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ORIGINAL ARTICLE

Intuitive eating longitudinally predicts better psychological health and lower use of disordered eating behaviors: findings from EAT 2010–2018

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Abstract

Purpose To examine longitudinal associations of intuitive eating (IE), defined as eating according to internal hunger and satiety cues, with psychological health outcomes and disordered eating behaviors.

Methods Data from a diverse sample of 1491 participants (54.1% female, 19.7% non-Hispanic white) followed from adolescence (baseline; M_{age} = 14.5 years) into young adulthood (follow-up; M_{age} = 22.2 years) came from the population-based EAT 2010–2018 (Eating and Activity over Time) study. Logistic regression models predicting psychological health outcomes and disordered eating behaviors at follow-up simultaneously included baseline IE and change in IE from baseline to follow-up as predictors, adjusting for demographic covariates, body mass index, and outcome at baseline.

Results Greater baseline IE and increases in IE from baseline to follow-up were both associated with lower odds of high depressive symptoms, low self-esteem, high body dissatisfaction, unhealthy weight control behaviors (e.g., fasting, skipping meals), extreme weight control behaviors (e.g., taking diet pills, vomiting), and binge eating at 8-year follow-up. Particularly strong protective associations were observed for binge eating, such that a one-point higher IE score at baseline was associated with 74% lower odds of binge eating at follow-up, and a one-point higher increase in IE score from baseline to follow-up was associated with 71% lower odds of binge eating at follow-up.

Conclusions These results indicate that IE longitudinally predicts better psychological and behavioral health across a range of outcomes and suggest that IE may be a valuable intervention target for improving psychological health and reducing disordered eating behaviors, particularly binge eating.

Level of evidence Level III, cohort study.

Keywords Appetite regulation · Depression · Self-concept · Body image · Feeding and eating disorders

Introduction

Dieting has been identified as a risk factor for a range of adverse psychological and behavioral health outcomes, including depression and disordered eating behaviors [1-4]. Theoretical models proposed to explain these relationships include restraint theory [5] and the spiral model of chronic dieting and eating disorders [6]. Restraint theory posits that dietary restraint decreases sensitivity to internal hunger cues and increases reliance on external cues for eating, thereby leading to overeating [5], and the spiral model posits that repeated dieting failures lead to low self-esteem and depression [6]. Notably, although weight loss is often the goal of dieting, a robust body of evidence indicates that dieting is not effective in achieving long-term weight loss [7–9]

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and instead predicts weight gain over time [10–14]. Taken together, theoretical and empirical support for adverse psychological and behavioral health consequences along with ineffectiveness for long-term weight loss indicates the need for an alternative to dieting.

Intuitive eating (IE) is a promising alternative to dieting that has received increased attention in the literature over recent years [15]. IE—defined as eating based on physiological hunger and satiety cues rather than situational and emotional cues—encourages rejecting the diet mentality and instead cultivating a positive relationship with food and the body [16]. Cultivating such a relationship appears to confer a range of benefits, as cross-sectional studies suggest that more intuitive eaters have better psychological and behavioral health [15, 17], lower body mass index (BMI) [15, 18, 19], and more stable weight histories than less intuitive eaters [20]. Importantly, IE has been found to contribute uniquely to psychological well-being above and beyond the contributions of dieting and disordered eating [21, 22], suggesting that IE does not simply reflect the absence of dieting or disordered eating. Rather, by promoting principles such as respecting one's body and making food choices that honor one's health but also bring satisfaction [16], IE may also reflect the presence of positive attributes. IE could, therefore, be an important target for intervention, particularly considering that it has been shown to be modifiable [23].

While extant research suggests that IE is associated with better psychological and behavioral health in existing literature, essentially all research on this topic to date has been conducted cross-sectionally [15, 17]. In cross-sectional studies, IE is associated with lower depressive symptoms, higher self-esteem, higher body satisfaction, and less disordered eating behaviors [19, 21, 22, 24–27]. However, longitudinal studies are needed to explicate the direction of the relationships observed in cross-sectional studies. To our knowledge, no population-based studies have examined these associations longitudinally [17], although changes in psychological and behavioral health outcomes have been examined in a small number of clinical studies aiming to increase reliance on internal hunger and satiety cues among individuals of higher weight status (i.e., BMI $\geq$ 25 kg/m^2). While two such interventions were found to improve psychological/behavioral health outcomes at follow-up [28, 29], a third did not [30], and effects of changes in IE on psychological and behavioral health outcomes were not formally examined in any of these studies. Further, generalizability of results from these studies to the general population is limited, as inclusion criteria for these samples included not only higher weight status, but also factors such as weight preoccupation [29] and a history of chronic dieting [28]. A population-based study is necessary to advance our understanding of how IE may relate longitudinally to psychological and behavioral health in the broader population. Therefore, the purpose of the present study was to examine longitudinal associations of IE with psychological health outcomes and disordered eating behaviors from adolescence into young adulthood in a large, community sample.

