VALIDATION

Validation of a French-Canadian Adaptation of the Intuitive Eating Scale-2 for the Adult Population

Authors:

Elise Carbonneau\textsuperscript{a,b}; Noémie Carbonneau\textsuperscript{c}; Benoît Lamarche\textsuperscript{a,b}; Véronique Provencher\textsuperscript{a,b}; Catherine Bégin\textsuperscript{a,d}; Maude Bradette-Laplante\textsuperscript{a,b}; Catherine Laramée\textsuperscript{a,b}; Simone Lemieux\textsuperscript{a,b}.

From the:

\textsuperscript{a} Institute of Nutrition and Functional Foods, Laval University, 2440 boulevard Hochelaga, Québec, G1V 0A6, QC, Canada.

\textsuperscript{b} School of Nutrition, Laval University, 2425 rue de l’Agriculture, Québec, G1V 0A6, QC, Canada.

\textsuperscript{c} Department of Psychology, Université du Québec à Trois-Rivières, 3351 boulevard des Forges, Trois-Rivières, G9A 5H7, QC, Canada.

\textsuperscript{d} School of Psychology, Laval University, 2325 rue des Bibliothèques, G1V 0A6, Québec, QC, Canada.

Corresponding author:

Élise Carbonneau

Institute of Nutrition and Functional Foods, Laval University

2440 boul. Hochelaga, local 2734, Quebec City, QC, Canada, G1V 0A6
elise.carbonneau.1@ulaval.ca

Telephone number: 1-418-651-2131 #11909
Fax Number: 1-418-656-5877
ABSTRACT

Intuitive eating is an adaptive eating style based on the reliance on physiological cues to determine when, what, and how much to eat. The Intuitive Eating Scale-2 (IES-2) is a validated four-subscale tool measuring the degree of adherence to intuitive eating principles. The present series of studies aimed at evaluating the psychometric properties of a French-Canadian adaptation of the IES-2 for the adult population. The factor structure, the reliability (internal consistency and test-retest), the construct validity, and the discriminant validity were evaluated in 334 women and 75 men from the Province of Québec, Canada, across two studies. A confirmatory factor analysis upheld that the four-factor structure of the original IES-2 was adequate for the present sample of French-Canadians. The scale demonstrated adequate internal consistency and test-retest reliability. Construct validity evidence was obtained with the significant associations between intuitive eating and psychological and eating-related variables. Intuitive eating was negatively associated with eating disorder symptomatology and with food- and weight-preoccupation, and positively associated with body-esteem and well-being. The French-Canadian IES-2 was also able to discriminate between genders and body mass index categories. The properties of this new version of the IES-2 are demonstrative of a reliable and valid tool to assess intuitive eating in the French-Canadian adult population of the Province of Québec.

Keywords:

Intuitive Eating Scale; Intuitive Eating; Validation; Canada; French.
**Introduction**

The research on eating behaviors has expanded rapidly in the literature in the last decades. However, most studies address eating behaviors from a pathogenesis standpoint, in that they scope disordered eating rather than healthy adaptive eating behaviors. Numerous questionnaires have been developed and validated in order to assess and identify symptoms or traits associated with maladaptive eating behaviors, such as the Three-Factor Eating Questionnaire (Stunkard & Messick, 1985), the Dutch Eating Behavior Questionnaire (van Strien, Frijters, Bergers, & Defares, 1986), the Eating Disorder Inventory (Garner, 1991; Garner, Olmstead, & Polivy, 1983), the Eating Attitudes Test (Garner, Olmsted, Bohr, & Garfinkel, 1982), and the Restraint Scale (Herman & Mack, 1975), to name only a few. Questionnaires assessing healthy adaptive eating behaviors are far fewer, the Mindful Eating Questionnaire (Framson et al., 2009), the ecSatter Inventory (Lohse, Satter, Horacek, Gebreselassie, & Oakland, 2007), and intuitive eating questionnaires (Hawks, Merrill, & Madanat, 2004; Tylka, 2006; Tylka & Kroon Van Diest, 2013) being among the only ones, to our knowledge.

The intuitive eating concept is defined as the reliance on physiological cues to determine when, what, and how much to eat (Tribole & Resch, 1995). While maintaining a healthy relation between food, mind, and body, intuitive eaters are mindful of emotions and pleasures derived from eating (Tribole & Resch, 1995). The intuitive eating concept, as originally proposed by Tribole and Resch, consists of 10 principles: (1) reject the diet mentality, (2) honor one’s hunger, (3) make peace with food, (4) challenge the food police, (5) respect one’s fullness, (6) discover the satisfaction factor, (7) honor one’s feelings without using food, (8) respect one’s body, (9) exercise and feel the difference, and (10) honor one’s health with gentle nutrition (Tribole &

Abbreviations: IES: Intuitive Eating Scale; IES-2: Intuitive Eating Scale-2; UPE: Unconditional Permission to Eat; EPR: Eating for Physical Reasons; RHSC: Reliance on Hunger and Satiety Cues; B-FCC: Body-Food Choice Congruence; EDI: Eating Disorder Inventory; BES: Body Esteem Scale.
A recent systematic review by Bruce and Ricciardelli (2015) showed that intuitive eating is associated with less eating disorders, a more positive body image, and a greater emotional functioning.

