students. This finding thus strengthens the line of studies supporting the four-factor structure (Akırmak et al., 2021; Bas et al., 2017; Carbonneau et al., 2015; Duarte et al., 2016; Ruzanska & Warschburger, 2017; van Dyck et al., 2016) and thereby the validity of IE measured by the IES-2. Scalar-level measurement invariance of the IES-2 was established comparing the two sexes and the underweight, normal weight, and overweight or obese BMI categories. This means that men and women as well as the different BMI groups conceptualized the subscales the same way, and the Hungarian adaptation of the scale measures the latent factors consistently and equivalently across these groups.

While several studies reported significant sex differences regarding IE, with men usually scoring higher on the IE scales, here the only marked difference in this direction was observed concerning the EPR factor, similarly to Carbonneau et al.'s findings (2016). This difference could be because women are generally more likely to eat in response to uncomfortable emotions (de Lauzon et al., 2004), a result underpinned by the strong inverse association between emotional eating that the EPR subscale found in this study.

As to the relationship between body size defined by BMI and the components of the IES-2, the different BMI groups differed significantly regarding the UPE, EPR, and RHSC subscales, with leaner groups being more allowing with their eating practices. Even normal-weight individuals were significantly more controlling over their selection of foods than underweight participants. This same analysis also revealed that overweight and obese participants were less likely to avoid eating in response to emotions and to rely on and trust their bodies' hunger and satiety signals as indicators of when, what, and how much to eat compared to the other two groups. These results confirm the construct validity of IE, while also underscoring the possibility that the eating behavior of overweight and obese individuals is detached from the body's self-regulatory processes, which may require intervention. However, the direction of causality in this regard cannot be established based on the results of this study.

Most of the subscales exhibited significant and positive interrelations among men and women as well, except for the UPE and BFCC subscales, which were negatively associated with each other. This latter finding is not unprecedented, as Tylka and Kroon Van Diest (2013) and Duarte et al. (2016) also reported similar inverse correlations between these two factors in both sexes. This finding suggests that those who pay attention to choosing healthy food options that may enhance the body's functioning also tend to control their food intake in general. This association of applying restrictions in eating behavior and opting for foods that serve the body's needs is consistent with the significant positive relationship among BFCC, current dieting practices, and cognitive restraint. In line with this, researchers demonstrated that individuals scoring higher on the cognitive restraint scale of the TFEQ

are indeed more likely to eat healthier, although they do not necessarily consume fewer calories than non-restrainers (de Lauzon et al., 2004; Goldstein et al., 2013). Thus, watching one's diet and body weight may share common theoretical ideals with the items of the BFCC subscale. Regarding the other IES-2 subscales, current and past-year dieting were significant negative predictors of the UPE subscale, and restrained eating negatively predicted the UPE and RHSC factors, confirming our expectations. These results propose that people who follow dieting rules are indeed less permissive about giving in to their food cravings and rely less on their bodies' innate hunger and satiety signals, as proposed by the general concept of IE.

According to our findings, uncontrolled eating was mostly unrelated to the components of IE, except for the faint association with UPE. This indicates that an allowing attitude in eating does not necessarily entail overeating, which confirms the discriminant validity of this IES-2 subscale. On the one hand, while a negative association was expected between emotional eating and the EPR subscale as a confirmation of construct validity of the latter variable, this relationship was quite strong, indicating the EPR factor is an inverse measure of emotional eating. On the other hand, the negative association of emotional eating with RHSC reasonably implies that those who listen to their bodies' signals about when, what, and how much to eat are less prone to eat in response to uncomfortable emotions when not hungry.

Although descriptions of IE and mindful eating — two types of eating styles that foster an anti-dieting approach (Robison et al., 2007) — together can be found in the literature for a while now, explorations of their relationships by quantitative methods are still scarce. In our study, the factors of the IES-2 showed significant positive associations with two out of the six subscales of the MES, namely Acceptance and Awareness. The items of Acceptance describe a non-judgmental approach towards food choice and embracing the feelings towards hunger, which are in line with the view of IE about the desirable rejection of categorizing foods as good or bad and allowing oneself to react to signals of hunger. Furthermore, paying attention is a common aspect of the Awareness, RHSC, and BFCC subscales, as careful observation is indispensable to consciously notice either the characteristics of the consumed food or the bodily signals related to eating. The rather weak regression coefficients and the lack of association with the remaining four subscales of the MES suggest that mindful eating and IE are distinct constructs. However, it is noteworthy that the reliability of the MES subscales was acceptable only in the case of these two and the Act with Awareness factors, and less adequate for the other three subscales. In comparison with our findings, Kerin et al. (2019) uncovered a more extensive significant relationship between these constructs using MES and the previous version of the IES-2 as measures. At the same time, applying another measure of mindful eating, the Mindful Eating Questionnaire (MEQ), Anderson et al. (2016) could not identify a significant overall association.

