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The Romanian Version of the Intuitive Eating Scale-2: Assessment of its Psychometric Properties and Gender Invariance in Romanian Adults

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# Abstract

The construct of intuitive eating is most often measured using the 23-item Intuitive Eating Scale-2 (IES-2). Here, we examined the psychometrics of a Romanian translation of the IES-2. Eight-hundred-and-thirty Romanian adults completed the IES-2 along with measures of positive body image, symptoms of disordered eating, and psychological well-being. Exploratory factor analyses (EFAs) with a split-half subsample (*n* = 420) indicated that IES-2 scores reduced to three factors in women and four in men, both of which diverged from the parent model. Confirmatory factor analysis with a second split-half sample (*n* = 410) indicated that the parent model had poor fit indices, whereas fit of the EFA-derived models were acceptable but not uniformly ideal. Scores on the 3-factor model – which had comparatively better fit of the models tested – had adequate internal consistency and evidenced scalar invariance across gender. However, evidence of test-retest reliability after four weeks (*n* = 205) was poor and evidence of construct validity, assessed through correlations with additional measures included in the survey, was weak at best. Based on these results, we question the degree to which the construct of intuitive eating can be applied to nations undergoing nutrition transitions.

**Keywords:** Intuitive eating; Psychometrics; Eating styles; Test adaptation; Romania

# 1. Introduction

*Intuitive eating* refers to a set of adaptive, healthy eating behaviours characterised by a reliance on internal hunger and satiety cues instead of situational and emotional cues (Tribole, 2017; Tribole & Resch, 2012; Tylka, 2006). The construct is theoretically grounded on the distinction between physical and emotional hunger, with the former being linked to an intrinsic ability to self-regulate food intake (Tribole, 2017). More specifically, individuals who eat intuitively are aware and trust their body’s physiological cues, give themselves unconditional permission to eat, are not preoccupied with food and dieting, and choose foods for the purpose of supporting or enhancing their body’s functioning (Tylka & Kroon Van Diest, 2013). A growing body of evidence indicates that intuitive eating is associated with lower body mass indices (e.g., Camilleri et al., 2016; Tylka et al., 2015) and weight stability (Tylka et al., 2020), as well as more positive psychological health (e.g., Homan & Tylka, 2018; Hazzard et al., 2020; Keirns & Hawkins, 2019; Tylka & Kroon Van Diest, 2013) and healthy eating behaviours (Barad et al., 2019; Craven & Fekete, 2019; Horwath et al., 2019; Soulliard & van der Wal, 2019).

To operationalise the construct of intuitive eating, Tylka (2006) developed the Intuitive Eating Scale (IES). This is a 21-item instrument measuring three facets of intuitive eating, namely *unconditional permission to eat* (i.e., an individual’s willingness to eat when hungry and a refusal to label certain foods as forbidden), *eating for physical rather than emotional reasons* (i.e., eating when one is physically hungry rather than to cope with emotional distress), and *reliance on hunger and satiety cues* (i.e., an individual’s trust in their internal hunger and satiety cues and reliance on these cues to guide eating behaviours). In college samples from the United States, Tylka (2006) reported that – following exploratory and confirmatory factor analyses – IES scores reduced to three factors with generally adequate psychometric properties. However, Tylka and Kroon Van Diest (2013) later identified several limitations with the IES, the most important of which were the absence of items measuring the facet of *gentle nutrition* (i.e., a tendency to make food choices that honour one’s health and body functioning) and the fact that most IES item reflect the absence of intuitive eating attitudes and behaviours rather than resistance to dieting and emotional eating.

With these limitations in mind, Tylka and Kroon Van Diest (2013) developed a revised version of the IES, known as the IES-2. To do so, they designed 17 new intuitive items to complement the original 21 items. In exploratory factor analyses (EFAs) with college students from the United States, these authors extracted 23 items that clustered in four factors, namely Eating for Physical Rather Than Emotional Reasons (8 items), Unconditional Permission to Eat (6 items), Reliance on Hunger and Satiety Cues (6 items), and Body-Food Choice Congruence (3 items). A confirmatory factor analysis (CFA) with college students from the United States indicated that the 4-factor model with a higher-order IES-2 score had adequate fit. In addition, scores on this model were largely invariant across gender, with men having significantly higher scores than women. Finally, Tylka and Kroon Van Diest (2013) also reported that IES-2 scores had adequate internal consistency coefficients, good test-retest reliability across a 3-week period, and adequate construct validity as determined through positive associations with body appreciation, self-esteem, and life satisfaction, as well as negative associations with eating disorder symptomatology, interoceptive awareness, body shame, and body mass index (BMI) (Tylka & Kroon Van Diest, 2013).

One concern with the parent study reporting on the development of the IES-2 was the reliance on samples of college students. To wit, studies with Black (Khalsa et al., 2019) and Latina (Madanat et al., 2020; see also Saunders et al., 2018) participants from the community in the United States have suggested that IES-2 scores reduce to five or six dimensions. Other studies have examined the factor structure of IES-2 outside the United States and likewise indicate difficulties confirming the 4-factor model of IES-2 scores. For example, CFA results with data from an online sample of French adults failed to confirm the expected 4-factor structure (Camilleri et al., 2015), with EFA instead supporting the extraction of 18 items clustered in three factors that mapped those found in the IES. Using CFA, Camilleri and colleagues (2015) reported that this 3-factor model, with an additional higher-order intuitive eating factor, had adequate fit. Similarly, in a sample of Malaysian adults, the results of EFAs indicated that IES-2 scores reduced to 4 factors (with 17 items) in women and 3 factors (with 15 items) in men, both of which diverged from the parent model (Swami, Todd et al., 2020). The results of a CFA failed to confirm the parent 4-factor model and indices for the EFA-derived models were acceptable but not ideal. Of the models tested, the EFA-derived 3-factor model had the best fit indices, but it was not possible to fit a 3-factor model with a higher-order factor (Swami, Todd et al., 2020).

On the other hand, several CFA-based studies have indicated adequate fit of the parent 4-factor model in a German-speaking university sample from Luxembourg, Germany, and Switzerland (van Dyck et al., 2016), a German community sample (Ruzanska & Warschburger, 2017), Portuguese mixed student-and-community samples (Duarte et al., 2016), community samples of French-Canadian adults (Carbonneau et al., 2016), and a Turkish university sample (Bas et al., 2017). Similarly, studies with a student-and-community sample from Brazil (da Silva et al., 2020) and a Turkish university sample (Akırmak et al., 2020) have supported the 4-factor model of IES-2 scores, albeit following the removal of several items. However, as discussed by Swami, Todd and colleagues (2020), many studies have typically privileged CFA over EFA in their analytic strategies. Given that CFA is not an appropriate tool for testing whether alternative models that have not been hypothesised fit the data better (for a discussion, see Swami & Barron, 2019), it is quite possible alternative, better-fitting models may exist for populations where the results of CFAs support the parent 4-factor model.

Beyond issues of dimensionality, other psychometric indices of the IES-2 are generally well-supported in diverse national groups. For example, internal consistency coefficients of total scores and/or IES-2 subscale scores have generally been adequate (but see Swami, Todd et al., 2020) and, test-retest reliability has been adequate where assessed (Akırmak et al., 2020; Camilleri et al., 2015; Carbonneau et al., 2016; Duarte et al., 2016). Likewise, the available evidence generally supports the construct validity of IES-2 scores across national groups, with significant associations being reported between greater intuitive eating and lower eating disorder symptomatology (e.g., Akırmak et al., 2020; Carbonneau et al., 2016; Duarte et al., 2016; Ruzanska & Warschburger, 2017), lower BMIs (e.g., da Silva et al., 2019; Duarte et al., 2016), more positive body image (e.g., Carbonneau et al., 2016; da Silva et al., 2020; Duarte et al., 2016), and higher psychological well-being (e.g., Akırmak et al., 2020; Camilleri et al., 2015; Carbonneau et al., 2016; Ruzanska & Warschburger, 2017). The one exception was the work of Swami, Todd and colleagues (2020) with Malaysian adults, where evidence of construct validity was weak, which led these authors to question whether the construct of intuitive eating can be meaningfully applied to non-Western populations.