Instruments have been developed in order to reflect the degree of adherence to intuitive eating principles. Hawks et al. (2004) have created a 27-item scale measuring intuitive eating through four subscales: intrinsic eating, extrinsic eating, antidieting, and self-care. Their scale showed overall good psychometrics properties, but the intrinsic eating subscale showed both low internal consistency and test-retest reliability, while the self-care subscale did not demonstrate the construct and concurrent validity expected by the authors (Hawks et al., 2004).

Another intuitive eating scale (IES) was developed by Tylka (2006). The 21-item IES has a three-factor structure, measuring three distinct concepts. The first subscale, Unconditional Permission to Eat (UPE), contains nine items reflecting the willingness to eat what food is desired when hungry. People who allow themselves the unconditional permission to eat do not label food as “acceptable/healthy” or “unacceptable/unhealthy”. According to the authors, when individuals do not have forbidden foods, they are less likely to overindulge in food, or to engage in binge eating. The second subscale, Eating for Physical Rather than for Emotional Reasons (EPR), reflects the use of food to satisfy a physical hunger drive rather than to cope with emotions, such as anxiety, loneliness, and boredom. This subscale is composed of six items. Last, the Reliance on Hunger and Satiety Cues (RHSC) subscale contains six items reflecting the awareness of, the trust in, and the reliance on internal hunger and satiety cues to guide eating behaviors. Items are rated on a five-point Likert scale ranging from “strongly disagree” to “strongly agree”. Mean scores are calculated for the total scale and each subscale, with higher scores reflecting more intuitive eaters. The evaluation of the psychometric characteristics of the
IES demonstrated good internal consistency reliability, construct validity and stability over time among women (Tylka, 2006).

Tylka and Kroon Van Diest (2013) developed and validated the Intuitive Eating Scale-2 (IES-2) in order to address some limitations of the IES. The first main change was to replace some negatively scored items by positively scored items in order to better assess the presence of intuitive eating behaviors rather than to measure the absence of dieting behaviors and emotional eating. The other main change was to add new items in a fourth subscale, the Body-Food Choice Congruence (B-FCC), in order to include in the questionnaire the “Honor your Health with Gentle Nutrition” principle proposed by Tribole and Resch (1995). This principle reflects the tendency to choose nutritious foods in order to honor health, body functioning, and well-being, while satisfying taste buds. Individuals who show high congruence between body needs and food choices do not feel pressured to eat healthy foods; they choose to do so because they feel that it is what their body needs. This concept is a core component of intuitive eating, yet Tribole and Resch (2012) insist that a healthy relationship with food is necessary before truly pursuing healthy eating without leaning towards dieting and cognitive restraint. The psychometric properties of the IES-2 were evaluated among American men and women and the scale was demonstrated as a valid, reliable, and useful tool for empirical research and clinical work (Tylka & Kroon Van Diest, 2013).

A French IES-2 was recently developed, culturally adapted, and validated in France (Camilleri et al., 2015). Exploratory and confirmatory factor analyses revealed a three-factor structure model, including the original UPE, EPR, and RHSC subscales. The three items of the B-FCC subscale, as well as two UPE items were not maintained in the French IES-2 due to low
loadings or high cross-loadings, resulting in an 18-item scale. The psychometric evaluation of the scale demonstrated its validity and reliability in a French adult population.

It is recognized that a translation, as well as some adaptations, are needed if measures are to be used across countries in order to maintain the content validity of the instruments (Beaton, Bombardier, Guillemin, & Ferraz, 2000). Thus, we consider that a cross-country adaptation is needed for the IES-2 to be used in a French-Canadian population.

The Present Research

The purpose of the present research was to adapt and validate the original IES-2 for French-Canadians. Specifically, in Study 1, we investigated the factor structure, the internal consistency, and the construct validity of the IES-2 in a sample of adult women. In Study 2, the internal consistency, the test-retest reliability and the discriminant validity of the questionnaire were tested in a sample including both men and women.

French adaptation protocol

As suggested by Beaton et al. (2000), two bilingual translators, whose first language was French, proceeded to the forward translation of the original items of the IES-2 (Tylka & Kroon Van Diest, 2013). The two translators had different profiles, one being a registered dietitian and nutrition Ph.D. candidate (E.C.), and the other being a psychology researcher and professor (N.C.). The two forward translations were compared and a consensus was reached to produce one common version. Next, a bilingual translator (M.B.-L.), totally blinded to the original version and to the concepts being examined in the questionnaire, translated the items back to English. The original English version, the two forward translations, and the back-translation
were reviewed by the three translators and by a nutrition researcher (S.L.) familiar with the intuitive eating concept. Discrepancies were discussed and consensus was reached for each item. A pre-test was then performed in a sample of 30 individuals (67.4% women), recruited from an internal list of people willing to participate in clinical studies, in order to investigate the acceptability and comprehension of the items. Participants completed the questionnaire and were invited to express their comments on each item. All items were well understood, therefore no change was made to the questionnaire. Procedures for the pre-test were approved by the Laval University ethics committee and written informed consent was obtained from all subjects.