We also examined the relationship of IE with variables with a motivational component, such as the different regulatory styles of healthy eating motivation and the extent of the internalization of the thin body ideal. Participants who find joy in preparing healthy meals and truly value healthy eating (i.e., autonomously motivated) scored higher on the RHSC and BFCC IES-2 subscales, as expected. However, both autonomous and controlled healthy eating motivation were inversely related to the UPE factor, and amotivation was positively related to the UPE factor. This implies that some extent of control over food selection may be desirable among those who find healthy eating important for either internal (i.e., good health, enjoyment) or external (i.e., approval from others, avoiding shame) reasons. It was rather those who expressed higher levels of a lack of motivation for healthy eating who allowed themselves to consume without restraints. Also, autonomous and controlled forms of motivation related differently to the RHSC subscale. Therefore, participants who experience greater internal and/or external pressures and expectations of eating healthily may feel that they cannot eat according to the pace of their bodily signals for fear of being internally or externally judged for it. Indeed, studies showed that controlled motivation for eating regulation is positively associated with BMI, dysfunctional eating practices, and dissatisfaction with the body, and inversely to eating healthily (Leong et al., 2012; Pelletier et al., 2004; Pelletier & Dion, 2007). These trends between the IES-2 subscales and eating self-regulation processes are also similar to what Carbonneau et al. found in their research (2015). Confirming the construct validity of the IES-2, participants who expressed a greater desire for looking slim with low body fat rate also marked lower scores on all subscales of IE, as it could be expected based on the theoretical background of IE and previous research findings (Dockendorff et al., 2012; Tylka, 2006; Tylka & Kroon Van Diest, 2013).

Limitations and Future Research

Some limitations of the current research need to be acknowledged. First, the cross-sectional design did not enable us to draw conclusions about causality in the relationship between the measured variables. Second, the convenience sampling method was applied, which poses constraints in the generalizability of the results. It would be worth examining the validity and reliability of the IES-2 among the general adult population too, as eating habits of university students might be very different from those of the working-age population with their own families, for example. Including more men in the study sample for a more proportionate sex distribution and reaching more overweight and obese participants — so that these BMI groups could be studied separately for measurement invariance — could also be useful. Third, test–retest reliability could not be established within the current study. Fourth, all data were based on self-report measures, including BMI values calculated from self-reported weight and height. These can influence honest reporting concerning the true characteristics of the participants. The subscale-level score differences between the BMI categories must be interpreted with caution as well, as the related effect sizes were rather weak. Also, the operationalizability of mindful eating using questionnaires is yet to be clarified, which may raise concerns regarding the internal consistency of the scales measuring this construct. Finally, it was not possible to include diagnostic measures of mental illness (i.e., eating disorders) in the current study, which could have allowed for drawing more accurate conclusions regarding the results.

Examining the test–retest reliability of this adaptation of the IES-2 and its sensitivity to change could be a valuable addition to the current psychometric investigation. A cross-cultural psychometric investigation and an international comparison of the tendency of IE would also be relevant to conduct. In the future, it would also be fruitful to further explore whether omitting the restrictive approach of dieting completely can or should be achieved by practicing IE, given the positive associations of BFCC with dieting and cognitive restraint, as well as the inverse relationship of the UPE factor with beneficial healthy eating motivations. Longitudinal intervention research may also shed light on whether acquiring mindful eating and intuitive eating techniques at the same time would increase or extend their beneficial effects, as they seem to be related, but sufficiently distinct adaptive eating styles. It would be equally interesting to examine whether IE (more specifically emphasizing size acceptance, healthy relationship to food and eating, and food enjoyment) could help to increase the level of autonomous motivation for healthy eating in individuals, which, in turn, may lead to longer-lasting behavior and weight changes (Silva et al., 2008) and may also help to resolve the problem of goal conflict in unsuccessful dieting behavior (Stroebe et al., 2008).

Conclusions

The present research revealed the covariance between several adaptive and maladaptive eating styles, besides confirming the factor structure of a questionnaire measuring IE. In all, the Hungarian adaptation of the IES-2 was found to be a valid and reliable tool that showed good psychometric properties among a sample of Hungarian university students. The original four factors were replicated, and the interpretation of these subscales separately is meaningful. The construct of IE did not produce strong inverse associations with maladaptive eating styles, except for emotional eating, and seemed to be distinct enough from mindful eating and autonomous healthy eating motivation. The vast majority of the identified significant associations were weak in strength, which is not uncommon in this field of research, due to the complexity of factors shaping eating behavior. The proportion of overweight and obese Hungarian adults (62.3%) is significant (Organisation for Economic Co-operation and Development, 2019). Thus, having valid and reliable tools to measure adaptive eating patterns — a perspective still in its infancy in local eating behavior research — is important, as they could have an essential role in promoting more diverse and potentially effective new weight management intervention approaches and in measuring their effects.