## 1.1. The Romanian Context

In the present study, we sought to contribute to the international literature on intuitive eating by examining the factor structure and psychometric properties of a Romanian translation of the IES-2. We suggest this is important for a number of reasons. First, from a practical point-of-view, the IES-2 appears to have been previously used to operationalise the construct of intuitive eating in Romanian populations (Ivanoff, 2018) without first establishing that scores on the instrument are reliable and valid for the target population. This is problematic because doing so risks introducing artefactual results into the body of research on intuitive eating (i.e., results may not be supported if future studies find that the IES-2 lacks robust estimates of validity and reliability for the target population; Swami & Barron, 2019). More generally, studies examining issues of intuitive eating have been heavily focused on North American and Western European samples, and the lack of population diversity in the empirical literature risks privileging a culturally-limited perspective in terms of future theory development (Swami, Todd et al., 2020).

Beyond these practical considerations, there is value in examining the construct of intuitive eating in Romania for several reasons. Following the period of transition from centralised to a more market-oriented economy, Romania has experienced a rapid transformation in its food consumption practices: the food profile of the majority of Romanians now resembles that of Western Europeans (i.e., high intake of fat, sugars, and processed foods combined with low intake of fruits and vegetables) (Lotrean et al., 2018). In contrast to Western European diets, however, both food quality (Voinea et al., 2019) and nutritional knowledge (Putnoky et al., 2020) in Romania remains relatively poorer (Voinea et al., 2019), and depressed monthly incomes have meant that consumer choice is often funnelled toward unhealthy diets (Banu et al., 2010). This has contributed to a rapid increase in the prevalence of adult overweight (about 31%) and obesity (about 21%), particularly among middle-aged groups (Roman et al., 2015). Some scholars have suggested that these changes can be traced back, in part at least, to the growth of a first “fast-food generation” in Romania following market liberalisation, for whom excess calorie intake and sedentary lifestyles are now the norm (Pantea Stoian et al., 2018). More recently, however, it has been possible to identify the start of a possible new transition, with Romanian consumers increasingly concerned about what they eat and the health effects of food consumption (Jităreanu et al., 2017), although Romanian mass media continue to over-emphasise emotional aspects (e.g., focusing on health and disease outcomes of eating, rather than scientific evidence of nutrition) of eating and food in advertising (Marinescu, 2019).

## 1.2. The Present Study

In short, Romania offers an interesting national context – one undergoing rapid transformation in its eating habits and behaviours – in which to examine the construct of intuitive eating. As such, a first objective of the present study was to examine the factor structure of IES-2 scores in a sample of Romanian adults. Following best-practice recommendations (Swami & Barron, 2019; Worthington & Whittaker, 2006), we adopted an EFA-to-CFA analytic strategy, which allowed us to explore and then confirm the best-fitting model of IES-2 scores for our target population. That is, unlike previous studies that have relied solely on CFA, the use of an EFA-to-CFA strategy allowed us to consider item behaviour in our sample and examine the fit of all hypothesised and data-driven models. Following the results of all translational studies that have used EFA as a first analytic step (Camilleri et al., 2015; Madanat et al., 2020; Swami, Todd et al., 2020), we were doubtful that we would find evidence of the parent 4-factor structure with a higher-order component, although we nevertheless intended to examine the fit of this model using CFA alongside any model derived through EFA.

In addition, we also examined the extent to which our final model of IES-2 would be invariant at the configural, metric, and scalar levels between women and men. This is important, firstly, because multi-group scalar or partial scalar invariance is a precondition of between-group comparisons on latent scores (Chen, 2007) and, secondly, because only three previous translational studies have specifically examined multi-group invariance with mixed results: two studies have supported full scalar invariance across gender (Duarte et al., 2016; Swami, Todd et al., 2020), while a third reported only finding metric invariance (da Silva et al., 2020). Here, we also examined test-retest reliability after four weeks and considered the construct validity of IES-2 scores through associations with scores on measures of positive body image (i.e., body appreciation), disordered eating, and psychological well-being (i.e., self-esteem and subjective happiness). These constructs were selected on the basis of significant associations reported in the parent study, as well as the availability of previously translated and validated measures in Romanian. Evidence of construct validity would be established through minimally moderate and significant positive correlations between IES-2 scores and measures of positive body image and psychological well-being, and significant negative correlations with indices of disordered eating. We also assessed convergent validity through associations with self-reported BMI, with the expectation that IES-2 scores would be significantly and negatively correlated with BMI.

# 2.1. Method

## 2.1. Participants

### **2.1.1. Main sample.**

Participants of the main study consisted of an online sample of 491 women and 339 men recruited from Romania. Participants ranged in age from 17 to 78 years (*M* = 26.88, *SD* = 10.88) and in self-reported BMI from 15.24 to 48.48 kg/m2 (*M* = 23.63, *SD* = 4.38). All participants were ethnic Romanians and, in terms of educational qualifications, 20.2% had completed minimum secondary schooling, 50.7% had an undergraduate degree, 12.3% had a postgraduate degree, and 16.7% had some other qualification. In terms of religion, 76.0% reported being Eastern Orthodox, 7.2% were Catholic, 6.5% were atheists, and the remainder were of another denomination. These participants completed all the measures listed below.

### 2.1.2. Test-retest sample.

The test-retest sample consisted of 153 women and 52 men. These participants ranged in age from 18 to 64 years (M = 24.98, SD = 9.26) and in self-reported BMI from 16.16 to 36.13 kg/m2 (M = 23.12, SD = 4.30). These participants completed the IES-2 at two time-points four weeks apart.

## 2.2. Measures

### 2.2.1. Intuitive eating.

Participants were asked to complete a Romanian translation of the 23-item IES-2 (Tylka & Kroon Van Diest, 2013). All items were rated on a 5-point scale, ranging from 1 (*strongly disagree*; Romanian: *dezacord puternic*) to 5 (*strongly agree*; Romanian: *acord puternic*). The translation procedure is described in Section 2.3 and the IES-2 items in English and Romanian are reported in Appendix 1.

### 2.2.2. Positive body image.

To measure a facet of positive body image, we used the Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015; Romanian translation: Swami et al., 2017). This is a 10-item scale that assesses acceptance of one’s body, respect and care for one’s body, and protection of one’s body from unrealistic beauty standards. All items were rated on a 5-point scale, ranging from 1 (*never*) to 5 (*always*), and an overall score was computed as the mean of all items. Higher scores on this scale reflect greater body appreciation. Scores on the Romanian version of the BAS-2 have been shown to be 1-dimensional and to have adequate internal consistency, construct validity, and test-retest reliability across a 3-week period (Swami et al., 2017). In the present study, internal consistency as assessed using McDonald’s omega (ω) for BAS-2 scores was .94 (95% CI = .93, .95).

### 2.2.3. Symptoms of disordered eating.

To assess symptoms of disordered eating, we used the Body Image Screening Questionnaire for Eating Disorder Early Detection (BISQ; Jenaro et al., 2011; Romanian translation: Tomsa et al., 2012). The BISQ is a 24-item scale that measures symptomatology of disordered eating along five dimensions, namely bulimia, anorexia, orthorexia, perception of obesity, and muscle dysmorphia. All items were rated on a 6-point scale (1 = *Never*, 6 = *Always*). Internal consistency coefficients for subscale scores on the Romanian BISQ have been shown to be less-than-adequate, while total scores have adequate reliability and discriminant validity (Tomsa et al., 2012). We, therefore, computed a total score as the mean of all items, following reverse-coding of five items. Higher scores on this scale reflect greater eating disorder symptomatology. Omega for the total score in the present study was .87 (95% CI = .86, .88).