**Study 1**

The first objective of Study 1 was to investigate whether the factor structure of the French-Canadian IES-2 concurs with the four-subscale structure of the original English version. We hypothesized that the French-Canadian version of the scale adheres to the four-factor structure of the original IES-2 (Tylka & Kroon Van Diest, 2013). This study also aimed at examining the internal consistency and the construct validity of the scale. We expected a good internal consistency between all 23 items, as well as within the four subscales, as observed in the original scale (Tylka & Kroon Van Diest, 2013). Besides, the French-Canadian IES-2 total and subscale scores are expected to demonstrate construct validity through their associations with various psychological and eating-related variables. Intuitive eating has been negatively associated with disordered eating attitudes and behaviors in previous studies (Tylka, 2006; Tylka & Kroon Van Diest, 2013; Tylka & Wilcox, 2006). Associations between intuitive eating and various psychological indices, such as higher self-esteem, self-acceptance, optimism, well-being, satisfaction with life, and positive affect, have also been observed (Augustus-Horvath & Tylka,
Intuitive eating has been found to be a distinct construct from low levels of disordered eating, contributing to unique amount of variance in many well-being indices, such as positive and negative affect, self-esteem, proactive coping, optimism, and life satisfaction, over and above the variance accounted for by eating disorder symptoms (Tylka & Kroon Van Diest, 2013; Tylka & Wilcox, 2006). Therefore, the French-Canadian IES-2 total and subscale scores are expected to be associated (a) in a negative direction with eating disorder symptomatology, (b) in a positive direction with body-esteem, (c) in a positive direction with psychological well-being, and (d) in a negative direction with food- and weight-preoccupation. Given the high prevalence of dietary restriction as a weight-loss strategy and its association with high food preoccupation (Polivy & Herman, 1999; Tribole & Resch, 1995), it is also hypothesized that women who want to lose weight are less intuitive than women not wanting to lose weight, independently of their body mass index (BMI).

**Materials and Methods**

**Participants and procedures**

Participants were 272 women from the Province of Québec, Canada, aged 20 to 45 years old (mean age: 29.8±6.6 years; mean BMI: 25.8±6.4 kg/m²), currently involved in a heterosexual romantic relationship. Women identified themselves as White (94.5%), African American (1.5%), Asian (1.5%), Hispanic (1.1%), or other (3.7%). Participants were mostly workers (61.4%) and students (21.3%). The majority had a university (43.8%) or a college (28.7%) degree, whereas 21.3% had a high school degree and 6.2% had a primary school degree, other, or prefer not to answer. Participants were recruited through an advertisement on Facebook. The
details of this study have been presented elsewhere (Carbonneau, Carbonneau, Cantin, & Gagnon-Girouard, 2015). An exclusion criterion for the IES-2 validation was pregnancy. Analyses were performed on 260 participants, after the exclusion of 12 pregnant women. This study was conducted according to the guidelines laid down in the Declaration of Helsinki, and all procedures involving human subjects were approved by the Université du Québec à Trois-Rivières Ethics Committee.

Measures

All measures were performed on an online survey website. Participants completed the French-Canadian IES-2. They also filled out four subscales of the Eating Disorder Inventory-2 (EDI-2; Garner, 1991), namely Interoceptive Awareness, Body Dissatisfaction, Drive for Thinness, and Bulimia. The 10-item EDI-Interoceptive Awareness subscale is an indicator of a poor ability to recognize and respond to internal states such as emotions, hunger, and satiety. A sample item is “I get confused about what emotion I am feeling.” The EDI-Body Dissatisfaction subscale consists of nine items that measure overall dissatisfaction with the body size and beliefs that some parts of the body are too large (e.g., “I think my thighs are too large”). The seven-item EDI-Drive for Thinness subscale is used to identify an excessive concern with dieting, preoccupation with weight, and fear of weight gain. A sample item is “I am terrified of gaining weight.” The EDI-Bulimia is a seven-item subscale that assesses the presence of episodes of binge eating and purging (e.g., “I eat moderately in front of others and stuff myself when they’re gone”). Items of the four subscales were rated from 1 (never) to 6 (always), higher scores indicating poorer interoceptive awareness, greater body dissatisfaction, greater drive for thinness or more bulimia-related behaviors. Continuous scoring was used as it was done in other studies.
(e.g., Tylka & Kroon Van Diest, 2013; Tylka & Subich, 2004). In the present study, all four EDI subscales’ Cronbach alpha coefficients were > .70.

The 23-item Body-Esteem Scale (BES; Mendelson, Mendelson, & White, 2001) was used to measure a total body-esteem score as well as three subscale scores, namely BES-Appearance (i.e., general feelings about appearance), BES-Weight (i.e., weight satisfaction), and BES-Attribution (i.e., evaluations attributed to others about one's body and appearance). Items were rated from 1 (never) to 5 (always). The total and subscale score were all internally reliable, Cronbach alphas > .70.

As performed in other studies (e.g., Koestner, Powers, Carbonneau, Milyavskaya, & Chua, 2012), psychological well-being was evaluated through a combination of two scales: a nine-item scale of positive and negative affect (Emmons, 1992) and the five-item Satis
tification with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). Items were rated on a scale from 1 (strongly disagree) to 7 (strongly agree), and negative affect items were reverse-coded. A higher mean score of the two measures represents a higher subjective well-being. In the present study, Cronbach alpha coefficient was .85 for both positive and negative affect and .90 for the Satisfaction with Life Scale.