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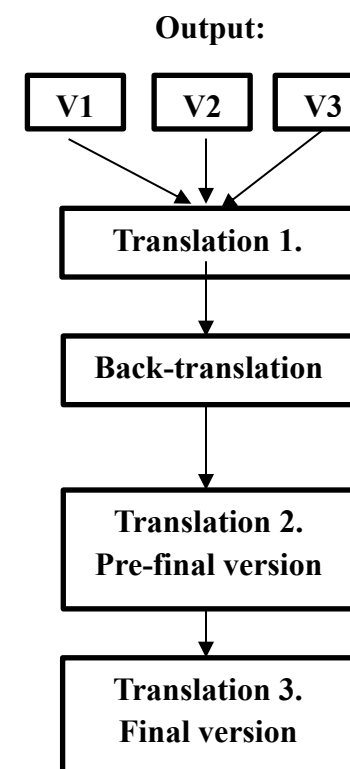
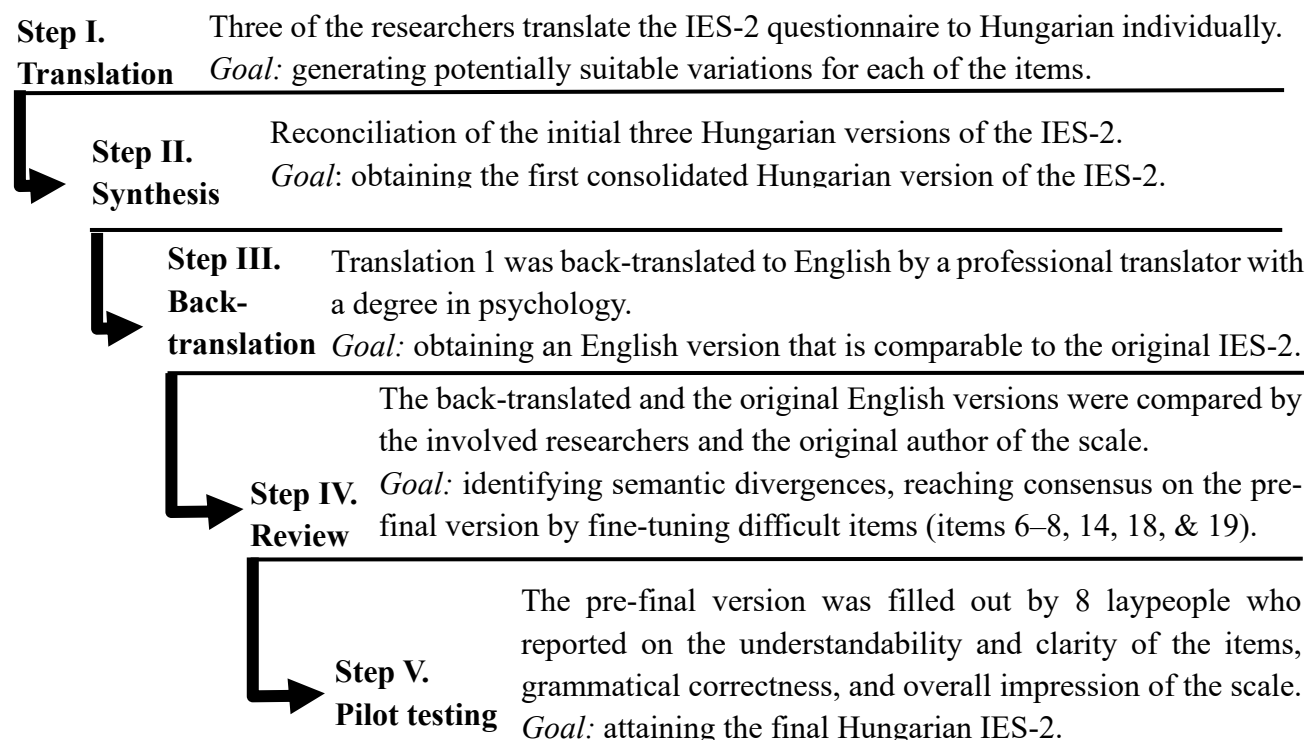
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Figure 1. Flow Chart of the Adaptation Process of the Intuitive Scale 2

Note. V = version

Table 1*Goodness-of-fit statistics for the estimated models of the Intuitive Eating Scale-2 and the Results of Measurement Invariance Testing*

Models	χ^2 (df)	CFI	TLI	RMSEA (90% CI)	SRMR
Model 1. 4-factor first-order model	1135.2* (224)	.873	.857	.075 (.071-.080)	.067
Model 2. 4-factor first-order model with a global IES-2 second-order factor	1239.0* (226)	.859	.842	.079 (.075-.083)	.095
Model 3. 4-factor first-order model allowing for error covariance between items ^a	644.5* (221)	.941	.933	.052 (.047-.056)	.061
Model 4. 4-factor first-order model with a global IES-2 second-order factor allowing for error covariance between items ^a	788.4* (223)	.921	.911	.059 (.055-.064)	.093
Results of the measurement invariance testing based on Model 3^a					
<i>Measurement invariance testing for sex</i>					
Configural invariance	951.74* (442)	.932	.922	.057 (.052-.062)	.066
Metric invariance	966.78* (461)	.932	.926	.055 (.050-.060)	.069
Scalar invariance	996.66* (480)	.931	.927	.055 (.050-.060)	.069
Configural vs. Metric invariance	$\Delta\chi^2 = 15.04$ ($\Delta df = 19$)	$\Delta CFI < .001$		$\Delta RMSEA = .002$	$\Delta SRMR = -.003$
Metric vs. Scalar invariance	$\Delta\chi^2 = 29.87$ ($\Delta df = 19$)	$\Delta CFI = .001$		$\Delta RMSEA < .001$	$\Delta SRMR < .001$
<i>Measurement invariance testing for BMI categories^b</i>					
Configural invariance	1218.68* (663)	.926	.916	.059 (.054-.064)	.072
Metric invariance	1264.08* (701)	.925	.919	.058 (.053-.063)	.078
Scalar invariance	1335.69* (739)	.921	.919	.058 (.063-.063)	.079
Configural vs. Metric invariance	$\Delta\chi^2 = 45.41$ ($\Delta df = 38$)	$\Delta CFI = .001$		$\Delta RMSEA = .001$	$\Delta SRMR = -.006$
Metric vs. Scalar invariance	$\Delta\chi^2 = 71.60$ ($\Delta df = 38$)	$\Delta CFI = .004$		$\Delta RMSEA < .001$	$\Delta SRMR = -.001$