Method

Participants

Longitudinal data from two time points were drawn from EAT 2010–2018 (Eating and Activity over Time), a population-based study designed to examine eating behaviors, physical activity, weight status, and related factors through a socio-ecological framework [31, 32]. At EAT 2010 (hereafter referred to as baseline), surveys and anthropometric measures were completed by 2793 adolescents from 20 public middle schools and high schools in the Minneapolis/St. Paul metropolitan area of Minnesota during the 2009–2010 academic year. At EAT 2018 (hereafter referred to as follow-up), 1568 of the baseline participants completed follow-up surveys as young adults (65.8% response rate among those with contact information available). All study procedures were approved by the University of Minnesota Institutional Review Board.

The analytic sample for the present study was comprised of 1491 participants who provided data on IE at both baseline and follow-up, data on at least one psychological health outcome or disordered eating behavior at both baseline and follow-up, and baseline covariate data. Responders and non-responders did not differ significantly on baseline IE, $t(2773) = 1.51$, $p = 0.13$; however, attrition did not occur completely at random. Non-responders were more likely than responders to be male, non-white, and have parents with low educational attainment in 2010. To account for missing data, inverse probability weighting (IPW) was used [33, 34]. After weighting, the mean age of this sample was 14.5 years (SD = 2.0) at baseline and 22.2 years (SD = 2.0) at follow-up. The weighted sex distribution of the sample was relatively equal (45.9% male, 54.1% female), and the sample was diverse with regard to race/ethnicity (19.7% non-Hispanic white, 28.6% non-Hispanic black, 17.1% Hispanic, 19.5% Asian, 15.1% other race/ethnicity) and socioeconomic status (39.8% low, 21.9% low middle, 17.5% middle, 13.4% high middle, 7.4% high).

Survey development

The EAT 2010 and 2018 surveys consisted of self-report instruments assessing a range of factors of potential relevance to weight status and weight-related behaviors among adolescents. Survey development was guided by (1) a review of previous Project EAT surveys [35] to identify the most

salient items, (2) a theoretical framework, which integrates an ecological perspective with social cognitive theory [36], (3) expert review by professionals from different disciplines, and (4) extensive pilot testing. Test–retest reliability of measures was assessed at baseline in a diverse sample of 129 adolescents over a 1-week period and at follow-up in a diverse sample of 112 young adults over a 3-week period.

Measures

Intuitive eating

Markers of IE were assessed at baseline and follow-up with the following three items adapted from the development of the Intuitive Eating Scale (IES) [24]: "I stop eating when I feel full," "I trust my body to tell me how much to eat," and "I eat everything that is on my plate, even if I'm not that hungry." These items were selected to represent using internal/physical cues to guide quantity of food eaten. The first item came from the Eating for Physical Rather Than Emotional Reasons subscale of the IES, the second item came from the Reliance on Internal Hunger/Satiety Cues subscale of the IES, and the third item came from the pool of items considered for inclusion on the Eating for Physical Rather Than Emotional Reasons subscale of the IES [24]. Response options were 1 = hardly ever, 2 = sometimes, 3 = much of the time, and 4 = almost always. The third item was reverse scored, and responses were averaged. Possible scores ranged from 1 to 4, with higher scores indicating higher levels of IE (McDonald's $\omega = 0.47$ at baseline and 0.56 at follow-up; test–retest $r = 0.57$ at follow-up).

Psychological health outcomes

Quartile cut-offs were used to dichotomize scores for psychological health outcomes, as has been done in previous Project EAT analyses [37, 38]. This approach was used because no clinical cut-offs exist for the self-esteem or body dissatisfaction measures, and the quartile cut-off identified in the present study for depressive symptoms aligned with the most sensitive of the three clinical cut-offs established by Kandel and Davies, the developers of the scale [39]. For consistency from baseline to follow-up, quartile cut-offs identified at baseline were used to define dichotomous variables at both time points.

