Intuitive Eating is Inversely Associated with Body Weight Status in the General Population-Based NutriNet-Santé Study

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Objective: To examine the relationship between intuitive eating (IE), which includes eating in response to hunger and satiety cues rather than emotional cues and without having forbidden foods, and weight status in a large sample of adults.

Methods: A total of 11,774 men and 40,389 women aged ≥18 years participating in the NutriNet-Santé cohort were included in this cross-sectional analysis. Self-reported weight and height were collected as well as IE levels using the validated French version of the Intuitive Eating Scale-2. The association between IE and weight status was assessed using multinomial logistic regression models.

Results: A higher IE score was strongly associated with lower odds of overweight or obesity in both men and women. The strongest associations were observed in women for both overweight [quartile 4 vs. 1 of IE: odds ratio, 95% confidence interval: (0.19, 0.17-0.20)] and obesity (0.09, 0.08-0.10). Associations in men were as follows: for overweight (0.43, 0.38-0.48) and obesity (0.14, 0.11-0.18).

Conclusions: IE is inversely associated with overweight and obesity which supports its importance. Although no causality can be inferred from the reported associations, these data suggest that IE might be relevant for obesity prevention and treatment.

Introduction

The high prevalence of overweight and obesity worldwide represents a major socioeconomic and health burden owing to numerous related comorbidities (1). One’s psychological traits, including both affective and cognitive components, can influence eating habits and weight control not only in people with overweight and obesity but also in normal-weight individuals. For instance, some individuals are likely to overeat in response to negative emotions, which can potentially lead to weight gain (2). Cognitive restraint can also adversely affect eating and body weight (3). However, little is known about adaptive eating behaviors which are positively related to well-being (4). These behaviors are more than just an absence of unhealthy eating practices or eating disorders (4). For instance, some individuals who may not exhibit excessive preoccupation with food, binge eating, or cognitive restriction might nonetheless not follow their hunger and satiety signals. A study conducted in men and women with obesity reported that hunger was a reason to start eating in only one in five eating occasions (5). Therefore, further study of these aspects may expand our understanding of the interaction among individual factors, eating behaviors, and weight control.

One type of adaptive behavior—called intuitive eating (IE)—is defined as generally eating in response to physiological hunger and satiety signals, not external and/or emotional cues, together with low overall preoccupation with food (6,7). Many factors in our industrialized environment might impair our biological regulation mechanisms, including food saliency and attractiveness (8), increased energy density and portion sizes (9), parental feeding practices early in life (10), and a multitude of energy-restrictive diets (11). Food preoccupation, beliefs, and rational control of food intake seem also overstressed, especially in Western societies, possibly due in part to the ubiquitous thinness ideal (11).

Weight loss programs based on energy restriction continue to flourish despite evidence of their limited benefits in the long term and the associated psychological and physiological adverse effects (11,12). As a result, interest in health-oriented non-dieting approaches based on an IE model has increased during the past decade. Randomized controlled trials in populations with overweight and obesity promoting IE have demonstrated weight maintenance (13,14) or weight loss (15). In turn, cross-sectional studies have assessed the link between IE and body weight in population-based...
samples and have reported a relatively consistent inverse association (7,16-18). Yet such studies present methodological limitations including homogeneity of the study population in terms of sex, age, and/or educational level. In addition, they were mostly correlation studies which did not adequately control for important confounding factors.

As most previous studies in this domain have been based on women, little is known about the role of sex in the association between IE and body weight status. The few available studies including both genders have reported lower IE scores in women than in men (18,19). Women are more likely to diet (11), which is generally coupled with cognitive restraint, as well as to eat in response to negative emotions (20). In addition, emotional eating (20) and cognitive restraint (21) have been found to be differentially associated with body weight in men and women.

The aim of this study was to evaluate whether higher IE was associated with lower body mass index (BMI) as well as overweight and obesity in a large sample of adults from the general population and the potential modification of this effect by sex.