Note. $N = 717$ -718. df = degrees of freedom; TLI = Tucker-Lewis fit index; CFI = comparative fit index; $RMSEA$ = root mean square error of approximation; CI = confidence interval; $SRMR$ = standardized root mean square residual; Δ = difference of the values, BMI = body mass index.

^a Model allowing for the error covariance of two items of the Unconditional Permission to Eat factor ("If I am craving a certain food, I allow myself to have it." and "I allow myself to eat what food I desire at the moment."), two items on the Eating for Physical rather than Emotional Reasons factor ("When I am bored, I do NOT eat just for something to do." and "When I am lonely, I do NOT turn to food for comfort."), and two items on the Reliance on Hunger and Satiety Cues factor ("I rely on my fullness (satiety) signals to tell me when to stop eating." and "I trust my body to tell me when to stop eating.").

^b BMI categories compared: underweight ($N = 95$), normal weight ($N = 496$), and overweight or obese ($N = 126$).

* $p < .001$.

Table 2

Descriptive Statistics, Cronbach's Alpha Coefficients and Factor Loadings of the Confirmatory Factor Analysis of the four first-order factor model of the Intuitive Eating Scale-2

	Unconditional Permission to Eat (UPE)	Eating for Physical Rather than Emotional Reasons (EPR)	Relying on Hunger and Satiety Cues (RHSC)	Body-Food Choice Congruence (BFCC)
1. I try to avoid certain foods high in fat, carbohydrates, or calories. ^R [Igyekszem kerülni azokat az élelmiszereket, amelyeknek magas a zsír-, a szénhidrát- vagy a kalóriatartalma.]	.738			
2. I have forbidden foods that I don't allow myself to eat. ^R [Megtiltottam magamnak bizonyos élelmiszerek fogyasztását.]	.738			
3. I get mad at myself for eating something unhealthy. ^R [Haragszok magamra, amikor egészségtelen ételt eszek.]	.586			
4. If I am craving a certain food, I allow myself to have it. [Ha megkívánok egy bizonyos ételt, akkor megengedem magamnak, hogy egyek belőle.]	.647			
5. I allow myself to eat what food I desire at the moment. [Megengedem magamnak, hogy abból az ételből egyek, amire éppen vágyom.]	.690			
6. I DO NOT follow eating rules or dieting plans that dictate what, when, and/or how much to eat. [NEM követek étkezési szabályokat vagy fogyókúra előírásokat, amik megmondanák, hogy mit, mikor és/vagy mennyit egyek.]	.664			
7. I find myself eating when I'm feeling emotional (e.g., anxious, depressed, sad), even when I'm not physically hungry. ^R [Amikor előttenek az érzelmek (pl. ideges, lehangolt vagy szomorú vagyok), azon kapom magam, hogy eszek, még akkor is, ha nem is vagyok éhes.]		.890		
8. I find myself eating when I am lonely, even when I'm not physically hungry. ^R [Amikor magányosnak érzem magam, van, hogy azon kapom magam, hogy eszek, még akkor is, ha nem is vagyok éhes.]		.851		

9. I use food to help me soothe my negative emotions. ^R [Evéssel próbálom csillapítani a negatív érzéseimet.]	.889
10. I find myself eating when I am stressed out, even when I'm not physically hungry. ^R [Amikor stresszelek valami miatt, azon kapom magam, hogy eszek, akkor is, ha nem is vagyok éhes.]	.834
11. I am able to cope with my negative emotions (e.g., anxiety, sadness) without turning to food for comfort. [Meg tudok birkózni a negatív érzéseimmel (pl. idegesség, szomorúság) anélkül, hogy az evésbe menekülnék.]	.559
12. When I am bored, I do NOT eat just for something to do. [Unalmamban NEM kezdek el enni csak azért, hogy éppen legyen mit csinálnom.]	.429
13. When I am lonely, I do NOT turn to food for comfort. [Amikor magányos vagyok, akkor nem eszem csak azért, hogy jobban érezzem magam.]	.607
14. I find other ways to cope with stress and anxiety than by eating. [Az evésen kívül más módokat is találok a stresszel vagy a szorongással való megküzdésre.]	.551
15. I trust my body to tell me when to eat. [Bízom benne, hogy a testen jelzi számomra, hogy mikor kell ennem.]	.792
16. I trust my body to tell me what to eat. [Bízom benne, hogy a testem jelzi számomra, hogy mit egyek.]	.664
17. I trust my body to tell me how much to eat. [Bízom benne, hogy a testem jelzi számomra, hogy mennyit kell ennem.]	.843
18. I rely on my hunger signals to tell me when to eat. [Az éhségérzetemre hagyatkozom abban, hogy eldöntsem, mikor egyek]	.637
19. I rely on my fullness (satiety) signals to tell me when to stop eating. [A teltségérzetemre hagyatkozom abban, hogy eldöntsem, mikor hagyjam abba az evést.]	.546
20. I trust my body to tell me when to stop eating.	.700