Participants were also asked about their preoccupation about food and weight through one item: “Globally, how preoccupied are you about food and weight, from (1) not at all, to (6) extremely?”. Participants were also questioned on their weight goals; they were asked if they wanted (1) to lose a lot of weight, (2) to lose a little weight, (3) to maintain their weight, (4) to gain little weight, or (5) to gain a lot of weight. Women were classified in two groups based on their answer; women who aimed at losing a little or a lot of weight were considered as “wanting
to lose weight”, and all other women were considered as “not wanting to lose weight”. Current height and weight were self-reported.

Statistical analyses

In order to determine the factorial validity of the French-Canadian version of the IES-2, a confirmatory factor analysis (CFA) using the maximum likelihood estimation was conducted with AMOS 21 software (Arburckle, 2012). The goodness of the model fit was determined with the following fit indexes: the Non-Normed Fit Index (NNFI), the Comparative Fit Index (CFI), the Standardized Root Mean Square (SRMR), and the Root Mean Square Error of Approximation (RMSEA). Adequacy of the model is indicated by NNFI and CFI values close to .95, SRMR values close to .08, and RMSEA values close to .06 (Hu & Bentler, 1999). Because the chi-square is sensitive to sample size, the normed chi-square (NC) was used. Bollen (1989) suggests that a NC value less than 3.0 indicates a reasonable fit to the data. Internal consistency reliability was assessed using Cronbach alpha coefficients. For the construct validity, Pearson’s correlation analyses were conducted to determine the relationships between IES-2 scores and various psychological and eating-related variables. Partial correlations were used to evaluate the association between two variables, while controlling for the effect of an additional variable. As suggested by Cohen (1992), the strength of the associations was determined with the following criteria: \( r_s > .50 \) indicate a strong effect size, \( r_s \) around .30 mean a moderate effect size, and \( r_s \) around .10 show a slight effect size. To assess the difference in intuitive eating score between women with different weight goals, the generalized linear model (GLM) procedure was used to compare women wanting to lose weight to women not wanting to lose weight. BMI was added as a covariate to counteract its effect on weight goals. The details about how missing data was
handled are presented elsewhere (Carbonneau et al., 2015). These analyses were performed using SAS® Studio version 3.3 (Copyright © 2012-2015, SAS Institute Inc., Cary, NC, USA).

Results and Discussion

Confirmatory factor analysis

It was hypothesized that a measurement model with four covarying latent factors (corresponding to the four IES-2 subscales) predicted by their respective items yields a coherent and meaningful fit to the data of the French-Canadian IES-2. The model was tested using participants who answered every item of the scale (n = 239). Hatcher (1994) has recommended at least a 5:1 participant-to-item ratio for factor analyses. Thus, the requirement of sufficient sample size was met in the present study, with a participant-to-item ratio > 10:1.

The model was tested and yielded fit indices that were not satisfying, $\chi^2 (df = 224, n = 239) = 653.83, p < .001$; NNFI = .815; CFI = .869; SRMR = .078; RMSEA = .090; 90% Confidence Intervals (CI) of the RMSEA = .082-.098. We conducted Lagrange Multiplier tests, which identify paths not included in the model that would significantly improve the model fit. The modification indices suggested adding error covariances between some items (note that the addition of error covariances does not alter the use and interpretation of the tool being validated). Error covariances are sometimes necessary to explain the commonality arising from a wording similarity between two or more items (Byrne, 2001). Therefore, based on modification indices and theoretical soundness, two covariances were added between error terms for (1) the items 13 and 14 (both from the EPR subscale), and (2) the items 22 and 23 (both from the RHSC subscale). The model was run again and results provided support for the model, $\chi^2 (df = 222, n = 239) = 479.97, p < .001$; NNFI = .911; CFI = .922; SRMR = .070; RMSEA = .070; 90% CI of
the RMSEA = .061-.078. All fit indices were acceptable (Hu & Bentler, 1999). In this model, the NC value was 2.16 (479.97/222), indicating a reasonable fit to the data.

As can be seen in Fig. 1, the four factors were moderately to strongly intercorrelated ($r$s ranging from .29 to .58, $p < .05$), except for the UPE and B-FCC factors, which were not significantly correlated ($r = .02, p > .05$). In addition, the 23 items had loadings ranging from .51 to .93 onto their respective factor, indicating that each item has a satisfactory association with the score of its subscale. Overall, the results of the CFA showed that the four-factor structure of the French-Canadian version of the IES-2 fits the data well.
Fig. 1. Factor loadings and intercorrelations between factors of the French-Canadian Intuitive Eating Scale-2, in Study 1.

Internal consistency reliability

Cronbach alpha coefficients were .90 for the total score, .74 for UPE, .90 for EPR, .92 for RHSC, and .89 for B-FCC. Consequently, the total and subscale scores are internally reliable.