Methods

Study population and design

Participants were volunteers enrolled in the NutriNet-Santé study, an ongoing Web-based prospective observational cohort study launched in France in May 2009 with a scheduled follow-up of 10 years. It aims to investigate the relationship between nutrition and chronic disease risk, as well as the determinants of dietary behavior and nutritional status. The study was implemented in the general French population (Internet-using adult volunteers, aged ≥18 years). The rationale, design, and methodology of the study have been fully described elsewhere (22). In brief, to be included in the study, participants completed a baseline set of self-administered, Web-based questionnaires assessing dietary intake, physical activity, anthropometric characteristics, lifestyle, socioeconomic conditions, and health status. As part of the follow-up, participants are asked to complete the same set of questionnaires every year. Moreover, each month, participants are invited by e-mail to fill in optional questionnaires related to dietary intakes, determinants of eating behaviors, and nutritional and health status. This study is conducted in accordance with the Declaration of Helsinki, and all procedures were approved by the Institutional Review Board of the French Institute for Health and Medical Research (IRB Inserm 0000388FWA00005831) and the Commission Nationale de l’Informatique et des Libertés (CNIL 908450 and 909216). All participants provided informed consent with an electronic signature. This study is registered in EudraCT (2013-000929-31).

Assessment of IE

IE was assessed by the validated French version of the Intuitive Eating Scale-2 (IES-2) (23). The questionnaire was available at https://www.etude-nutrinet-sante.fr website for completion in December 2013. Completion of this questionnaire was optional. The French IES-2 includes three dimensions: (1) Eating for Physical Rather Than Emotional Reasons (“Physical Reasons,” eight items), for example, “I find other ways to cope with stress and anxiety than by eating”; (2) Reliance on Hunger and Satiety Cues (“Hunger and Satiety Cues,” six items), for example, “I trust my body to tell me when to eat”; and (3) Unconditional Permission to Eat (“Unconditional Permission,” four items), for example, “I do NOT follow eating rules or dieting plans that dictate what, when, and/or how much to eat.” Items are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) with each point on the scale represented by a word anchor. Individual item scores were summed in each of the three subscales, which were then summed up into an IE score. The resulting scores were divided by the number of items in each subscale or in the total IES-2, as appropriate, leading to a possible score range from 1 to 5. Higher scores indicated greater levels of IE or its dimensions. In the present data set, the IES-2 items displayed good internal consistency (z_ordinal_global_score = 0.89), and subscale z-coefficients ranged from 0.67 (Unconditional Permission subscale) to 0.94 (Physical Reasons subscale).

Assessment of anthropometric data

Height and weight were collected at enrollment and each year thereafter by a self-administered anthropometric questionnaire. Subjects were advised to report the exact height and weight if recently assessed by a health care professional. If no such measure was available, participants were asked to perform the measurement themselves if a scale was available at home. Detailed, standardized instructions (along with images) for weight and height measurements were provided. For this study, we used anthropometric data provided as close to the IE assessment as possible. The average interval between the IE and the anthropometric assessment was 6.8 months (SD = 7.7). BMI was calculated as the ratio of weight to the square of height (kg/m²).

Assessment of covariates

At inclusion and each year thereafter, participants provided data on sociodemographic and lifestyle characteristics, including potential IE confounders, such as: sex (18,19,24), age (17,25), educational level (primary, secondary, or university) (17), smoking status (never smoker, former smoker, or current smoker) (17), and physical activity (17,25). For this study, we used data provided as close to the IE assessment as possible. Physical activity was assessed using the short form of the French version of the International Physical Activity Questionnaire (IPAQ) (26). The weekly activity-associated energy expenditure expressed in metabolic equivalent task in minutes per week was estimated, and three categories of physical activity were defined [low (<30 min/d), moderate (30-59 min/d), and high (≥60 min/d)].

Statistical analyses

The present analyses focused on participants included in the NutriNet-Santé study who had completed the IES-2 questionnaire and were not pregnant at the time of completion.