[Megbízom a testem jelzéseiben arra vonatkozóan, hogy mikor kell abbahagynom az evést.]				
21. Most of the time, I desire to eat nutritious foods. [Többnyire egészséges élelmiszereket kívánok fogyasztani.]				.764
22. I mostly eat foods that make my body perform efficiently (well). [Legtöbbször olyan élelmiszereket fogyasztok, amelyek elősegítik a szervezetem jó működését.]				.945
23. I mostly eat foods that give my body energy and stamina. [Legtöbbször olyan élelmiszereket fogyasztok, amelyek energiát és megfelelő állóképességet biztosítanak a szervezetemnek.]				.774
Mean (<i>SD</i>)	3.59 (0.94)	3.85 (0.91)	3.80 (0.84)	3.66 (0.87)
Cronbach- α	.84	.89	.86	.86
(McDonald's ω)	(.84)	(.89)	(.85)	(.87)

Note. $N = 718$. Standardized factor loadings. Items 1-3 and 7-10 were reverse coded before including in the analysis. Sentences in brackets are the scale items in Hungarian. *SD* = standard deviation. All factor loadings are statistically significant at $p < .01$.

^RReversed item.

Table 3

The Relationship between the Intuitive Eating Scale 2 Factors and their Validating Variables Including Different Eating Behavior Styles. Results of the CFA with Covariates Analysis

Predictors	Outcome variables: Intuitive Eating Scale 2 factors			
	Unconditional Permission to Eat	Eating for Physical Rather than Emotional Reasons	Relying on Hunger and Satiety Cues	Body-Food Choice Congruence
Age	-.02	.01	-.05	.00
Sex	.08	-.03	.08	-.04
BMI	.04	-.03	-.02	-.11
Currently dieting	-.21	.01	-.02	.20
Dieting in the last year	-.11	-.03	-.04	.05
Uncontrolled Eating (TFEQ-R21)	.09	.00	-.09	-.08
Cognitive Restraint (TFEQ-R21)	-.62	.05	-.16	.40
Emotional Eating (TFEQ-R21)	-.05	-.86	-.20	-.09
Acceptance (MES)	.17	.08	.23	.27
Awareness (MES)	.07	.01	.23	.18
Non-reactivity (MES)	.09	.02	.05	-.08
Routine (MES)	.05	.00	.02	-.06
Acting with Awareness (MES)	-.10	.05	-.02	.00
Unstructured Eating (MES)	-.01	.02	.02	-.02
<i>R</i> ²	.82	.84	.38	.30

Note. *N* = 705. Standardized regression coefficients. The factors of the IES-2 are included as latent variables. Sex is coded 0: male, 1: female. Current / last year dieting is coded 0: no dieting, 1: dieting. *BMI* = body mass index; *TFEQ-R21* = Three Factor Eating Questionnaire; *MES* = Mindful Eating Scale.

Boldfaced coefficients are significant at least at $p < .05$

Table 4

The Relationship between the Intuitive Eating Scale 2 Factors and their Validating Variables Including Different Motivational Factors. Results of the CFA with Covariates Analysis

Predictors	Outcome variables: Intuitive Eating Scale 2 factors			
	Unconditional Permission to Eat	Eating for Physical Rather than Emotional Reasons	Relying on Hunger and Satiety Cues	Body-Food Choice Congruence
Age	-.11	.06	-.04	.09
Sex	.01	-.23	-.03	-.05
BMI	-.11	-.26	-.19	-.07
Amotivation for Healthy Eating (MHES)	.15	-.09	-.04	-.05
Controlled Motivation for Healthy Eating ^a (MHES)	-.11	-.07	-.10	.03
Autonomous Motivation for Healthy Eating ^b (MHES)	-.27	.07	.24	.63
Internalization of thin ideal (SATAQ-4)	-.33	-.18	-.30	-.20
Internalization of muscular/athletic ideal (SATAQ-4)	-.02	.02	-.07	.07
R^2	.48	.17	.18	.49

Note. $N = 686$. Standardized regression coefficients. Sex is coded as 0: male, 1: female.

MHES = Motivation for Healthy Eating Scale; *SATAQ-4* = Sociocultural Attitudes Towards Appearance Questionnaire 4.

^aControlled motivation consists of the External and Introjected regulation subscales of MHES.

^bAutonomous motivation includes the Intrinsic motivation, Integrated, and Identified regulation subscales of MHES.

Bold-faced coefficients are significant at least at $p < .05$.

Table 5

Results of the Subscale-level Analysis of Variance (ANOVA) with Post-hoc Tests by BMI Group using the Intuitive Eating Scale 2.