Depressive symptoms were assessed at baseline and follow-up with the six-item Kandel and Davies Depressive Mood Scale [39]. Response options were 1 = not at all, 2 = somewhat, and 3 = very much. Responses were averaged, and the average was multiplied by ten. Possible scores ranged from 10 to 30, with higher scores indicating higher depressive symptoms (McDonald's $\omega = 0.82$ at baseline and 0.90 at follow-up; test–retest $r = 0.75$ at baseline and 0.71 at follow-up). Dichotomous baseline and follow-up variables were defined using a score greater than 20 (the quartile cut-off identified at baseline) as the cut-off for high depressive symptoms.

Self-esteem was assessed at baseline and follow-up with six items from the Rosenberg Self-Esteem Scale [40]. response options were 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree. Appropriate items were reverse scored, and responses were summed. Possible scores ranged from 6 to 24, with lower scores indicating lower levels of self-esteem (McDonald's $\omega = 0.80$ at baseline and 0.82 at follow-up; test–retest $r = 0.69$ at baseline and 0.78 at follow-up). Dichotomous baseline and follow-up variables were defined using a score less than or equal to 15 (the quartile cut-off identified at baseline) as the cut-off for low self-esteem.

Body dissatisfaction was assessed at baseline and follow-up with a 13-item modified Body Shape Satisfaction Scale [41]. Response options ranged from 1 = very dissatisfied to 5 = very satisfied. Responses were summed. Possible scores ranged from 13 to 65, with lower scores indicating higher levels of body dissatisfaction (McDonald's $\omega = 0.95$ at baseline and follow-up; test–retest $r = 0.66$ at baseline and 0.80 at follow-up). Dichotomous baseline and follow-up variables were defined using a score less than 35 (the quartile cut-off identified at baseline) as the cut-off for high body dissatisfaction.

Disordered eating behaviors

Unhealthy and extreme weight control behaviors were assessed at baseline and follow-up with the question, "Have you done any of the following things to lose weight or keep from gaining weight during the past year?" [42]. Behaviors were categorized as unhealthy weight control behaviors (UWCBs: fasted, ate very little food, used a food substitute, skipped meals, smoked more cigarettes) or extreme weight control behaviors (EWCBs: took diet pills, induced vomiting, used laxatives, used diuretics). Response options were yes and no for each method. Responses were used to create dichotomous variables for endorsing any one or more of the UWCBs (test–retest agreement = 85% at baseline and 76% at follow-up) and any one or more of the EWCBs (test–retest agreement = 96% at baseline and 93% at follow-up).

Binge eating was assessed at baseline and follow-up with the following two questions from the Questionnaire on Eating and Weight Patterns-Revised [43]: "In the past year, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you (binge eating)?" and, if yes, "During the times when you ate this way, did you feel you couldn't stop eating or control what or how much you were eating?". Response options were yes and no for each question. Responses were used to create dichotomous

variables representing binge eating (i.e., overeating with loss of control; test–retest agreement = 97% at baseline and 89% at follow-up).

Baseline covariates

Age, sex, race/ethnicity, and socioeconomic status were self-reported at baseline. Socioeconomic status was based primarily on parental education level at baseline, defined as the higher level of educational attainment of either parent (test–retest $r = 0.90$). A classification and regression tree-based algorithm was also used to take into account family eligibility for public assistance, eligibility for free or reduced-cost school meals, and parent employment status [44]. BMI was calculated using anthropometric data assessed at baseline by trained staff following standardized procedures [45].

Statistical analysis

Descriptive statistics were computed, using a paired sample *t* test to evaluate changes from baseline to follow-up in IE and McNemar's tests to evaluate changes from baseline to follow-up in psychological health outcomes and disordered eating behaviors. Separate logistic regression models were conducted to examine associations between IE and each psychological health outcome/disordered eating behavior, adjusting for age, sex, race/ethnicity, socioeconomic status, BMI, and outcome at baseline. Both IE at baseline and stability of IE from baseline to follow-up were of interest, and IE scores at baseline and follow-up were weakly correlated ($r = 0.20$). For these reasons, baseline IE and change in IE from baseline to follow-up were simultaneously included as predictors in each model. This approach allowed for examination of associations for each IE variable while controlling for the other.

Analyses were conducted using SAS 9.4 and weighted using IPW to account for differential loss to follow-up [33, 34]. Weights for IPW were derived as the inverse of the estimated probability that an individual responded at the two time points based on baseline age, sex, citizenship, race/ethnicity, socioeconomic status, past-year dieting frequency, and BMI. After weighting, there were no significant differences between the baseline and follow-up samples by demographic characteristics, dieting, or weight status ($p > 0.9$).