Student’s t-tests, non-parametric Wilcoxon’s rank-sum tests, and chi-square tests were used to compare included versus excluded subjects and men versus women, as appropriate. Quartiles of IE and the subscale scores were defined for men and women separately. Participant characteristics were presented by sex-specific quartiles of IE scores and differences were tested using linear contrast or Mantel-Haenszel tests, as appropriate. Analyses were carried out for the IE score and the IE subscale scores, modeled as quartiles since Hunger and Satiety Cues and Physical Reasons scores were not normally distributed in both sexes, even after transformation. After BMI was
### TABLE 1 Individual characteristics of 52,163 participants in the NutriNet-Santé study (2013) according to quartiles of the IE score, stratified by sex

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All (n = 40,389)</td>
<td>Q1 (n = 10,168)</td>
</tr>
<tr>
<td>Median score [range]&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.28 ± 1.00 (1.00-5.00)</td>
<td>3.06 ± 1.00 (2.78-3.28)</td>
</tr>
<tr>
<td>Age (years)**</td>
<td>55.5 ± 14.1</td>
<td>55.5 ± 14.1</td>
</tr>
<tr>
<td>Education level (%)***</td>
<td>16.7%</td>
<td>17.6%</td>
</tr>
<tr>
<td>Primary</td>
<td>18.6%</td>
<td>18.8%</td>
</tr>
<tr>
<td>Secondary</td>
<td>17.6%</td>
<td>19.4%</td>
</tr>
<tr>
<td>University</td>
<td>65.5%</td>
<td>64.3%</td>
</tr>
<tr>
<td>Missing data</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Smoking status (%)***</td>
<td>41.0%</td>
<td>40.8%</td>
</tr>
<tr>
<td>Never smoker</td>
<td>52.2%</td>
<td>50.6%</td>
</tr>
<tr>
<td>Former smoker</td>
<td>35.3%</td>
<td>38.5%</td>
</tr>
<tr>
<td>Current smoker</td>
<td>12.5%</td>
<td>10.9%</td>
</tr>
<tr>
<td>Physical activity (%)***</td>
<td>10.2%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Low</td>
<td>17.6%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Moderate</td>
<td>32.0%</td>
<td>33.4%</td>
</tr>
<tr>
<td>High</td>
<td>40.2%</td>
<td>36.5%</td>
</tr>
<tr>
<td>Missing data</td>
<td>10.2%</td>
<td>10.4%</td>
</tr>
<tr>
<td>BMI (kg/m&lt;sup&gt;2&lt;/sup&gt;)***</td>
<td>25.2 ± 3.8</td>
<td>26.6 ± 4.3</td>
</tr>
<tr>
<td>Weight status (%)**</td>
<td>54.5%</td>
<td>40.1%</td>
</tr>
<tr>
<td>Non-overweight (&lt;25 kg/m&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>70.9%</td>
<td>50.1%</td>
</tr>
<tr>
<td>Overweight (25-29.99 kg/m&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>35.6%</td>
<td>41.8%</td>
</tr>
<tr>
<td>Obesity (≥30 kg/m&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>9.9%</td>
<td>18.1%</td>
</tr>
</tbody>
</table>

<sup>a</sup>Values are means ± SD or % as appropriate.

<sup>b</sup>On the basis of linear contrast tests (continuous variables) or Mantel-Haenszel tests (categorical variables).

<sup>c</sup>Possible range 1-5. Higher scores indicate higher IE.

**Significant differences between men and women on the basis of Student's t-tests or chi-square tests as appropriate (P<0.0001).
log-transformed to improve normality, linear regression analyses were used to estimate the associations between IE and BMI. Multinomial logistic regression models were used to assess the associations between IE and overweight (25 ≤ BMI < 30 kg/m²) and obesity (BMI ≥ 30 kg/m²) (reference: underweight/normal weight, BMI < 25 kg/m²) (27). Odds ratios (OR) and 95% confidence intervals (CI) were reported. Tests for linear trend were performed using the ordinal score regarding quartiles of IE and its subscale scores. The respective two-way interaction terms of IE and its subscales with sex were tested. Since interactions of IE and its subscales with sex were significant (all P < 0.0001), all models were stratified by sex. All regression models were adjusted for age, educational level, smoking status, and physical activity. Missing data for physical activity and educational level were imputed using the multiple imputation method. All tests of significance were two-sided, and a P-value < 0.05 was considered significant. All statistical analyses were performed using SAS software (version 9.3, SAS Institute Inc.).