	Underweight		Normal weight		Overweight / obese		<i>F</i>	<i>p</i>	η^2
	BMI < 18.5		BMI = 18.5-24.9		BMI > 25		(2,714)		
	<i>N</i> = 95		<i>N</i> = 496		<i>N</i> = 126				
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Unconditional Permission to Eat (UPE)	4.04 ^a	0.89	3.62 ^b	0.91	3.18 ^c	0.95	24.7	<.001	0.06
Eating for Physical rather than Emotional Reasons (EPR)	4.07 ^a	0.74	3.87 ^a	0.88	3.58 ^b	1.10	8.81	<.001	0.02
Relying on Hunger and Satiety Cues (RHSC)	3.94 ^a	0.82	3.86 ^a	0.83	3.54 ^b	0.79	14.4	<.001	0.04
Body-Food Choice Congruence (BFCC)	3.58 ^a	0.93	3.71 ^a	0.86	3.53 ^a	0.83	2.90	.056	0.01

Note. *N* = number of participants in group; *M* = Mean; *SD* = standard deviation; *BMI* = Body mass index. Means in the same row that do not share superscripts differ at $p < 0.01$.

Supplementary files

Supplementary Table 1

Correlation Matrix of the Intuitive Eating Scale-2 (IES-2) Subscales, and the Validating Constructs, by Sex.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
1.Unconditional Permission to Eat (UPE, IES-2)	-	.22	.44	-.41	-.17	-.25	-.56	-.57	-.02	-.85	-.26	.49	.10	.21	.23	-.11	-.13	.36	-.51	-.35	-.45	-.43
2. Eating for Physical Rather than Emotional Reasons (EPR, IES-2)	.32	-	.48	.19	.05	-.27	-.10	-.24	-.52	-.13	-.91	.49	.16	.34	.08	.40	.35	-.12	.06	-.13	-.24	-.11
3.Relying on Hunger and Satiety Cues (RHSC, IES-2)	.49	.52	-	.22	-.05	-.22	-.19	-.29	-.35	-.35	-.44	.51	.34	.30	.10	.26	.20	-.07	.09	-.13	-.34	-.16
4. Body-Food Choice Congruence (BFCC, IES-2)	-.33	.26	.12	-	.16	-.05	.31	.19	-.26	.35	-.15	.15	.20	.03	-.15	.25	.23	-.44	.66	.22	-.06	.25
5. Age	-.04	-.11	-.06	-.14	-	.17	.04	.11	-.12	.13	-.03	.07	.00	.01	-.34	.08	.12	-.09	.06	.05	-.04	-.10
6. BMI	-.39	-.21	-.30	.01	.39	-	.20	.28	.17	.27	.29	-.29	-.06	-.05	-.02	-.12	-.07	-.01	.03	.09	.11	-.01
7. Currently dieting	-.54	-.10	-.18	.25	.11	.31	-	.63	-.07	.35	.10	-.17	-.05	-.09	-.07	.02	-.02	-.24	.34	.08	.16	.18
8. Dieting in the last year	-.39	-.05	-.14	.25	.21	.25	.62	-	.05	.39	.23	-.29	-.14	-.16	-.09	-.07	-.01	-.18	.30	.15	.23	.18
9. Uncontrolled Eating (TFEQ-R21)	.06	-.30	-.21	-.07	.04	.12	.05	-.06	-	.02	.56	-.44	-.07	-.49	-.02	-.43	-.38	.024	-.12	.07	.22	.11
10. Cognitive Restraint (TFEQ-R21)	-.86	-.31	-.45	.17	.17	.41	.47	.35	.04	-	.22	-.45	-.07	-.10	-.18	.10	.16	-.31	-.41	.26	.46	.43
11. Emotional Eating (TFEQ-R21)	-.32	-.87	-.51	-.19	.12	.19	.20	.17	.42	.37	-	-.50	-.14	-.34	-.07	-.37	-.31	.11	-.02	.15	.29	.16
12. Acceptance (MES)	.53	.37	.41	.14	.05	-.27	-.18	-.05	-.33	-.49	-.43	-	.15	.35	.10	.32	.25	-.00	-.13	-.26	-.53	-.30
13. Awareness (MES)	.17	.19	.16	.06	.14	.12	-.01	.11	-.08	-.07	-.14	.06	-	.10	-.05	.40	.13	-.19	.19	-.01	-.11	-.03
14. Non-reactivity (MES)	.19	.17	.15	-.06	.01	.14	-.28	-.17	-.33	-.09	-.24	.16	.20	-	.21	.28	.20	-.10	-.07	-.15	-.15	-.22

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15. Routine (MES)	.22	-.01	.07	-.13	-.05	.12	-.29	-.24	.06	-.20	-.09	.14	.07	.16	-	.02	-.04	.03	-.12	-.16	-.06	-.20
16. Acting with Awareness (MES)	.01	.38	.19	.15	.10	.15	.09	.24	-.13	.06	-.32	.16	.54	.13	.05	-	.51	-.32	.20	-.07	-.12	.03
17. Unstructured Eating (MES)	.04	.21	.02	-.07	.15	.13	-.01	.13	-.19	.05	-.22	.24	.17	.10	.04	.45	-	-.17	.15	.03	-.08	.04
18. Amotivation for healthy eating (MHES)	.25	-.11	-.01	-.20	.08	-.16	-.15	-.17	.15	-.07	.11	.01	-.23	-.18	-.12	-.31	.10	-	-.60	-.07	-.04	-.24
19. Autonomous motivation for healthy eating ^a (MHES)	-.43	.02	.16	.67	-.10	.05	.33	.23	.12	.29	.08	-.16	.10	-.10	-.10	.16	-.10	-.29	-	.36	.16	.42
20. Controlled motivation for healthy eating ^b (MHES)	-.19	-.05	-.10	.22	-.22	-.00	.04	-.01	.16	.19	.07	-.30	-.08	-.19	-.21	-.18	-.04	.27	.28	-	.24	.28
21. Internalization of thin ideal (SATAQ-4)	-.43	-.18	-.28	-.19	-.06	.18	.26	.11	.15	.48	.25	-.57	-.13	-.18	-.16	-.03	-.02	.08	.06	.22	-	.43
22. Internalization of muscular/athletic ideal (SATAQ-4)	-.27	.10	.05	.29	-.24	-.03	.30	.14	.08	.19	-.01	-.19	.06	-.29	-.13	.08	-.16	-.07	.41	.34	.36	-