Results

On average, the sample reported relatively high IE scores at baseline ($M = 2.93$, SD = 0.57; possible range: 1–4), with slightly lower scores at follow-up ($M = 2.87$, SD = 0.58), $t(1490) = 2.98$, $p = 0.003$. Sample prevalences of psychological health outcomes and disordered eating behaviors at baseline and follow-up are reported in Table 1. Prevalences of high depressive symptoms, low self-esteem, UWCBs, EWCBs, and binge eating increased from baseline to follow-up (all p's < 0.001), while prevalence of high body dissatisfaction did not significantly change from baseline to follow-up ($p = 0.11$).

Longitudinal associations of IE with psychological health outcomes and disordered eating behaviors at follow-up are presented in Table 2. After adjusting for age, sex, race/ethnicity, socioeconomic status, BMI, and outcome at baseline, greater baseline IE and increases in IE from baseline to follow-up were both associated with lower odds of high depressive symptoms, low self-esteem, high body dissatisfaction, UWCBs, EWCBs, and binge eating at 8-year follow-up (all p's < 0.01). The strongest protective associations were observed for binge eating, such that scoring one point higher on IE at baseline was associated with 74% lower odds (95% confidence interval [CI]: 60–82%) of binge eating at follow-up, and increasing scores on IE by one point from baseline to follow-up was associated with 71% lower odds (95% CI: 60–79%) of binge eating at follow-up.

Table 1 Psychological health outcomes and disordered eating behaviors at baseline and 8-year follow-up in EAT 2010–2018

	N	Baseline % (*n*)[a]	Follow-up % (*n*)[a]	*p*[b]
High depressive symptoms	1477	20.1 (299)	30.8 (468)	< 0.001
Low self-esteem	1448	26.6 (391)	32.7 (489)	< 0.001
High body dissatisfaction	1463	23.7 (349)	26.0 (398)	0.11
Unhealthy weight control behaviors	1464	43.1 (631)	51.9 (762)	< 0.001
Extreme weight control behaviors	1464	4.2 (61)	13.1 (196)	< 0.001
Binge eating	1450	7.8 (114)	11.6 (174)	< 0.001

[a]Percentage is weighted to account for attrition over time and allow for extrapolation to the original population-based sample, while *n* represents observed count

[b]Changes from baseline to follow-up were evaluated using McNemar's tests

Table 2 Longitudinal associations of intuitive eating with psychological health outcomes and disordered eating behaviors at 8-year follow-up in EAT 2010–2018

	High depressive symptoms	Low self-esteem	High body dissatisfaction	Unhealthy weight control behaviors	Extreme weight control behaviors	Binge eating
	Odds ratio (95% confidence interval)[a]					
Baseline intuitive eating[b]	0.59 (0.45, 0.77)***	0.52 (0.40, 0.68)***	0.62 (0.46, 0.84)**	0.67 (0.52, 0.87)**	0.60 (0.42, 0.86)**	0.26 (0.18, 0.40)***
Change in intuitive eating[b]	0.62 (0.50, 0.76)***	0.56 (0.46, 0.69)***	0.53 (0.42, 0.66)***	0.62 (0.51, 0.76)***	0.59 (0.45, 0.78)***	0.29 (0.21, 0.40)***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

[a]Models were adjusted for age, sex, race/ethnicity, socioeconomic status, body mass index, and outcome at baseline

[b]Baseline intuitive eating and change in intuitive eating from baseline to follow-up were included simultaneously as predictors

Discussion

The current study examined longitudinal associations of IE with depressive symptoms, self-esteem, body dissatisfaction, and disordered eating behaviors from adolescence into young adulthood in a diverse community-based sample. In this sample, greater IE in adolescence and greater increases in IE over the 8-year study period were associated with lower odds of high-depressive symptoms, low self-esteem, high body dissatisfaction, UWCBs, EWCBs, and binge eating in young adulthood, with particularly strong protective associations observed for binge eating. These results indicate that IE longitudinally predicts better psychological and behavioral health across a range of outcomes.