### 2.2.4. Self-esteem.

The survey package included the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Romanian translation: Schmitt & Allik, 2005), a 10-item measure of global self-evaluations of worth as a human being. All items were rated on a 4-point scale (1 = *Definitely disagree*, 4 = *Definitely agree*) and an overall score was computed as the mean of all 10 items, following reverse-coding of five items. Higher scores on this scale reflect greater self-esteem. The Romanian version of the RSES has evidenced factorial validity (Schmitt & Allik, 2005) and patterns of convergent validity (e.g., Sava et al., 2011). In the present study, ω for this scale was .87 (95% CI = .86, .88).

### 2.2.5. Subjective happiness.

To assess subjective happiness, we used the Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999; Romanian translation: Swami et al., 2017). This is a 4-item measure that assesses the degree to which respondents consider themselves to be happy or unhappy persons. Items on the scale were rated on a 7-point scales with various anchors. A total score was computed as the mean of all items, with higher scores reflecting greater subjective happiness. Swami and colleagues (2017) reported that Romanian SHS scores are 1-dimensional, with adequate internal consistency coefficients. In the present study, ω for this scale was .83 (95% CI = .79, .87).

### 2.2.6. Body mass index.

We asked participants to self-report their height and weight information, and these data were used to compute BMI as kg/m2.

### 2.2.7. Demographics.

We requested demographic details consisting of gender identity, age, educational qualifications, and religion.

## 2.3. Test Adaptation

The IES-2 was translated from English into Romanian (*limba română* or лимба ромынэ in Moldovan Cyrillic) using the 5-stage procedure proposed by Beaton, Bombardier, Guillemin, and Ferraz (2000). In a first step, two translators – one informed, the other uninformed – independently forward-translated the IES-2 items from English to Romanian. In a second step, the two translations were scrutinised by a third independent and blind translator, who resolved discrepancies between the translations and produced a synthesised translation. In a third step, two new independent translators who were naïve to the IES-2 back-translated the synthesised translation into English (Brislin, 1970). In a fourth step, the forward- and back-translations were examined by a bilingual committee comprising all the aforementioned translators and three bilingual authors of the present study. This step did not highlight any concerns with the translations, so we proceeded to the final step in which a pre-final version of the IES-2 was pre-tested in a sample of 31 individuals (women *n* = 15, men *n* = 16) who broadly matched the target sample. These participants were asked to rate each item for understanding on a 5-point scale (1 = *do not understand at all*, 5 = *understanding completely*). The mean responses per item were then assessed (overall *M* = 4.63, *SD* = 0.47, range = 4.29-4.92) and, given the high ratings for all items, no further revisions were made to item content. The items of the final translation used in the present study are reported in Appendix 1.

## 2.4. Procedures

All research was conducted in accordance with the principles of the Declaration of Helsinki and ethics approval was obtained from departmental ethics committee at the West University of Timișoara (approval code: 260/8.01.2020). Participants were recruited via advertisements placed on social media sites and through word-of-mouth via the researchers’ social networks. Inclusion criteria included being a Romanian citizen, Romanian resident, and being of Romanian ethnicity. The project was advertised as a study about “eating styles and behaviours” and all potential participants were provided with further information about the study requirements, including an estimated duration of survey completion. Participants who agreed to take part provided digital informed consent before being asked to complete an online questionnaire containing the scales listed above in a predetermined order (IES-2, RSES, BISQ, SHS, BAS-2, and demographics last). All data were collected between February and April 2020. IP addresses were examined to ensure that no participant took the survey more than once. The questionnaire was anonymous and participants took part on a voluntary basis and without remuneration. Upon completing the questionnaire, participants were asked to provide their email addresses if they were willing to be contacted for a future study and were debriefed.

Four weeks after initial testing, a randomly-selected subsample of 250 participants were invited to complete a follow-up questionnaire. Of these participants, 205 agreed and completed only the IES-2 following the same procedures as above. Unique codes were generated to link test and retest data, and these along with email addresses were destroyed prior to analyses. All retest participants took part on a voluntary basis and did not receive any remuneration. At the end of this testing session, participants were provided with debriefing information about this portion of the project.

## 2.5. Analytic Strategy

### 2.5.1. Data treatment.

There were no missing responses in the dataset and improbable BMI values (< 12 and > 50 kg/m2; *n* = 6) were recoded as missing data and replaced using the mean replacement technique. To examine the factor structure of the IES-2, we used the EFA-to-CFA analytic method recommended by Swami and Barron (2019). To ensure adequate sample sizes for both EFA and CFA, we first split the main sample using a computer-generated random seed, resulting in one split-half for EFA (women *n* = 253, men *n* = 167) and a second split-half for CFA (women *n* = 238, men *n* = 172). There were no significant differences between the two subsamples in terms of mean age and BMI, as well as the distribution of genders, ethnic groups, and religious groups (all *p*s > .067; full results are omitted here for brevity but are available from the corresponding author).

### 2.5.2. Exploratory factor analysis.

Data from the first split-half were subjected to principal-axis EFA using the *psych* package (Revelle, 2019) in *R* (*R* Development Core Team, 2014). Because we could not rule out the possibility of gendered differences in factor structure, the EFAs were run separately for women and men. This analytic strategy is also consistent with the EFAs run separately by gender in the parent study (Tylka & Kroon Van Diest, 2013). To assess subsample size adequacy, we used Worthington and Whittaker’s (2006) item-communality requirement, namely that sample sizes of 150-200 are adequate if item communalities are ≥ .50 or there are 10:1 items per factor with factor loadings of about .40. In the present study, item communalities were ≥ .55 in women and ≥ .53 in men. To determine whether our data were factorable, we computed the Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett’s test of sphericity. For the EFAs, we followed Tylka and Kroon Van Diest (2013) in applying a direct oblimin rotation, with a delta weight of zero, so as to allow for moderate relationships between the factors. The number of factors to be extracted was determined using parallel analysis (Hayton et al., 2004), which works by creating a random dataset with the same number of cases and variables as the actual dataset. Factors in the actual data are only retained if their eigenvalues are greater than the eigenvalues from the random data (Hayton et al., 2004). Item retention was based on Comrey and Lee’s (1992) recommendation that items with “fair” loadings (i.e., ≥ .33) should be retained and that cross-loading items (i.e., items that had loadings of ≥ .33 on more than one factor) should be omitted. Finally, the degree of factor similarity across women and men was assessed using Tucker’s (1951) congruence coefficient, with values between .85 and .94 corresponding to fair similarity across groups and values ≥ .95 suggesting that factor structures can be considered equal across groups (Lorenzo-Seva & ten Berge, 2006).

### 2.5.3. Confirmatory factor analysis.

Data from the second split-half were subjected to CFA using the *lavaan* (Rosseel, 2012), *semTools* (Jorgensen et al., 2018), and *MVN* packages (Korkmaz et al., 2014) with *R* (*R* Development Core Team, 2014). Based on a proactive Monte Carlo simulation, Swami, Todd and colleagues (2020) previously reported that a minimum sample size of 386 is required for CFA, which was surpassed in our study. Our analytic plan consisted of testing the fit of the 4-factor model with a higher-order factor proposed by Tylka and Kroon Van Diest (2013) and, if discrepant, the model(s) that emerged from our EFAs. Analyses were conducted with the total sample and gender invariance examined separately (see Section 2.5.4). Assessment of the present data for normality indicated that they were neither univariate (Sharipo-Wilks *p* < .001) nor multivariate normal (Mardia’s skewness = 5118.22, *p* < .001, Mardia’s kurtosis = 36.03, *p* < .001), so parameter estimates were obtained using the robust maximum likelihood method with the Satorra-Bentler correction (Satorra & Bentler, 2001). To assess goodness-of-fit, we used the normed model chi-square (χ²/df; values < 3.0 considered indicative of good fit; Hu & Bentler, 1999), the Steiger-Lind root mean square error of approximation (RMSEA) and its 90% CI (values close to .06 considered to be indicative of good fit and up to .08 indicative of adequate fit; Steiger, 2007), the standardised root mean square residual (SRMR; values < .09 indicative of good fit; Hu & Bentler, 1999), the comparative fit index (CFI; values close to or > .95 indicative of adequate fit; Hu & Bentler, 1999), the Tucker-Lewis index (TLI; values close to or > .95 indicative of good fit; Hu & Bentler, 1999), and Bollen’s Incremental Fit Index (BL89; values close to or > .95 indicative of good fit; Hu & Bentler, 1999). Akaike’s Information Criterion (AIC) was used as an index of comparative fit, with lower values preferable.