Note. N (male) = 127; N (female) = 558. Below diagonal: sample of males, above diagonal: sample of females. The factors of the IES-2 are included as latent variables.

BMI = body mass index; $TFEQ-R21$ = Three-Factor Eating Questionnaire; MES = Mindful Eating Scale; $MHES$ = Motivation for Healthy Eating Scale; $SATAQ-4$ = Sociocultural Attitudes Towards Appearance Questionnaire.

^aAutonomous motivation includes the Intrinsic motivation, Integrated, and Identified regulation subscales.

^bControlled motivation consists of the External and Introjected regulation subscales.

Boldfaced coefficients are significant at least at $p < .05$.

Supplementary Table 2.

The Relationship between the Intuitive Eating Scale 2 Factors and their Validating Variables Including Different Eating Behavior Styles and BMI Categories as Dummy Variables. Results of the CFA with Covariates Analysis.

Predictors	Outcome variables			
	Unconditional Permission to Eat	Eating for Physical Rather than Emotional Reasons	Relying on Hunger and Satiety Cues	Body-Food Choice Congruence
Age	-.01	.00	-.06	-.00
Sex	.07	-.03	.09	-.04
Illness affecting diet	-.00	.01	.06	-.01
Overweight or Obese BMI	-.01	-.01	-.05	-.09
Underweight BMI	-.04	-.00	-.10	.03
Currently dieting	-.20	.01	-.03	.20
Dieting in the last year	-.10	-.03	-.04	.05
Uncontrolled Eating (TFEQ-R21)	.09	.05	-.10	-.09
Cognitive Restraint (TFEQ-R21)	-.63	.09	-.19	.39
Emotional Eating (TFEQ-R21)	-.05	-.87	-.20	-.09
Acceptance (MES)	.16	.08	.23	.27
Awareness (MES)	.07	.01	.23	.18
Non-reactivity (MES)	.10	.02	.04	-.08
Routine (MES)	.05	.00	.02	-.06
Acting with Awareness (MES)	-.10	.05	-.03	.00
Unstructured Eating (MES)	-.02	.02	.01	-.02
R^2	.82	.84	.40	.30

Note. Standardized regression coefficients. ($N = 705$). The factors of the IES-2 are included as latent variables. Sex is coded 0: male, 1: female. Dieting is coded 0: no dieting, 1: dieting, Underweight BMI is coded 0: normal weight, overweight or obese, 1: underweight. Overweight or obese BMI is coded 0: underweight or normal weight, 1: overweight or obese. Illness affecting diet is coded 1: doctor has ever told them they have an illness which requires watching one's diet, 0: doctor has never told them/they do not know if a doctor has never told them they have an illness which requires watching one's diet.

BMI = body mass index; *TFEQ-R21* = Three-Factor Eating Questionnaire; *MES* = Mindful Eating Scale. Bold-faced coefficients are significant at least at $p < .05$.

Supplementary Table 3.

The Relationship between the Intuitive Eating Scale 2 Factors and their Validating Variables Including Different Motivational Factors and BMI categories as dummy variables. Results of the CFA with Covariates Analysis.

Predictors	Outcome variables			
	Unconditional Permission to Eat (UPE)	Eating for Physical Rather than Emotional Reasons (EPR)	Relying on Hunger and Satiety Cues (RHSC)	Body-Food Choice Congruence (BFCC)
Age	-.10	.05	-.05	.08
Sex	.00	-.22	-.02	-.04
Illness affecting diet	-.09	-.00	.00	.01
Overweight or obese BMI	-.17	-.19	-.19	-.08
Underweight BMI	.07	.07	-.05	-.04
Amotivation for Healthy Eating (MHES)	.15	-.09	.05	-.04
Controlled Motivation for Healthy Eating ^a (MHES)	-.12	-.08	-.10	.03
Autonomous Motivation for Healthy Eating ^b (MHES)	-.26	.07	.25	.64
Internalization of thin ideal (SATAQ-4)	-.33	-.19	-.31	-.21
Internalization of muscular/athletic ideal (SATAQ-4)	-.11	.02	-.08	.06
R ²	.49	.16	.18	.49

Note. Standardized regression coefficients. (N = 686). Sex is coded as 0: male, 1: female. Underweight BMI is coded 0: not underweight, 1: underweight. Overweight or obese BMI is coded 0: underweight or normal weight, 1: overweight or obese. Illness affecting diet is coded 1: doctor has ever told them they have an illness which requires watching one's diet, 0: doctor has never told them/they do not know if a doctor has never told them they have an illness which requires watching one's diet.