Construct Validity
Correlations between the IES-2 and the other study variables are presented in Table 1. In accordance with our hypothesis, the IES-2 total score showed strong inverse correlations with EDI-Interoceptive Awareness, EDI-Drive for Thinness, EDI-Body Dissatisfaction and EDI-Bulimia. All four IES-2 subscales showed moderate to strong negative associations with the four EDI-2 subscales. The French-Canadian IES-2 total and subscale scores are thus inversely associated with eating disorder symptomatology. As hypothesized, the IES-2 total and subscale scores showed moderate to strong positive associations with the total BES score as well as with the BES-Appearance and BES-Weight subscales. The BES-Attribution subscale was slightly to moderately positively associated with IES-2 total and subscale scores. Partial correlations between the IES-2 total score and the BES total score, adjusted for each of the four EDI subscales, were all significant ($r$ ranging from .39 to .44, all $p$s < .001). These results confirm that the intuitive eating concept measured by the French-Canadian IES-2 is associated with a better body-esteem. The psychological well-being score showed moderate positive associations with IES-2 total and subscale scores. When adjusted for each of the four EDI subscales, partial correlations between the IES-2 total score and psychological well-being were all significant ($r$ ranging from .19 to .21, all $p$s < .005), except when adjusted for EDI-Interoceptive Awareness ($p = .16$). Finally, IES-2 scores showed moderate to strong negative associations with the item pertaining to food- and weight-preoccupation.

In accordance with our hypothesis, our results showed that women who desired to lose weight ($n = 193$) were significantly less intuitive than women who did not ($n = 64$) as indicated by lower scores for total IES-2 score ($3.20\pm0.63$ and $3.78\pm0.61$; $p < .001$), UPE ($3.36\pm0.71$ and $3.70\pm0.76$; $p = .002$), EPR ($2.93\pm0.96$ and $3.56\pm0.96$; $p < .001$), RHSC ($3.11\pm0.97$ and
3.88±0.89; \( p < .001 \), and B-FCC (respectively 3.75±0.84 and 4.35±0.76; \( p < .001 \)), when adjusted for BMI.

Taken together, these results provide support for the French-Canadian IES-2’s construct validity.
Table 1. Means, standard deviations, and correlations among the variables in Study 1 (n=260).

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<td>EDI-Body dissatisfaction</td>
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<td>.42**</td>
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<tr>
<td>BES-Attribution</td>
<td>3.02</td>
<td>1.17</td>
<td></td>
<td>.48**</td>
<td>.29**</td>
<td>.30**</td>
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<td>.38**</td>
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<td>.52**</td>
<td>.55**</td>
<td>.43**</td>
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<tr>
<td>Psychological Well-being</td>
<td>7.51</td>
<td>1.17</td>
<td></td>
<td>.48**</td>
<td>.29**</td>
<td>.30**</td>
<td>.30**</td>
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<td>.55**</td>
<td>.43**</td>
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<tr>
<td>Food and Weight Preoccupation</td>
<td>4.64</td>
<td></td>
<td></td>
<td>.48**</td>
<td>.29**</td>
<td>.30**</td>
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<td>.43**</td>
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</tbody>
</table>
| Note: IES-2 = Intuitive Eating Scale-2; UPE = Unconditional Permission to Eat; EPR = Eating for Physical Reasons; RHSC = Reliance on Hunger and Satiety Cues; B-FCC = Body-Food Choice Congruence; EDI = Eating Disorder Inventory; BES = Body Esteem Scale;‡ = Intuition and Autonomy subscale; BES = Body Esteem Scale; * = p < .05, ** = p < .01, † = p < .10, ‡ = p < .001.
Study 2

The main objective of Study 2 was to explore the psychometric properties of the IES-2 within a sample including both men and women. The study aimed at evaluating whether the scale yields consistent scores over time. Intuitive eating has been proposed to be fairly consistent over time, and other validation studies have documented a good test-retest reliability on periods from three to eight weeks (Camilleri et al., 2015; Hawks et al., 2004; Tylka, 2006; Tylka & Kroon Van Diest, 2013). Thus, we expected the French-Canadian IES-2 to be stable over a four to seven-week period. We also tested the internal consistency reliability among men and women separately with anticipated Cronbach alpha coefficients > .70 in both genders. Finally, the study aimed at evaluating the IES-2’s discriminant validity, which is the ability of the scale to differentiate groups in predictable ways. We expected men to eat in a more intuitive way than women, since men usually feel less sociocultural pressure than women to watch their weight and restrict their eating (Kroon Van Diest & Tylka, 2010). Women are also more prone to emotional eating compared to men (Peneau, Menard, Mejean, Bellisle, & Hercberg, 2013). We also expected normal-weight participants to be more intuitive than overweight or obese participants, as previous research suggests that overweight individuals are more susceptible to cognitive restraint, uncontrolled eating, and emotional eating than are non-overweight subjects (Peneau et al., 2013). This hypothesis was tested in Study 2 because height and weight were measured by trained professionals rather than self-reported as in Study 1.

Materials and Methods

Participants and procedures
Data for this study were derived from 149 participants (74 women and 75 men) recruited in the Quebec City metropolitan area and involved in a larger study aiming at validating eight questionnaires. Participants were recruited through electronic messages sent to university students and employees, and to members of the electronic newsletter of the Institute of Nutrition and Functional Foods. Participants had to have at least minimal informatics skills since questionnaires were completed online. They also had to be free from conditions affecting intestinal absorption since blood biomarkers of fruit and vegetable intake were also being validated in the study. An exclusion criterion was being pregnant or lactating. When recruited, participants came to the Clinical Investigation Unit for a blood sample and for anthropometric measurements. Then, they had access to the Internet platform of the study where they were allowed a one-month period to complete all questionnaires. After a two-week delay, they had to complete all questionnaires once more within a one-month period.