### Results

#### Characteristics of participants

From the initial sample of 101,345 participants who received the IES-2 questionnaire, a total of 53,353 (53%) completed it. Excluding 1,150 pregnant women and 40 participants with missing data for weight or height left 52,163 participants available for analysis (40,389 women and 11,774 men). Compared with excluded participants, included participants were older (49.9 years in included vs. 42.5 years in excluded participants, P < 0.0001), with higher percentages of men (22.6% vs. 19.5%, P < 0.0001), more formal education (67.1% vs. 62.8% with university-level education, P < 0.0001), higher physical activity levels (>60 min/d, 31.1% vs. 26.0%, P < 0.0001), and with a lower percentage of current smokers (12.0% vs. 20.6%, P < 0.0001). In included participants, the proportion of overweight persons (excluding obesity) was higher whereas the proportion of persons with obesity was lower compared with excluded participants (23.2% vs. 21.7% and 9.6% vs. 11.5%, respectively, P < 0.0001).

Table 1 presents the characteristics of the participants by quartiles of IE scores, stratified by sex. Women were younger than men. Among women, there was a higher percentage of never smokers and of individuals with high educational levels, as well as a lower percentage of individuals with high physical activity levels, compared with men. Women also had lower BMI and a lower prevalence of overweight (excluding obesity). Finally, compared with men, women showed moderately lower median scores on the IE scale as well as Physical Reasons and Unconditional Permission subscales, and higher scores on Hunger and Satiety Cues subscale (Table 2, all P < 0.0001).

Most of the sociodemographic and lifestyle variables differed across IE quartiles in both sexes (Table 1). For instance, IE scores were positively associated with education and physical activity levels and inversely associated with BMI and the probability of overweight or obesity in both men and women. In addition, men and women in the top quartile of IE scores were younger (while age was rather stable across the first three quartiles) and more likely to be current smokers, while the percentage of never smokers did not seem to vary.

### Association of IE with BMI in men and women

Greater IE and also higher subscale scores (Physical Reasons, Hunger and Satiety Cues, and Unconditional Permission) were associated with lower BMI in the multivariate linear regression analysis in both men and women (Table 3). The strength of all associations was higher in women than in men.

### Association of IE with overweight and obesity in men and women

In multinomial logistic regression analysis, the likelihood of having overweight and, to an even greater extent, obesity decreased across ascending quartiles of the IE score in both men and women (Table 4). The strength of all associations was higher in women than in men. These associations were also found for all IE subscales except for a non-significant trend of odds of overweight across quartiles of Unconditional Permission subscale scores in men; however, only the OR for Q4 versus Q1 of Unconditional Permission was significant.

### Discussion

To our knowledge, this study is the first to examine the association between IE and body weight status in both men and women from a very large population-based sample of adults. As hypothesized, our results revealed a strong inverse association between IE and BMI, overweight, and obesity. Inverse associations were observed between all three IE subscales and weight status, the strongest of which was seen with the Physical Reasons subscale. The strength of all associations appeared to be higher in women than in men.
<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>P</th>
<th>P trend</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men (n = 11,774)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IE</td>
<td>Reference</td>
<td>−4.67 (−5.32, −4.02)</td>
<td>&lt;0.0001</td>
<td>−6.37 (−7.00, −5.74)</td>
<td>&lt;0.0001</td>
<td>−8.30 (−8.92, −7.67)</td>
</tr>
<tr>
<td>Eating for physical rather than emotional reasons</td>
<td>Reference</td>
<td>−4.92 (−5.55, −4.29)</td>
<td>&lt;0.0001</td>
<td>−6.25 (−6.88, −5.60)</td>
<td>&lt;0.0001</td>
<td>−7.78 (−8.39, −7.16)</td>
</tr>
<tr>
<td>Reliance on hunger and satiety cues</td>
<td>Reference</td>
<td>−1.61 (−2.28, −0.93)</td>
<td>&lt;0.0001</td>
<td>−3.49 (−4.18, −2.81)</td>
<td>&lt;0.0001</td>
<td>−5.91 (−6.55, −5.27)</td>
</tr>
<tr>
<td>Unconditional permission to eat</td>
<td>Reference</td>
<td>−0.21 (−0.91, 0.50)</td>
<td>0.57</td>
<td>−0.57 (−1.21, 0.08)</td>
<td>0.09</td>
<td>−1.62 (−2.33, −0.91)</td>
</tr>
<tr>
<td><strong>Women (n = 40,389)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IE</td>
<td>Reference</td>
<td>−7.07 (−7.48, −6.65)</td>
<td>&lt;0.0001</td>
<td>−11.82 (−12.22, −11.42)</td>
<td>&lt;0.0001</td>
<td>−15.37 (−15.76, −14.99)</td>
</tr>
<tr>
<td>Eating for physical rather than emotional reasons</td>
<td>Reference</td>
<td>−7.31 (−7.73, −6.89)</td>
<td>&lt;0.0001</td>
<td>−11.53 (−11.93, −11.12)</td>
<td>&lt;0.0001</td>
<td>−14.82 (−15.20, −14.44)</td>
</tr>
<tr>
<td>Reliance on hunger and satiety cues</td>
<td>Reference</td>
<td>−4.43 (−4.86, −4.00)</td>
<td>&lt;0.0001</td>
<td>−7.98 (−8.41, −7.55)</td>
<td>&lt;0.0001</td>
<td>−11.81 (−12.22, −11.39)</td>
</tr>
<tr>
<td>Unconditional permission to eat</td>
<td>Reference</td>
<td>0.26 (−0.22, 0.73)</td>
<td>0.29</td>
<td>−1.10 (−1.62, −0.59)</td>
<td>&lt;0.0001</td>
<td>−3.77 (−4.26, −3.28)</td>
</tr>
</tbody>
</table>