### 2.5.4. Multi-group invariance.

Using data from the second split-half, we used multi-group CFA (Chen, 2007) to assess measurement invariance at the configural, metric, and scalar levels for gender. Configural invariance implies that the latent IES-2 variables and the pattern of loadings of the latent variables on indicators are similar across groups (i.e., the unconstrained latent model should fit the data well in all groups). Metric invariance implies that the magnitude of the loadings is similar across groups and is tested by comparing two nested models consisting of a baseline model and an invariance model. Because the Δ*χ*² statistic is overly stringent criterion invariance (Meade et al., 2008), we used ΔCFI < .01 as an indicator of metric invariance (Cheung & Rensvold, 2002). Finally, scalar invariance implies that both the item loadings and item intercepts are similar across groups and is examined using the same nested-model comparison strategy as with metric invariance (Chen, 2007). For scalar invariance, Chen (2007) suggested that invariance is supported when ΔCFI < .01 *and* ΔRMSEA < .015 *or* ΔSRMR < .030, although other scholars suggest that ΔCFI < .01 is sufficient (Cheung & Rensvold, 2002).

### 2.5.5. Further analyses.

To assess internal consistency, we computed ω and its associated 95% CI, with values greater than .70 reflecting adequate internal reliability (Dunn et al., 2014). In the CFA portion of the dataset, evidence of convergent validity was assessed using the Fornell-Larcker criterion (Fornell & Larcker, 1981), with average variance extracted (AVE) values of ≥ .50 considered adequate (Malhotra & Dash, 2011) and meaning that a latent variable is able to explain more than half of the variance of its indicators on average. We aimed to examine gender differences in IES-2 scores using a multivariate analysis of variance (MANOVA) with follow-up univariate ANOVAs only if scalar or partial scalar invariance were established (see above). Test-retest was examined using intraclass correlation coefficients and paired-samples *t*-tests to estimate the stability of IES-2 scores. Finally, to assess construct validity, we used the total sample and examined bivariate correlations between IES-2 scores and scores for body appreciation, symptoms of disordered eating, self-esteem, subjective happiness, and BMI.

# 3. Results

## 3.1. Exploratory Factor Analysis

### 3.1.1. Female subsample.

For the female subsample from the first split-half (*n* = 253), Bartlett’s test of sphericity, χ2(253) = 3354.5, *p* < .001, and the KMO measure of sampling adequacy, KMO = .87, indicated that the IES-2 items had adequate common variance for factor analysis. Parallel analysis indicated that three factors from the actual data had λ greater than the criterion λ generated from the random data (i.e., λ1 7.61 > 1.61, λ2 3.16 > 1.49, λ3 2.28 > 1.42). The two remaining factors derived from the actual data had an λ that was lower than the corresponding criterion λ generated from the random data (i.e., λ4 1.27 > 1.34, λ5 1.15 > 1.29). As such, we retained three factors, which explained 50.0% of the common variance. The fit indices for this model were: χ2(187) = 745.18, *p* < .001, CFI = .820, TLI = .754, RMSEA = .109 (90% CI = .101, .117), SRMR = .06, BIC = -289.56. As reported in Table 1, all 23 items had minimally “fair” factor loadings based on Comrey and Lee’s (1992) standards.

In this subsample, Items #3, 18, 19, and 20 showed cross-loadings >.33, which is indicative of item redundancy and so were eliminated from the model (Tabachnick & Fidell, 2007). The first factor comprised all items from the Reliance on Hunger and Satiety Cues subscale (Items #6, 7, 8, 21, 22, and 23) and scores had adequate internal consistency (ω = .91, 95% CI = .88, .93). The second factor comprised all items from the Eating for Physical Rather Than Emotional Reasons subscale (Items #2, 5, 10, 11, 12, 13, 14, and 15) and scores had adequate internal consistency (ω = .91, 95% CI = .88, .92). Finally, five of the Unconditional Permission to Eat items loaded onto the third factor (Items #1, 4, 9, 16, and 17) and scores had adequate internal consistency (ω = .76, 95% CI = .70, .81).

### 3.1.2. Male subsample.

For the male subsample from the first split-half of participants (*n* = 167), Bartlett’s test of sphericity, χ2(253) = 1849.8, *p* < .001, and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, KMO = .80, indicated that the IES-2 items had adequate common variance for factor analysis. The results of the EFA revealed 6 factors with λ > 1.0, but parallel analysis indicated that 4 factors should be extracted: only the first 4 factors from the actual data had λ greater than the criterion λ generated from the random data (i.e., λ1 5.80 > 1.75, λ2 3.65 > 1.62, λ3 2.35 > 1.52, λ4 1.53 > 1.42). The remaining 2 factors derived from the actual data had an λ that was lower than the corresponding criterion λ generated from the random data (i.e., λ5 1.20 < 1.36, λ6 1.10 < 1.25). As such, we retained 4 factors, which explained 46.8% of the common variance. The fit indices for this model were: χ2(167) = 442.35, *p* < .001, CFI = .828, TLI = .734, RMSEA = .099 (90% CI = .088, .111), SRMR = .06, BIC = -412.35. Twenty-two of the 23 item had minimally “fair” factor loadings, and one item did not load onto any of the four factors (Item #15).

In this subsample, Item #3 showed cross-loadings >.33, and Item #15 did not load onto any of the 4 factors. The first factor comprised all items from the Reliance on Hunger and Satiety Cues subscale (Items #6, 7, 8, 21, 22, and 23) and scores had adequate internal consistency (ω = .88, 95% CI = .84, .92). The second factor combined five Unconditional Permission to Eat items (Items #1, 4, 9, 16, and 17), and all items from the Body-Food Choice Congruence subscale (Items #18, 19, and 20). As such, we considered this factor to be an amalgamation of the aforementioned subscales, and scores had adequate internal consistency (ω = .70, 95% CI = .55, .81). The third factor included four Eating for Physical Rather Than Emotional Reasons items (Items #2, 5, 10, and 11), and scores had adequate internal consistency (ω = .83, 95% CI = .76, .87). Finally, the fourth factor comprised three Eating for Physical Rather Than Emotional Reasons items (Items #12, 13, and 14), and scores had adequate internal consistency (ω = .77, 95% CI = .68, .83).1

### 3.1.3. Factor structure congruence and summary.

The factor loadings reported in Table 1 for the female and male subsamples suggest a fair degree of similarity across factor structures. The first factor (the Reliance on Hunger and Satiety Cues subscale) was consistent across both the male and female subsamples in terms of the items retained (Tucker’s congruence coefficient = .95, indicating equivalent factor structure). Tucker’s congruence coefficient for the remaining factors in the EFA-derived models was suggestive of factor-structure divergence (.54 to .94). In short, the EFAs point to two models – a 4-factor model comprising 21 items for men and a 3-factor model comprising 18 items in women – that differed substantially from the parent factor structure proposed by Tylka and Kroon Van Diest (2013). For this reason, we tested for model fit of both of these models alongside the parent model in our CFA analyses.