Our results build upon previous cross-sectional studies that have found that IE is associated with better psychological health and lower use of disordered eating behaviors [19, 21, 22, 24–27] by providing evidence that IE predicts these outcomes longitudinally. In addition, results from the present study align with some clinical studies testing interventions to increase reliance on internal hunger and satiety cues among individuals of higher weight status, in which such interventions were found to improve self-esteem and reduce binge eating to a greater extent than control conditions by 1- or 2-year follow-up [28, 29]. While a third intervention was not found to improve self-esteem by 2-year follow-up, the same intervention also produced no difference in IE between intervention and control groups at that 2-year follow-up [30].

When introducing the concept of IE, Tribole and Resch theorized that dieting is detrimental to psychological well-being because failed weight-loss attempts through dieting undermine confidence in oneself [16]. As this theory closely mirrors the spiral model of chronic dieting [6], the protective associations observed in the present study may be explained in part by mechanisms that explain associations of dieting with adverse psychological and behavioral health outcomes. In support of this idea, a less dichotomous thinking style around food and dieting (e.g., not buying into "good" versus "bad" foods or "successful" versus "failed" diets) has been found to mediate the inverse association between IE and disordered eating behaviors [46]. However, IE may confer additional benefits beyond removing dieting failures from the equation. For example, IE has been found to be associated with body appreciation [46], suggesting that an IE approach may facilitate accepting, valuing, and respecting one's body and its internal cues. Future research should aim for further understanding of the mechanisms by which IE may confer psychological and behavioral benefits.

The present study has methodological strengths as well as limitations. Strengths of the study include the longitudinal design and the large, racially/ethnically and socioeconomically diverse sample of males and females. The inclusion of racial/ethnic minorities and males in this sample is particularly notable, as the vast majority of research on IE to date has been conducted in predominantly white, female samples [17]. A key limitation of the present study is low internal consistency of the IE measure. This low internal consistency may have resulted, in part, from attempting to capture two components of the IE construct—corresponding to the Eating for Physical Rather Than Emotional Reasons subscale and the Reliance on Internal Hunger/Satiety Cues subscales of the IES—rather than a singular IE construct. However, low internal consistency is expected with low numbers of items, and the ability to assess IE along with several other eating- and weight-related constructs at the population level necessitated a brief measure. Although internal consistency was low, measures with conventionally low levels of internal consistency still provide valuable information [47], and low internal consistency likely resulted in underestimation of associations rather than overestimation. An additional limitation related to the assessment of IE is the self-report nature of the measure. Another important limitation of the present study is that although data were longitudinal and analyses controlled for potential confounding factors, we cannot infer causation from the observed associations. In addition, loss to follow-up did not occur completely at random; however, sampling weights were used to minimize potential response

bias due to missing data and to allow for extrapolation back to the original school-based sample.

The findings from this study suggest that IE may be a valuable intervention target for improving psychological health and reducing disordered eating behaviors, particularly binge eating. An important next step to advance research in this area might be conducting cognitive interviews to learn how interventions can most effectively introduce and teach IE. While further work in this area is needed, clinicians may want to consider helping clients identify the extent to which they engage in IE, keeping in mind that both baseline levels and changes over the course of treatment may be relevant. Particularly for clients with a history of chronic dieting, working to shift from eating in response to situational and emotional cues to eating in response to physiological hunger and satiety cues may help reduce disordered eating and mitigate related psychological health concerns. Similarly, school-based nutrition education interventions may benefit from incorporating an IE approach, though research is needed to determine the most appropriate balance between traditional nutrition education and an IE approach. Despite the clear need for more research in this area, the present study provides evidence to suggest that adopting IE approaches in the clinic and the community may yield benefits for a range of psychological and behavioral health outcomes.

What is already known on this subject?

Intuitive eating—defined as eating based on physiological hunger and satiety cues rather than situational and emotional cues—encourages rejecting the diet mentality and instead cultivating a positive relationship with food and the body. Cross-sectional studies suggest that more intuitive eaters have better psychological and behavioral health and lower body mass index compared to less intuitive eaters.

What this study adds?

This study advances our understanding of how intuitive eating relates longitudinally to psychological and behavioral health, finding that intuitive eating longitudinally predicted lower odds of high depressive symptoms, low self-esteem, high body dissatisfaction, and disordered eating behaviors in a diverse community sample. Integrating intuitive eating approaches into clinical practice and school-based nutrition education interventions may, therefore, help promote psychological well-being and mitigate risk for future disordered eating behaviors.