*Values are regression coefficients (95% CI). The full model was adjusted for age, educational level, smoking status, and physical activity.

Exponentiated parameter estimate so that each coefficient can be interpreted as a percent change in the expected geometric mean of BMI.

Tests for linear trend were performed using the ordinal score regarding quartiles of IE and its subscales.
In our large population-based sample, a higher IE score was associated with lower BMI as well as lower odds of overweight and, to an even greater extent, obesity in both men and women. In agreement with our results, previous cross-sectional studies have shown an inverse association between IE and BMI (7,16-18). These studies were mostly correlation studies carried out on university students. Only one of these studies considered confounding factors and was conducted in a nationwide sample (N = 1,601), but in a middle-aged woman-only group (17). Due to cross-sectional design issues, all of those prior results raise the possibility of reverse causality. Weight gain might impair perceived hunger and satiety signals, or alternatively, individuals with overweight or obesity might be prone to consciously ignore their physiological signals (and consequently disrupt their regulatory processes) in favor of external dieting rules in order to lose weight or in stressful conditions (28). Reverse causality has indeed been reported for cognitive restraint whereby the latter led to weight changes (21), and conversely high BMI led to a larger increase in cognitive restraint (29). Randomized controlled trials have demonstrated that implementing IE within a broader non-diet-based program, or focusing on specific physiological aspects such as training to recognize initial hunger, enabled participants with overweight or obesity to lose (15) or maintain weight (13,14). However, these interventions mainly included women (13,14). The only randomized control trial including normal-weight participants (men and women) resulted in decreased body weight over 5 months in subjects with high pre-meal blood glucose levels, trained to reliably recognize sensations of initial hunger compared to controls who gained weight, while no differences were found in subjects with low pre-meal glucose levels (15). Altogether, these findings provide some evidence that IE might prevent weight gain.

### IE and body weight status

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### IE dimensions and body weight status

All three IE dimensions were inversely associated with BMI, overweight, and obesity, which is consistent with previous reports (7,17,18). The Physical Reasons dimension measures the extent to which people use food to satisfy hunger rather than to cope with negative emotional states such as anxiety, depression, boredom, or...
Intuitive Eating and Weight Status

The Hunger and Satiety Cues subscale captures one’s trust to use physical hunger and satiety cues to determine when, what, and how much to eat. Children appear to have an innate ability to adjust energy intake over successive meals (32) so that their intakes meet their nutritional requirements. However, external factors such as feeding practices (10) or dieting (11) may give priority to cognitive information, overriding hunger and satiety signals (33), which may result in weight gain. For instance, there is consistent evidence of a positive association between eating in the absence of hunger in response to palatable foods and overweight in children, predicted by parents’ restrictive feeding practices (10,34). In addition, an observational study conducted in university students has also shown that, compared with normal-weight participants, overweight participants were less likely to be influenced by internal cues of meal satiation (35). Alternatively, dieters who are in the process of caloric restriction generally ignore these internal signals, which might stimulate both physiological and psychological compensatory mechanisms including hormonal adaptations that favor weight (re)gain (36).