## 3.3. Confirmatory Factor Analysis

### 3.3.1. Parent model.

In the second split-half sample (*n* = 410), we first attempted to examine the fit of Tylka and Kroon Van Diest’s (2013) 4-factor, multi-level model. However, after 5763 iterations, a stable CFA solution for the model was not achievable. Next, we examined the fit of the parent model without the higher-order intuitive eating factor. For this model, fit indices were suggestive of poor fit to the data: SBχ²(224) = 794.429, SBχ²normed = 3.55, robust RMSEA = .088 (90% CI = .081, .095), SRMR = .076, robust CFI = .853, robust TLI = .834, BL89 = .857, AIC = 25067.27. Suggested modification indices were consulted to improve model fit, with modifications being based on correlations among like items from the same factor (Schumacker & Lomax, 2004). Despite successively freeing up to 3 error covariances per subscale, in accordance with the results from likelihood ratio tests (see Table 2), the fit indices remained below acceptable levels on some indices: SBχ²(217) = 461.901, SBχ²normed = 2.13, robust RMSEA = .057 (90% CI = .050, .064), SRMR = .073, robust CFI = .938, robust TLI = .928, BL89 = .939, AIC = 24639.42.

### 3.3.2. EFA-derived 4-factor model.

Second, we examined the fit of the EFA-derived 4-factor model from the male subsample. Fit indices were indicative of a poor model fit: SBχ²(183) = 926.171, SBχ²normed = 5.06, robust RMSEA = .110 (90% CI = .103, .117), SRMR = .115, robust CFI = .798, robust TLI = .768, BL89 = .800, AIC = 23336.511. Therefore, modification indices were consulted to improve model fit (see Table 2). Error covariances were successively freed based on assumed correlations among like items from the same factor. These modifications resulted in an improved model fit, although values for SRMR, CFI, TLI, and BL89 were still less-than-adequate: SBχ²(178) = 490.494, SBχ²normed = 2.76, robust RMSEA = .071 (90% CI = .063-.078), SRMR = .105, robust CFI = .918, robust TLI = .903, BL89 = .916, AIC = 22797.98. We also examined the fit of the EFA-derived 4-factor model with the additional constraint of a higher-order intuitive eating factor. However, after 1240 iterations, a stable CFA solution for the model was not achievable.

### 3.3.3. EFA-derived 3-factor model.

Finally, we examined the fit of the EFA-derived 3-factor model. For this model, fit indices were: SBχ²(132) = 578.874, SBχ²normed = 4.39, robust RMSEA = .103 (90% CI = .095, .112), SRMR = .074, robust CFI = .852, robust TLI = .829, BL89 = .864, AIC = 20023.938. As indices were less-than-adequate, suggested modification indices were again considered to improve model fit. Error covariances were freed at a rate of up to three per subscale, in accordance with the results from likelihood ratio tests (see Table 2) and based on assumed correlations among like items from the same factor. This resulted in an improved fit, although some indices remained below adequate thresholds: SBχ²(126) = 296.938, SBχ²normed = 2.36, robust RMSEA = .063 (90% CI = .054, .073), SRMR = .068, robust CFI = .947, robust TLI = .937, BL89 = .948, AIC = 19644.01. Finally, we examined the fit of the EFA-derived 3-factor model from the male subsample, with the additional constraint of a higher-order intuitive eating factor. However, after 640 iterations, a stable solution was not achievable.

### 3.3.4. Summary and further analyses.

The CFA analyses indicated that three models (the parent model without a higher-order factor, the EFA-derived 4-factor model, and the EFA-derived 3-factor model) had acceptable fit on some indices, but less-than-adequate fit on other indices. However, comparison of AIC values indicated that the 3-factor model was the model that was least likely to be over- and under-fitted (Burnham & Anderson, 2003). Based on the suggestion that fit thresholds should not be applied rigidly (Swami & Barron, 2019), we elected to use the 3-factor model in all further analyses (see Figure 1). Convergent validity for this model was slightly below adequate, as while AVE was .52 for Eating for Physical Rather Than Emotional Reasons, and .59 for Unconditional Permission to Eat, it was < .50 for Reliance on Hunger and Satiety Cues (AVE = .44). In the second split-half sample, ω for Eating for Physical Rather Than Emotional Reasons scores was .89 (95% CI = .86, .91) in women and .90 (95% CI = .86, .92) in men. Omega for Unconditional Permission to Eat scores was .78 (95% CI = .73, .82) in women and .79 (95% CI = .72, .84) in men, and ω for Reliance on Hunger and Satiety Cues scores was .91 (95% CI = .88, .93) in women and .89 (95% CI = .85, .92) in men.

## 3.4. Gender Invariance

Next, we tested for measurement invariance across gender for the second split-half subsample, based on the EFA-derived, 3-factor model. As reported in Table 3, all indices suggested that configural, metric, and scalar invariance were supported across gender. Based on the observation of scalar invariance, we computed a MANOVA with gender as the independent variable and the three IES-2 factor scores as the dependent variable, using the total sample. The results indicated a significant main effect of gender, *F*(3, 826) = 11.51, *p* < .001, Wilk’s λ = .96, ηp2 = .04. Inspection of the univariate resulted indicated that men had significantly higher scores on Reliance on Hunger and Satiety Cues than women (women *M* = 3.83, *SD* = 0.87; men *M* = 3.98, *SD* = 0.82), *F*(1, 828) = 6.56, *p* = .011, ηp2 < .01. On the other hand women had significantly higher scores than men on Eating for Physical Rather Than Emotional Reasons (women *M* = 3.20, *SD* = 0.49; men *M* = 3.07, *SD* = 0.47), *F*(1, 828) = 15.82, *p* < .001, ηp2 = .02. Women also had significantly higher scores than men on Unconditional Permission to Eat (women *M* = 3.20, *SD* = 0.52; men *M* = 3.05, *SD* = 0.55), *F*(1, 828) = 16.52, *p* < .001, ηp2 = .02.

## 3.5. Test-Retest Reliability

For Reliance on Hunger and Satiety Cues, the intraclass correlation was .59 (CI = .46, .69) and mean scores were not significantly different across the first (*M* = 3.77, *SD* = 0.86) and second (*M* = 3.84, *SD* = 0.75) testing sessions, *t*(203) = 1.03, *p* = .303. The intraclass coefficient for on Eating for Physical Rather Than Emotional Reasons was .54 (CI = .39, .65) and mean scores were significantly different across the first (*M* = 3.19, *SD* = .0.42) and second testing sessions (*M* = 3.11, *SD* = .0.46), *t*(203) = 2.16, *p* = 0.32. Finally, the intraclass coefficient for Unconditional Permission to Eat was .61 (CI = .53, .71) and there was no significant different in mean scores across the first (*M* = 3.14, *SD* = .0.51) and second testing sessions (*M* = 3.08, *SD* = .0.52), *t*(203) = 1.77, *p* = 0.78.

## 3.6. Construct validity.

We examined the construct validity of the 3-factor model of IES-2 scores through correlations with scores on additional measures included in the present study, using the total sample. Because the 3-factor model was derived from the EFA with women, we examined construct validity separately for women and men. The table of inter-correlations is reported in Table 4. The three IES-2 factors were only weakly inter-correlated in both women and men. In addition, inter-correlations between the IES-2 factors and the additional variables included in the present study were generally weak in both women and men. Of particular note, most of the inter-correlations between the additional variables and Unconditional Permission to Eat in both genders and Eating for Physical Rather Than Emotional Reasons in men did not reach significance. For exploratory purposes, we also examined associations between the IES-2 factor scores and age, but – aside from the association between age and Eating for Physical Rather Than Emotional Reasons in women (*r* = -.10, *p* = .026) – all associations did not reach significance.