Participants ranged in age from 18 to 65 years (mean age: 47.4±13.3 years). They identified themselves as White (95.3%), African American (1.3%), Arab (1.3%), Native American (0.7%), or Latina/Latino (0.7%). One participant (0.7%) did not report an ethnic identification. Participants indicated that they were workers (65.8%), retired (21.5%), or students (6.0%). Three participants (2.0%) had no job and seven (4.7%) preferred not to answer. The majority (60.4%) had a university degree, whereas 30.2% had a collegial degree, and 9.4% had a high school degree. Average BMI was 25.1±4.4 kg/m² (range from 17.6 to 40.6 kg/m²) in women and 26.0±4.3 kg/m² (range from 16.9 to 41.2 kg/m²) in men. This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Laval University Ethics Committee. Written informed consent was obtained from all participants.
**Measures**

The French-Canadian IES-2 presented in Study 1 was used in Study 2. Participants also completed a socio-demographic questionnaire and seven other questionnaires being concurrently validated. During the visit to the Clinical Investigation Unit, height and weight were measured by trained professionals according to standardized procedures (Callaway, Chumlea, & Bouchard, 1988). Height was measured to the nearest millimeter, and body weight was measured to the nearest 0.1 kg on a calibrated balance.

**Statistical analyses**

The test-retest reliability was assessed with Pearson’s correlation analyses conducted between scores of the two completions. Internal consistency reliability was assessed using Cronbach alpha coefficients with data from the first completion of the questionnaire. For the discriminant validity, Student’s *t*-tests were used to compare intuitive eating scores in men vs. women, and differences between BMI categories were assessed using the GLM procedure. No participant was excluded for missing data; all participants answered > 90% of the IES-2 items. All variables were normally distributed therefore no transformation was necessary. Analyses were performed using SAS® Studio version 3.3 (Copyright © 2012-2015, SAS Institute Inc., Cary, NC, USA).

**Results and Discussion**

**Test-retest reliability**

Based on the 146 participants (74 women and 72 men) who completed the scale twice, Pearson’s correlation coefficients between both completions were .88 for the total scale, .74 for UPE, .88 for EPR, .73 for RHSC, and .68 for B-FCC (all *ps* < .001). All scores exceeded the .70
recommendation for an adequate reliability (McDowell & Newell, 1996), except for the B-FCC scale where the correlation coefficient was just below this threshold. When looking at women and men separately, test-retest Pearson’s correlation coefficients were similar to those of the complete sample, ranging from $r = .64$ to $.90$ (all $ps < .001$) in women, and from $r = .72$ to $.86$ (all $ps < .001$) in men. The French-Canadian IES-2 can thus be considered as stable across a four to seven-week period (test-retest lapse: $40.5 \pm 12.7$ days) among women and men.

Intercorrelations between IES-2 subscales and internal consistency reliability

Correlation analyses between the IES-2 subscales were performed in the total sample of participants and are presented in Table 2.

As found in Study 1, the total IES-2 and subscale scores were internally reliable for the complete sample, all Cronbach alpha coefficients being $> .70$ (.88 for the total score, .71 for UPE, .94 for EPR, .83 for RHSC, and .76 for B-FCC). The scores showed good internal consistency among both women and men, with Cronbach alpha coefficients ranging from .67 to .95 among women, and from .75 to .92 among men.

 Discriminant validity

Discriminant validity was used to evaluate the ability of the French-Canadian IES-2 to differentiate groups in predictable ways. In the present study, men had significantly higher scores than women for the total IES-2 score ($p = .035$) and EPR ($p = .013$; see Table 2). Men and women did not differ for the other subscales. Results followed the same pattern when adjusted for BMI (data not shown). Differences in intuitive eating between genders were observed in previous studies (Camilleri et al., 2015; Hawks et al., 2004; Tylka & Kroon Van Diest, 2013).

In this study, significant differences in scores of intuitive eating were also observed according to BMI classification, using the internationally accepted definitions of normal-weight
(≥ 18.5 and < 25 kg/m²), overweight (≥ 25 and < 30 kg/m²), and obesity (≥ 30 kg/m²) (WHO, 1995). Obese participants had lower total intuitive eating and EPR scores than normal-weight and overweight participants (all ps < .001; see Table 2). Normal-weight individuals had higher B-FCC score than overweight (p = .003) and obese subjects (p = .004; see Table 2). UPE and RHSC subscales failed to discriminate between BMI categories. The same pattern of results was observed when gender was added as a covariate in the models (results not shown); note that there was no difference in the BMI categories distribution between women and men (p = .19). Differences in intuitive eating according to BMI categories were documented in other studies, and as observed in the present study, the magnitude of the difference observed was often larger for total intuitive eating score than for subscale scores (Camilleri et al., 2015; Dockendorff, Petrie, Greenleaf, & Martin, 2012; Hawks et al., 2004; Tylka, 2006; Tylka & Kroon Van Diest, 2013).

Globally, these results provide support for the French-Canadian IES-2’s reliability and discriminant validity in a sample of men and women.
Table 2: Intercorrelations between the French-Canadian Intuitive Eating Scale-2 subscales, and means and standard deviations of total and subscale scores according to gender and BMI categories, in Study 2.