The third component of IE, namely Unconditional Permission, was also associated with weight status although to a lesser extent. This dimension reflects an individual’s willingness to eat when hungry without following external food rules and having forbidden foods. It has been suggested that people who give themselves unconditional permission to eat might be less prone to lose control over eating, compared to people who restrict their food intake (6,7,37). However, reverse causality is also possible. Since individuals with overweight and obesity are attempting to control their intake more than normal-weight individuals do (29), they will consequently show lower Unconditional Permission scores.

**Effect of sex on the IE-weight status association**

Compared with men, women had less overall IE behavior, and they were less prone to eat for physical rather than emotional reasons or to give themselves unconditional permission to eat. These findings are in agreement with the few earlier reports in the literature (18,19). However, in our study women were more prone to rely on their hunger and satiety cues than were men. Other studies have shown inconsistent results regarding this dimension (18,24). Generally, women might be more likely to be dissatisfied with their bodies and hence to impose food restrictions on themselves (11) that may habituate them to disregard physiological signals and thus become more responsive to external cues.

The magnitude of the associations between IE, all three subscales, and weight status was stronger in women than in men. Most existing studies have included only women, therefore restricting the possibility of comparisons. The few studies including men have also reported that certain aspects of IE were related to BMI or BMI categories in both sexes but no tests for potential effect modification by sex were performed (18,24). The stronger inverse association observed in women compared with men can be interpreted in the context of the stronger positive association between emotional eating (20) and weight status also found in women compared with men or a positive association between cognitive restraint and weight gain in women only while it was associated in the opposite direction in men (21). In another subsample of the NutriNet-Santé cohort, IE scores were indeed negatively correlated with emotional eating and cognitive restraint, as hypothesized (23).

**Strengths and limitations**

The major strength of our study is its large sample size. Also, the use of the Internet for data collection permitted access to a heterogeneous sample of volunteers in whom a wide range of sociodemographic and lifestyle characteristics were assessed so as to effectively control for potential confounding factors (22). In addition, the Web-based version of the IES-2 questionnaire minimized missing data by using automatic controls and alerts to users. Next, the French version of the IES-2 was validated in a subsample of the cohort and demonstrated good psychometric properties (23). However, the Unconditional Permission subscale includes four items only and would perhaps benefit from further development to better grasp the underlying concept. Several limitations in the study design should also be mentioned. The main concern is the cross-sectional design that prevents the demonstration of causality. Caution is also needed when generalizing our results since the NutriNet-Santé study is a long-term nutrition-focused cohort and participants are recruited on a voluntary basis. Thus, participants are likely to be particularly health conscious and interested in nutritional issues. Compared with national estimates (38), this study included proportionally more women (77% in this study vs. 52% in national estimates) and more individuals with university education (65% vs. 25%). In addition, compared to a study conducted in a national sample of adults (39), we observed lower rates of overweight and obesity (23% and 10%, respectively, in the present sample vs. 32% and 15% in the nationally representative sample). An additional selection bias might also have occurred given the response rate regarding the IE questionnaire, owing to its optional nature. Weight status was estimated using self-reported anthropometric data, which may have led to misclassification. However, clinical measurements performed in a subsample of the cohort confirmed the validity of the Web-based self-reported heights and weights and the resulting BMI with an intraclass correlation coefficient of 0.97 (40). BMI classification was correct in 93% of cases and weighted kappa for agreement was 0.89. Finally, collection date of self-reported heights and weights and the completion of the IE questionnaire differed on average from 6.8 months (SD = 7.7).

**Conclusion**

In conclusion, our results indicated a strong inverse association of IE with BMI and odds of overweight and obesity, especially in women. Moreover, inverse associations were observed for all three IE subscales. Thus far, obesity prevention and treatment strategies have focused mainly on counteracting detrimental dietary behaviors. Considering adaptive behaviors such as IE could be useful in creating behavioral guidelines insisting on incentives rather than restrictions. Prospective studies are needed to further elucidate these findings and to establish causality.
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