# 4. Discussion

The IES-2 has emerged as a widely-used instrument for operationalising the construct of intuitive eating in diverse social identity groups. As a contribution to extant knowledge, we examined the psychometric properties of a novel Romanian translation of the IES-2. Overall, the results of our work provide limited support for the psychometric properties of this instrument in Romanian adults. Specifically, our factor analyses resulted in a factor structure that diverged from the parent 4-factor model, with our final, 3-factor model also not demonstrating adequate fit on all indices. In addition, evidence of test-retest reliability after four weeks was poor and evidence of construct validity was limited. On a more positive note, we were able to demonstrate that scores on the 3-factor model of Romanian IES-2 scores had adequate internal consistency and evidenced scalar invariance across gender. We discuss each of these findings and their implications below.

First, in terms of factorial validity, we were unable to find support for the parent, 4-factor model of IES-2 scores as proposed by Tylka and Kroon Van Diest (2013). Instead, based on our EFAs, we derived two gender-specific models – an 18-item model with 3 factors and a 21-item model with 4 factors, both without a higher-order factor – that showed better fit than the parent, 4-factor model. Of the two EFA-derived models, we proceeded with the 3-factor model based on its relatively better comparative fit (i.e., based on AIC values), although it should be noted that all three models that we tested did not evidence adequate fit along all dimensions. In broad outline, these findings are consistent with previous studies with French (Camilleri et al., 2015) and Malaysian adults (Swami, Todd et al., 2020), as well as ethnic minority groups in the United States (Khalsa et al., 2019; Madanat et al., 2020; Saunders et al., 2018), which have reported difficulties replicating the parent model of IES-2 scores. Given these findings, a closer look at the specific factor structure of Romanian IES-2 scores is warranted.

A first important point to note is that our 3-factor model appears to index three core intuitive constructs, namely Reliance on Hunger and Satiety Cues, Eating for Physical Rather Than Emotional Reasons, and Unconditional Permission to Eat. That is, similar to the findings of Camilleri and colleagues (2015), our findings appear to suggest that intuitive eating in Romanian adults may be best conceived as consisting of the three original factors from the IES. In our 3-factor model, the three Body-Food Choice Congruence items cross-loaded and were, therefore, eliminated. One might suggest that it is important to retain these items, given that they measure an important facet of intuitive eating (Tylka & Kroon Van Diest, 2013). Utilising the 4-factor model derived from the EFA with men might, therefore, seem preferable, although it should be remembered that the three Body-Food Choice Congruence items in this model in fact loaded onto a common factor with Unconditional Permission to Eat items. In short, Body-Food Choice Congruence items do not appear to reflect the existence of an independent construct in Romanian adults, similar to what was found with French (Camilleri et al., 2015) and Malaysian adults (Swami, Todd et al., 2020).

Given the present results, it is worth considering what might help explain the discrepancy in factor structure with the parent study and, indeed, with studies that have been conducted in other national contexts. One possibility is that the IES-2 may not adequately operationalise the construct of intuitive eating in diverse national or social identity groups. However, this does not seem an entirely cogent explanation, given that at least some translational studies have found that the parent 4-factor model has adequate fit (Akırmak et al., 2020; Bas et al., 2017; Carbonneau et al., 2017; da Silva et al., 2020; Ruzanka & Warschburger, 2017; van Dyck et al., 2016), although – as we noted earlier – these studies have typically not examined whether better-fitting models may explain their data better than the parent, 4-factor model. An alternative explanation problematises not so much the IES-2 *per se*, but rather the construct of intuitive eating more generally. As discussed by Swami, Todd and colleagues (2020), the construct of intuitive eating may represent a largely Western (or Euro-American) definition of eating styles that does not adequately capture the meaning of adaptive eating styles in non-Western contexts. We might broaden this critique to suggest that the construct of intuitive eating may not adequately map eating styles in nations or sociocultural contexts undergoing rapid nutrition transitions.

More specifically, for populations in nations that are undergoing nutrition transitions, eating habits and styles may be in a state of flux. In the context of Romania specifically, food profiles and nutritional knowledge all remain relatively different compared to other European nations (Putnoky et akl., 2020; Voinea et al., 2019), traditional eating styles may compete or operate in tandem with evolving food consumption practices (Banu et al., 2010), and the focus may remain on emotional aspects of eating rather than the science of nutrition (Marinescu, 2019). In such a context, it is possible that adaptive eating styles that are reflective of the constructs operationalised by the IES-2 are only beginning to emerge. Of course, such an explanation assumes that, as nutrition transitions progress, there will be a straightforward shift towards forms of intuitive eating that are captured in the IES-2 (an assumption that may be tested by re-examining the factorial validity of the IES-2 in Romanian adults at a later date).2 However, such an explanation may unnecessarily privilege Western forms of eating styles; that is, it is equally possible that alternative forms and patterns of adaptive eating may emerge in nations such as Romania (see Barrada et al., 2020). This speaks to a broader problem of relying on an instrument originally developed with participants from the United States: as Swami, Todd and colleagues (2020) have suggested (see also Swami & Barron, 2019), there may be some value in adopting an emic approach to understanding intuitive eating in the Romanian context. Such an approach might begin with qualitative research designed to fully capture the meaning(s) of intuitive eating in Romanian adults, which is then used to develop item content specific to this national setting. Such an approach will likely result in an instrument that lack generalisability, but the benefit is that it would offer a tool that more precisely taps current Romanian experiences. Theoretically, such an approach would also offer scholars internationally a fuller understanding of the possible ways in which the construct of intuitive eating differs across nations or cultures.

A further problem with the Romanian IES-2 is that scores generally did not evidence adequate patterns of construct validity. Specifically, unlike previous studies (e.g., Akırmak et al., 2020; Carbonneau et al., 2016; da Silva et al., 2019; Duarte et al., 2016; Ruzanska & Warschburger, 2017), though mirroring some of the findings of Swami, Todd and colleagues (2020) with Malaysian adults, IES-2 factor scores – particularly on Eating for Physical Rather Than Emotional Reasons and Unconditional Permission to Eat –were only weakly or non-significantly associated with measures of positive body image, symptoms of disordered eating, psychological well-being, and self-reported BMI. The strongest evidence of construct validity was provided in relation to the Reliance on Hunger and Satiety Cues, but even here associations with additional variables included in the present study was weak. Further, convergent validity as assessed using the AVE criterion was also less-than-adequate. These findings raise questions about the extent to which the Romanian IES-2 measures eating styles that are truly adaptive and healthy. A further cause for concern was the weak evidence of test-retest reliability after four weeks: although the use of ICC cut-offs is discouraged (Charter & Feldt, 2001; Shrout, 1998), higher values are generally preferred. Our results indicated only middling ICC values and, furthermore, the results of paired comparisons indicated that scores on the Eating for Physical Rather Than Emotional Reasons factor were not temporally stable.

For readers seeking more positive news, the present results do indicate that scores on the 3-factor model of Romanian IES-2 scores had adequate internal consistency coefficients and evidenced scalar invariance across gender. The establishment of scalar invariance allowed us to compare IES-2 factor scores across gender, with men having significantly higher Reliance on Hunger and Satiety Cues than women, whereas women had significantly higher scores than men Eating for Physical Rather Than Emotional Reasons and Unconditional Permission to Eat. However, we caution against an interpretation that emphasises marked gender differences given that the effect sizes for these significant effects were negligible-to-small. In contrast, Tylka and Kroon Van Diest (2013) reported that men had significantly higher scores than women with comparatively larger effect sizes. Overall, then, the strongest evidence for the psychometric properties of the Romanian IES-2 comes from its indices of internal consistency and gender invariance, but this will need to be balanced with the weaker evidence of factorial and construct validity.