<table>
<thead>
<tr>
<th>Correlations between subscales</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>*<em>p &lt; .001, <em>p &lt; .05, †p &lt; .10.</em></em></td>
<td>−</td>
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<tr>
<td>Mean values with unlike superscript letters are significantly different.</td>
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<tbody>
<tr>
<td>Women (n = 74)</td>
<td></td>
<td></td>
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<tr>
<td>Normal-Weight (women, n = 42; men, n = 32)</td>
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<tr>
<td>Overweight (women, n = 23; men, n = 32)</td>
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<tr>
<td>Obese (women, n = 9; men, n = 11)</td>
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<tr>
<td>Men (n = 75)</td>
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<tr>
<td>Normal-Weight (women, n = 42; men, n = 32)</td>
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<tr>
<td>Overweight (women, n = 23; men, n = 32)</td>
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<tr>
<td>Obese (women, n = 9; men, n = 11)</td>
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</thead>
<tbody>
<tr>
<td>1. Total IES</td>
<td>3.48</td>
<td>0.52</td>
<td>3.60</td>
<td>0.74</td>
<td>3.61</td>
<td>0.49</td>
<td>3.64</td>
<td>0.49</td>
<td>3.19</td>
<td>0.74</td>
<td>3.16</td>
<td>0.49</td>
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<tr>
<td>2. Unconditional Permission to Eat</td>
<td>0.39</td>
<td>-</td>
<td>0.39</td>
<td>-</td>
<td>0.39</td>
<td>-</td>
<td>0.39</td>
<td>-</td>
<td>0.39</td>
<td>-</td>
<td>0.39</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Eating for Physical rather than Emotional Reasons</td>
<td>0.85</td>
<td>-</td>
<td>0.85</td>
<td>-</td>
<td>0.85</td>
<td>-</td>
<td>0.85</td>
<td>-</td>
<td>0.85</td>
<td>-</td>
<td>0.85</td>
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<tr>
<td>4. Reliance on Hunger and Satiety Cues</td>
<td>0.38</td>
<td>-</td>
<td>0.38</td>
<td>-</td>
<td>0.38</td>
<td>-</td>
<td>0.38</td>
<td>-</td>
<td>0.38</td>
<td>-</td>
<td>0.38</td>
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<tr>
<td>5. Body-Food Choice Congruence</td>
<td>0.41</td>
<td>-</td>
<td>0.41</td>
<td>-</td>
<td>0.41</td>
<td>-</td>
<td>0.41</td>
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<td>0.41</td>
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<td>0.41</td>
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</table>
General Discussion

The purpose of this series of studies was to assess the validity of a cross-country adapted IES-2 for the French-Canadian population. Intuitive eating is one of the most studied adaptive eating concepts, therefore it is relevant that a validated tool for measuring its features be developed for the French-speaking Canadian population. The scale was adapted by French-Canadian translators, starting from the original IES-2 (Tylka & Kroon Van Diest, 2013) rather than from Camilleri and colleagues’ version (2015), mainly because the adaptation process was already began when the validated French IES-2 was published. Also, despite the fact that the same language is spoken in France and in the province of Québec, the culture is different, which enhances the need to adapt and validate the IES-2 in both populations. The CFA confirmed that it was relevant not to start with the French version since our factor structure did not yield the same results as those obtained by Camilleri et al. (2015). Whereas their data fit in a three-factor structure, which excluded the B-FCC subscale, our data from Study 1 demonstrated that the original four-subscale model of the IES-2 was adequate for our population.

Unconditional Permission to Eat

UPE assesses the willingness to eat when physiologically hungry and what food is desired at the moment. In the two studies, this subscale demonstrated adequate internal and test-retest reliability. The present studies uphold the inverse association documented between UPE and eating disorder symptomatology (Tylka, 2006; Tylka & Kroon Van Diest, 2013; Tylka & Wilcox, 2006), and the positive relations observed between UPE and body-esteem, and body appreciation (Dockendorff et al., 2012; Tylka, 2006; Tylka & Kroon Van Diest, 2013), as well as psychological well-being (Tylka, 2006; Tylka & Kroon Van Diest, 2013). In the present series of studies, we did not test whether UPE contributed to the variance in psychological well-being and
body-esteem, above and beyond the contribution of eating disorder symptomatology. Previous studies have shown that, in contrast to the other intuitive eating subscales, UPE overlapped considerably with low levels of disordered eating (Tylka & Kroon Van Diest, 2013; Tylka & Wilcox, 2006). Consistent with Camilleri et al. (2015) but contrary to our hypothesis and other studies (Dockendorff et al., 2012; Madden, Leong, Gray, & Horwath, 2012; Tylka, 2006; Tylka & Kroon Van Diest, 2013), this subscale failed to differentiate between BMI categories. Also, whereas Tylka and Kroon Van Diest (2013) and Camilleri et al. (2015) observed higher UPE scores in men than women, we did not find such a difference between genders.

*Eating for Physical rather than Emotional Reasons*

The EPR subscale reflects the tendency to eat to satisfy an internal hunger drive rather than to cope with emotions. In Study 1 and 2, EPR showed high internal and test-retest reliability. This subscale also demonstrated good construct validity, being associated with all eating- and body-related variables, as well as psychological measures in expected directions. In previous validation studies, EPR was the only subscale being systematically associated with all psychological, eating- and body-related variables (Camilleri et al., 2015; Dockendorff et al., 2012; Tylka, 2006; Tylka & Kroon Van Diest, 2013). These associations uphold the adaptive trait of intuitive eating, and particularly of this dimension of the concept. In the present studies, EPR showed the strongest association with the total intuitive eating score. In Study 2, EPR also discriminated between genders and BMI categories in expected ways, as observed in previous studies (Camilleri et al., 2015; Dockendorff et al., 2012; Madden et al., 2012; Tylka, 2006; Tylka & Kroon Van Diest, 2013).