MHES = Motivation for Healthy Eating Scale; *SATAQ-4* = Sociocultural Attitudes Towards Appearance Questionnaire.

^aControlled motivation consists of the External and Introjected regulation subscales.

^bAutonomous motivation includes the Intrinsic motivation, Integrated, and Identified regulation subscales. Boldfaced coefficients are significant at least at $p < .05$.

Supplementary Table 4*Definitions of the Main Eating Behavior-related Concepts of the Study.*

<u>Maladaptive eating behaviors</u>	Umbrella term covering eating behaviors that are regularly applied in response to eating cues other than physical hunger, as well as the routine of intentional avoidance of eating response in the presence of physical hunger signals.
Obesogenic eating behaviors	A group of eating behaviors that may lead to weight gain and obesity because of excessive food consumption and/or episodes of overeating.
<i>Uncontrolled eating / overeating</i>	"...loss of control over [food] intake.." (de Lauzon et al., 2004, p. 2372)
<i>Disinhibition</i>	"Disinhibition is the inability to maintain attention on food intake in the presence of other distracting information." (Dovey, 2010, p. 169)
<i>Emotional eating:</i>	"[...] the tendency to overeat in the presence of emotional distress..." (de Lauzon et al., 2004, p. 2372) "...or in an attempt to avoid focusing on especially strong or distressing emotions." (Dovey, 2010, p. 169)
<i>Restrained eating / Cognitive restraint:</i>	"[...] the tendency of some persons to restrict their food intake in order to control their body weight." (Stunkard & Messick, 1985, p. 71)
<i>Binge eating:</i>	"Binge eating is defined as eating a larger amount of food than normal during a short period of time (within any 2-hour period) and, during this time, experiencing a loss of control over eating." (Lo Coco & Ricardelli, 2018, p. 78)
<u>Adaptive eating behaviors</u>	"In the field of eating behavior, scholars have emphasized the need to define adaptive eating as more than the absence of disordered eating symptoms because its dimensions, benefits, and protective ability cannot be inferred by conceptualizing it as the lack of pathology." (Tylka, Eneli, Kroon Van Diest, & Lumeng, 2013, p. 58)
Non-diet approaches	"The non-diet approach emphasizes eating in response to physiological cues, i.e. using hunger and satiety as regulators of food intake as opposed to dietary restraint, and enhancing body acceptance, regardless of whether an individual is successful at weight control." (Bacon et al., 2002, p. 854)
<i>Intuitive eating</i>	Intuitive eating entails honoring hunger, respecting fullness, enjoying the pleasure of eating and making food choices without experiencing guilt or self-judgement (Tribble & Resch, 2003). "[...] three central features of intuitive eating: (a) unconditional permission to eat when hungry and what food is desired, (b) eating for physical rather than emotional reasons, and (c) reliance on internal hunger and satiety cues to determine when and how much to eat." (Tylka, 2006, p. 226)

	Experiencing eating and the food environment with an aware, open, accepting, and non-judgmental attitude, on purpose (Framson et al., 2009; Hulbert-Williams, Nicholls, Joy, & Hulbert-Williams, 2014; Mantzios, 2020).
Mindful eating	<i>"Mindful eating is the enjoyment of food utilizing all of the senses without judgment. The basic principles of mindful eating involve listening to internal cues of the body (ie, hunger and satiety) to avoid overconsumption and utilizing external cues (reducing portion sizes and distractions while eating, and eating slowly) to assist in achieving awareness." (Monroe, 2015, p. 217)</i>
Self-regulation of eating behaviors	<p><i>"The term self-regulation is often used to refer broadly to efforts by humans to alter their thoughts, feelings, desires, and actions in the perspective of such higher goals." (de Ridder & de Wit, 2006, p. 2)</i></p> <p><i>"Eating self-regulation can be defined as the attempt to manage dietary intake in a mindful, voluntary and self-directed way (e.g., to achieve and maintain energy balance or weight loss), within the context of other physiological and environmental constraints." (Carraça et al., 2011, p. 4)</i></p>
Autonomous motivation for healthy eating behavior	<p>Self-determined regulatory processes towards healthy eating behaviors (Pelletier, Dion, Slovinec-D'Angelo, & Reid, 2004).</p> <p><i>"[...] goal-directed activities...[that] are enacted with a full sense of volition and choice. Intrinsic motivation and well-internalized extrinsic motivation [i.e. integrated and identified regulation] are the bases for autonomous or self-determined behavior." (Deci & Ryan, 2000, p. 237)</i></p>
Controlled motivation for healthy eating behavior	<p>Non-self-determined regulatory processes towards healthy eating behaviors (Pelletier et al., 2004).</p> <p><i>"[...] behavior is considered controlled or non-self-determined to the extent that people feel pressured to do it. External and introjected regulations are the processes through which behavior is controlled." (Deci & Ryan, 2000, p. 237)</i></p>
Amotivation for healthy eating behavior	<i>"Amotivation refers to a state where individuals fail to perceive contingencies between their actions and the outcomes of their actions". (Pelletier et al., 2004, p. 249)</i>

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