Our findings raise an important practical question: on the basis of our findings, what should be done by scholars wishing to measure intuitive eating in Romanian-speaking populations? Depending on the specific aims and objectives of future studies, the Romanian IES-2 may offer a preliminary instrument with scores operationalised in terms of our EFA-derived 3-factor, or possibly, our EFA-derived 4-factor model. The Reliance on Hunger and Satiety Cues factor specifically may offer the most robust conceptualisation of a core facet of intuitive eating as it is currently conceived. In contrast, we suggest avoiding scoring Romanian IES-2 scores based on the parent 4-factor model and we actively discourage computation of total IES-2 scores for Romanian-speaking populations. More generally, the results of the present study, alongside those of previous research (Akırmak et al., 2020; Camilleri et al., 2015; da Silva et al., 2020; Swami, Todd et al., 2020), suggest that cross-national invariance in IES-2 scores is unlikely to be obtained, which raises questions about the utility of the IES-2 as an index of intuitive eating internationally. More broadly, we suggest on the basis of the available research that the construct of intuitive eating is unlikely to be consistent across all nations, which in turn requires further research to better understand how the construct is similar and different in diverse national groups.

Several limitations restrict the conclusions that can be drawn from the present study. First, and perhaps most importantly, our recruitment methods mean that it is very unlikely that our sample is representative of the wider Romanian population. This is especially true given that there are large inter- and intra-regional differences in such factors as socioeconomic status, levels of education, urban-rural residence, health literacy, and food consumption habits (e.g., Sandu, 2011; Swami, Vintila et al., 2020; Voinea et al., 2019), all of which may affect patterns of findings. Given these issues, it may be important to replicate our findings with more representative samples of Romanian adults and, where possible, we would also recommend reassessment of the factorial models derived here any time the Romanian IES-2 is used. Second, we were only able to conduct a preliminary examination of construct validity given the dearth of translated and psychometrically-validated tools that are available in Romanian. As the database of available instruments in Romanian expands, it may be possible to re-assess issues of construct validity *vis-à-vis* the Romanian IES-2. We also did not counterbalance the order of presentation of scales, so cannot rule out order effects. Finally, we note that our study was conducted just as the coronavirus (COVID-19) pandemic was unfolding, which may have affected our results in ways that are difficult to determine, particularly in terms of test-retest.

In conclusion, the results of the present study provide preliminary evidence that may support the use of a 3-factor model of intuitive eating in Romanian-speaking adults. However, we draw this conclusion very cautiously, particularly given that fit indices of the 3-factor model were not entirely adequate and especially in the face of less-than-adequate construct validity. While these issues may be specific to scholars who have previously used the IES-2 in Romania (e.g., Ivanoff, 2018) or who intend to do so in the future, we suggest that our findings also have important ramifications for scholars studying intuitive eating internationally. Given that the construct of intuitive eating was originally developed with North American populations in mind, it may have relatively limited applicability elsewhere, particularly in nations that are undergoing nutrition transitions. For scholars interested in the construct of intuitive eating, it will be important in future theoretical and empirical work to more fully consider how this construct is both similar and different across diverse social identity groups. This will be particularly important when faced with the growing obesity epidemic in nations undergoing nutrition transitions, which places a heavy socioeconomic burden on nations such as Romania (Andrei et al., 2018).

# Footnote

1The fact that the items of the Eating for Physical Rather than Emotional Reasons were split across two factors in men may reflect a method artefact. Specifically, the items were split based on those that were reverse-coded and those that were not.

2We conducted a very preliminary assessment of this possibility in our study by examining associations between the IES-2 factor scores and participant age, but associations were weak and mainly non-significant. It should be noted, however, that these were exploratory analyses and our study is not ideally set up to examine generational differences.

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# Table 1. Item-Factor Loadings for Female and Male Participants from the First Split-Half Subsample.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Item | Dimension in Tylka and Kroon Van Diest (2013) | Women (*n* = 253) | | | Men (*n* = 167) | | | |
| F1 | F2 | F3 | F1 | F2 | F3 | F4 |
| 1 | UPE | .07 | .07 | **.67** | **-**.27 | **.57** | .20 | .24 |
| 2 | EPR | .02 | **.82** | .04 | .03 | .02 | **.84** | -.03 |
| 3 | UPE | **.36** | .21 | **-.41** | .15 | -**.50** | .22 | **.39** |
| 4. | UPE | -.15 | .25 | **.50** | -.12 | **.52** | .28 | .11 |
| 5 | EPR | -.04 | **.71** | -.06 | -.08 | .05 | **.55** | -.06 |
| 6 | RHSC | **.69** | -.13 | .08 | **.69** | -.12 | -.04 | .09 |
| 7 | RHSC | **.78** | -.01 | -.02 | **.80** | -.01 | -.04 | -.12 |
| 8 | RHSC | **.81** | -.05 | -.02 | **.77** | .06 | -.05 | -.08 |
| 9 | UPE | -.09 | -.01 | **.63** | -.27 | **.46** | .16 | .04 |
| 10 | EPR | .07 | **.89** | .05 | -.14 | -.01 | **.58** | -.13 |
| 11 | EPR | -.01 | **.82** | .08 | .01 | <.01 | **.76** | -.09 |
| 12 | EPR | .02 | **-.71** | .04 | -.04 | -.07 | -.22 | **.57** |
| 13 | EPR | .12 | **-.53** | .15 | .05 | .10 | -.20 | **.61** |
| 14 | EPR | .19 | **-.58** | .04 | -.03 | .09 | -.17 | **.65** |
| 15 | EPR | .19 | **-.56** | .08 | .27 | .05 | -.12 | .32 |
| 16 | UPE | .31 | .09 | **-.54** | .24 | **-.62** | .06 | .23 |
| 17 | UPE | .20 | -.04 | **-.54** | .29 | **-.41** | .12 | .21 |
| 18 | B-FFC | **.42** | .04 | **.50** | .23 | **.71** | .06 | .02 |
| 19 | B-FFC | **.45** | -.10 | **.46** | .32 | **.66** | -.03 | .12 |
| 20 | B-FFC | **.44** | -.04 | **.40** | .29 | **.62** | <.01 | .10 |
| 21 | RHSC | **.72** | .02 | -.05 | **.68** | .04 | .01 | .11 |
| 22 | RHSC | **.69** | -.09 | -.08 | **.65** | .04 | -.03 | .09 |
| 23 | RHSC | **.78** | -.07 | -.09 | **.76** | .10 | .04 | .06 |

*Note.* Items in bold indicate items associated with each factor. UPE = Unconditional Permission to Eat, EPR = Eating for Physical Rather Than Emotional Reasons, RHSC = Reliance on Hunger and Satiety Cues, B-FCC = Body-Food Choice Congruence, F = Factor.

# Table 2. Modification Indices and Likelihood Ratio Test Results for Model Adjustments.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parent Model | | 4-factor, EFA-derived model | | 3-factor EFA-derived model | |
| Modification Index | Likelihood ratio | Modification Index | Likelihood ratio | Modification Index | Likelihood ratio |
| 22 + 23, MI = 161.68 | χ²(1) = 164.7, *p* < .001 | 19 + 20, MI = 224.319 | χ²(1) = 302.25, *p* < .001 | 22 + 23, MI = 159.97 | χ²(1) = 160.6, *p* < .001 |
| 13 + 14, MI = 101.18 | χ²(1) = 109.88, *p* < .001 | 22 + 23 = 161.769 | χ²(1) = 163.05, *p* < .001 | 13 + 14, MI = 101.31 | χ²(1) = 110.0, *p* < .001 |
| 3 + 16, MI = 54.21 | χ²(1) = 55.25, *p* < .001 | 16 + 17 = 52.47 | χ²(1) = 51.08, *p* < .001 | 12 + 15, MI = 45.67 | χ²(1) = 47.39, *p* < .001 |
| 12 + 15, MI = 45.53 | χ²(1) = 47.24, *p* < .001 | 6 + 7 = 16.10 | χ²(1) = 14.97, *p* < .001 | 1 + 4, MI = 37.60 | χ²(1) = 35.61, *p* < .001 |
| 16 + 17, MI = 26.09 | χ²(1) = 25.29, *p* < .001 | 8 + 21 = 14.76 | χ²(1) = 12.18, *p =* .001 | 14 + 15, MI = 22.20 | χ²(1) = 21.96, *p* < .001 |
| 14 + 15 = 19.90 | χ²(1) = 21.88, *p* < .001 |  |  | 6 + 7, MI = 17.68 | χ²(1) = 16.37, *p* < .001 |
| 3 + 17 = 17.51 | χ²(1) = 17.58, *p* < .001 |  |  |  |  |