*Reliance on Hunger and Satiety Cues*
This subscale represents the degree of awareness of and trust in internal hunger and satiety signals to guide eating behaviors. These concepts are often the first to be evoked when describing intuitive eating. One can see them as being trivial for the management of food intake, but long-term dieters and emotional eaters can have a hard time reconnecting with this awareness of and the trust in their physiological cues. As expected based on previous studies (Camilleri et al., 2015; Tylka, 2006; Tylka & Kroon Van Diest, 2013), the RHSC subscale demonstrated high reliability (internal consistency and test-retest) and good construct validity through its associations, in the predicted directions, with all variables measured. However, in Study 2, RHSC failed to discriminate between genders and BMI categories, whereas moderate to strong negative associations were observed between this subscale of intuitive eating and BMI in other studies (Camilleri et al., 2015; Madden et al., 2012; Tylka, 2006; Tylka & Kroon Van Diest, 2013).

**Body-Food Choice Congruence**

This subscale was added to the latest version of the Intuitive Eating Scale by Tylka and Kroon Van Diest (2013) to address the gentle nutrition principle (Tribole & Resch, 2012), which reflects the ability and desire to choose nutritious foods that offer energy and stamina to the body. The psychometric properties of the B-FCC subscale has only been assessed by Tylka and Kroon Van Diest (2013). In contrast to their findings, we showed negative relations from this subscale to the four EDI-2 subscales and to food and weight preoccupation. The fact that B-FCC was positively associated with body-esteem and psychological well-being is in line with the results obtained by Tylka and Kroon Van Diest (2013). Whereas we did not observe difference between genders, significant differences in the B-FCC score were observed between BMI categories, with normal-weight participants scoring higher on this subscale than overweight and
obese participants, contrary to Tylka and Kroon Van Diest (2013)’s results. These findings demonstrate that this B-FCC shares similar psychometric properties with the three other subscales which upholds its relevance in the scale.

*Intuitive Eating Total Score*

Finally, the intuitive eating total score showed good reliability, construct validity and discriminant validity, being associated with every variable measured, in expected direction. We also observed that the IES-2 total score is significantly associated with body-esteem and psychological well-being, even when controlling for eating disorder symptomatology, in accordance with other authors who claim that intuitive eating is distinct from low level of eating disorder (Tylka & Kroon Van Diest, 2013; Tylka & Wilcox, 2006). Therefore, a high intuitive eating score, regardless of the individual subscale scores, globally reflects adaptive eating behaviors.

*Future research*

This series of study demonstrated the validity of the whole intuitive eating scale, and of its subscales. The total intuitive eating score reflects the adherence to the global concept of intuitive eating and can bring sufficient information for some studies. However, given that each subscale portrays unique intuitive eating principles, the interpretation of the subscales separately is meaningful. Intuitive eating represents more than a way of eating; it depicts a mindset that influences many aspects of life (e.g. emotion coping, physical activity). According to Tribole and Resch (2012) one cannot be considered as an intuitive eater if all principles are not respected. Future research should address whether individuals who score high on the total intuitive eating scale (but not necessarily on each subscale) have similar profiles as individual scoring high on
each of the four subscales. The uniqueness of each subscale should also be investigated in the context of interventions aiming at increasing intuitive eating.

**Strengths and limitations**

Strengths of the present study should be noted. First, the populations included in both studies were a lot more diverse than the college sample used in most previous studies that validated intuitive eating scales (Hawks et al., 2004; Tylka, 2006; Tylka & Kroon Van Diest, 2013). Although only women were included in Study 1, they represented a relatively wide range of age (from 20 to 45 years) and were distributed across various education levels (Carbonneau et al., 2015). In Study 2, a sample of men and women from 18 to 65 years was recruited. Furthermore, in Study 2, the fact that trained professionals measured height and weight brings more validity to BMI values.

Some limitations should also be acknowledged. Although our samples were more diverse than in most previous validation studies of intuitive eating scales, our participants were mostly Caucasian and were highly educated (44% and 60% of the sample having a university degree, in Study 1 and Study 2 respectively). Furthermore, when investigating eating behaviors, it cannot be ruled out that people who are interested in participating in nutrition research projects are more likely to be knowledgeable in nutrition and to be more conscious about the food they eat. These characteristics of the sample limit the generalizability of the results to different populations. Finally, all data was exclusively self-reported, except for the height and weight that were measured in Study 2, and one could wonder if participants can accurately report their eating behaviors.

**Conclusion**
Globally, the results of the present study demonstrated that the French-Canadian IES-2 shares most of the psychometric properties of the original IES-2. The intuitive eating total and subscale scores are reliable in the French-Canadian population according to our study samples. Also, these findings support the adaptive traits of intuitive eating. However, there is a need to assess the psychometric properties of this scale in more heterogeneous samples of French-Canadians in future research.

Acknowledgements

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References