*Note.* EFA = Exploratory Factor Analysis

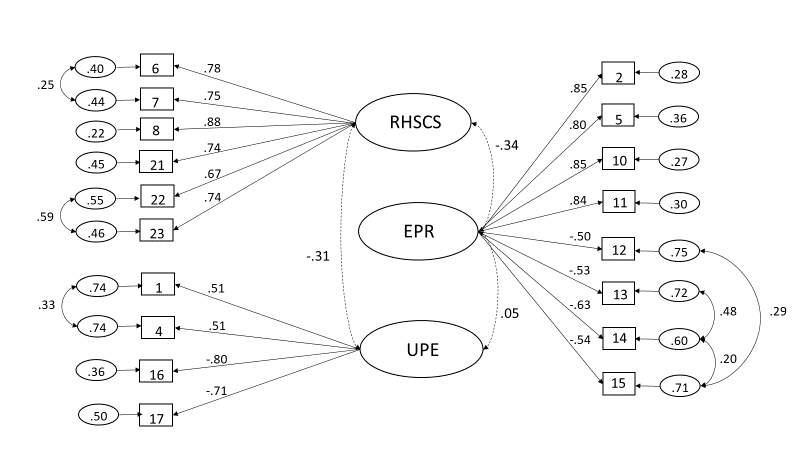
# Table 3. Measurement Invariance Across Gender in the Second Split-Half Subsample.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | SBχ² | *df* | Robust CFI | Robust RMSEA | SRMR | Model Comparison | ΔSB*χ*² | Δ*df* | *p* | ΔRobust CFI | ΔRobust RMSEA | ΔSRMR | PGFI |
| Configural | 720.43 | 264 | .848 | .105 | .081 |  |  |  |  |  |  |  | .689 |
| Metric | 733.54 | 279 | .850 | .101 | .082 | Configural *vs*. metric | 13.11 | 15 | .891 | .002 | .004 | .001 | .728 |
| Scalar | 772.11 | 294 | .845 | .100 | .083 | Metric *vs*. scalar | 38.57 | 15 | .001 | .005 | .001 | .001 | .767 |

# Table 4. Associations between Intuitive Eating and Additional Measures Included in the Study and for the Total Sample, Reported for Women (Upper Diagonal) and Men Separately.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| (1) RHSC |  | -.09\* | .01 | .40\*\* | -.44\*\* | .35\*\* | .16\*\* | -.11\* |
| (2) EPR | .09 |  | .12\* | .20\*\* | -.30\*\* | .10\* | .10\* | -.09\* |
| (3) UPE | .12\* | .27\*\* |  | .06 | .15\* | .07 | .14\* | .09 |
| (4) Body appreciation | .45\*\* | .08 | .07 |  | -.61\*\* | .61\*\* | .56\*\* | -.24\*\* |
| (5) Disordered eating | -.30\*\* | .22\*\* | .19\* | -.35\*\* |  | -.45\*\* | -.22\*\* | .33\*\* |
| (6) Self-esteem | .21\*\* | -.04 | -.07 | .53\*\* | -.34\*\* |  | .49\*\* | .03 |
| (7) Subjective happiness | .19\*\* | .08 | .14\* | .51\*\* | -.07 | .41\*\* |  | .01 |
| (8) Body mass index | -.16\* | .03 | .09 | -.09 | .27\*\* | -.01 | .02 |  |

*Note.* RHSC = RHSC = Reliance on Hunger and Satiety Cues, EPR = Eating for Physical Rather Than Emotional Reasons, UPE = Unconditional Permission to Eat. \* *p* < .05, \*\* *p* < .001

**

# Figure 1.

Path diagram and estimates for the 3-factor model of Romanian Intuitive Eating Scale-2 scores. The large ovals are the latent constructs, with the rectangles representing measured variables. The path factor loadings are standardised with significance levels were determined by critical ratios (all *p* < .001).

# Appendix 1

*Intuitive Eating Scale-2 Items in English and (in Italics) Romanian.*

|  |  |
| --- | --- |
| Item |  |
| 1 | I try to avoid certain foods high in fat, carbohydrates, or calories / *Incerc sa evit anumite alimente cu continut ridicat in grasimi, carbohidrati sau calorii* |
| 2 | I find myself eating when I’m feeling emotional (e.g., anxious, depressed, sad), even when I’m not physically hungry / *Ma surprind mancand atunci cand ma simt emotional (ex. anxios, depresiv sau trist), chiar daca nu imi este foame* |
| 3 | If I am craving a certain food, I allow myself to have it / *Daca poftesc foarte mult un anumit aliment, imi dau voie sa-l consum* |
| 4 | I get mad at myself for eating something unhealthy / *Ma supar pe mine insami atunci cand mananc ceva nesanatos* |
| 5 | I find myself eating when I am lonely, even when I’m not physically hungry / *Ma surprind mancand atunci cand sunt singur, chair daca nu imi este foame* |
| 6 | I trust my body to tell me when to eat / *Am incredere in corpul meu in a-mi spune cand sa mananc* |
| 7 | I trust my body to tell me what to eat / *Am I ncredere in corpul meu in a-mi spune ce sa mananc* |
| 8 | I trust my body to tell me how much to eat / *Am incredere in corpul meu in a-mi spune cat sa mananc* |
| 9 | I have forbidden foods that I don’t allow myself to eat / *Mi-am interzis alimente pe care nu-mi permit sa le consum* |
| 10 | I use food to help me soothe my negative emotions / *Folosesc mancarea pentru a ma ajuta sa-mi calmez emotiile negative* |
| 11 | I find myself eating when I am stressed out, even when I’m not physically hungry / *Ma surprind mancand atunci cand sunt stresat, chiar daca nu imi este foame* |
| 12 | I am able to cope with my negative emotions (e.g., anxiety, sadness) without turning to food for comfort / *Sunt in stare sa fac fata emotiilor negative (ex. anxietate, tristete) fara sa folosesc mancarea pentu a ma linisti* |
| 13 | When I am bored, I do NOT eat just for something to do / *Cand sunt plictisit NU mananc doar pentru a avea ceva de facut* |
| 14 | When I am lonely, I do NOT turn to food for comfort / *Cand ma simt singur, NU folosesc mancarea pentru a ma linisti* |
| 15 | I find other ways to cope with stress and anxiety than by eating / *Am gasit alte modalitati de a face fata stresului si anxietatii decat mancatul* |
| 16 | I allow myself to eat what food I desire at the moment / *Imi dau voie sa mananc orice mancarea doresc la momentul respectiv* |
| 17 | I do NOT follow eating rules or dieting plans that dictate what, when, and/or how much to eat / *NU urmez reguli de mancare sau diete care imi impun ce, cand si/sau cat de mult sa mananc* |
| 18 | Most of the time, I desire to eat nutritious foods / *De cele mai multe ori, doresc sa mananc alimente nutritive* |
| 19 | I mostly eat foods that make my body perform efficiently (well) / *De cele mai multe ori, consum alimente care fac ca organismul meu sa functioneze efficient (bine)* |
| 20 | I mostly eat foods that give my body energy and stamina / *De cele mai multe consum alimente care dau organismului meu energie si rezistenta* |
| 21 | I rely on my hunger signals to tell me when to eat / *Ma bazez pe semnalele mele de foame pentru a-mi spune cand sa mananc* |
| 22 | I rely on my fullness (satiety) signals to tell me when to stop eating / *Ma bazez pe semnalele mele de satietatea pentru a-mi spune cand sa ma opresc din mancat* |
| 23 | I trust my body to tell me when to stop eating / *Am incredere in corpul meu pentru a-mi spune cand sa ma opresc din mancat* |