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Author contributions DN-S and NL were responsible for the conception, design, and data collection of the EAT 2010–2018 study. All authors contributed to the conception and design of the study presented in the manuscript. Data analyses were performed by VH, ST, and MS. The first draft of the manuscript was written by VH and all authors commented on iterations of the manuscript. All authors read and approved the final manuscript.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the University of Minnesota Institutional Review Board and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all participants included in the study.

References

1. Stice E, Hayward C, Cameron RP et al (2000) Body-image and eating disturbances predict onset of depression among female adolescents: a longitudinal study. J Abnorm Psychol 109:438–444. https://doi.org/10.1037/0021-843X.109.3.438
2. Johnson F, Wardle J (2005) Dietary restraint, body dissatisfaction, and psychological distress: a prospective analysis. J Abnorm Psychol 114:119–125. https://doi.org/10.1037/0021-843X.114.1.119
3. Goldschmidt AB, Wall M, Choo T-HJ et al (2015) Shared risk factors for mood-, eating-, and weight-related health outcomes. Health Psychol. https://doi.org/10.1037/hea0000283
4. Hilbert A, Pike KM, Goldschmidt AB et al (2014) Risk factors across the eating disorders. Psychiatry Res 220:500–506. https://doi.org/10.1016/j.psychres.2014.05.054
5. Herman CP, Mack D (1975) Restrained and unrestrained eating. J Personal 43:647–660. https://doi.org/10.1111/j.1467-6494.1975.tb00727.x
6. Heatherton TF, Polivy J (1992) Chronic dieting and eating disorders: A spiral model. In: Crowther JH, Tennenbaum DL, Hobfoll SE, Stephens MAP (eds) Series in applied psychology: social issues and questions. The etiology of bulimia nervosa: the individual and familial context. Hemisphere Publishing Corp, Washington, pp 133–155
7. Mann T, Tomiyama AJ, Westling E et al (2007) Medicare's search for effective obesity treatments: diets are not the answer. Am Psychol 62:220–233. https://doi.org/10.1037/0003-066X.62.3.220
8. Ayyad C, Andersen T (2000) Long-term efficacy of dietary treatment of obesity: a systematic review of studies published between 1931 and 1999. Obes Rev 1:113–119

9. Dansinger ML, Tatsioni A, Wong JB et al (2007) Meta-analysis: the effect of dietary counseling for weight loss. Ann Intern Med 147:41–50
10. Neumark-Sztainer D, Wall M, Story M, Standish AR (2012) Dieting and unhealthy weight control behaviors during adolescence: associations with 10-year changes in body mass index. J Adolesc Health 50:80–86. https://doi.org/10.1016/j.jadohealth.2011.05.010
11. Neumark-Sztainer D, Wall M, Guo J et al (2006) Obesity, disordered eating, and eating disorders in a longitudinal study of adolescents: how do dieters fare 5 years later? J Am Diet Assoc 106:559–568. https://doi.org/10.1016/j.jada.2006.01.003
12. Lampuré A, Castetbon K, Hanafi M et al (2017) Relative influence of socioeconomic, psychological and sensory characteristics, physical activity and diet on 5-year weight gain in french adults. Nutrients 9:3–7. https://doi.org/10.3390/nu9111179
13. Field AE, Aneja P, Austin SB et al (2007) Race and gender differences in the association of dieting and gains in BMI among young adults. Obesity 15:456–464. https://doi.org/10.1038/oby.2007.560
14. Lowe MR, Annunziato RA, Markowitz JT et al (2006) Multiple types of dieting prospectively predict weight gain during the freshman year of college. Appetite. https://doi.org/10.1016/j.appet.2006.03.160
15. Van Dyke N, Drinkwater EJ (2014) Relationships between intuitive eating and health indicators: literature review. Public Health Nutr. https://doi.org/10.1017/S1368980013002139
16. Tribole E, Resch E (1995) Intuitive eating: a recovery book for the chronic dieter. St. Martin's Press, New York
17. Bruce LJ, Ricciardelli LA (2016) A systematic review of the psychosocial correlates of intuitive eating among adult women. Appetite 96:454–472. https://doi.org/10.1016/j.appet.2015.10.012
18. Camilleri GM, Méjean C, Bellisle F et al (2016) Intuitive eating is inversely associated with body weight status in the general population-based NutriNet-Santé study. Obesity 24:1154–1161. https://doi.org/10.1002/oby.21440
19. Denny KN, Loth K, Eisenberg ME, Neumark-Sztainer D (2013) Intuitive eating in young adults: who is doing it, and how is it related to disordered eating behaviors? Appetite 60:13–19. https://doi.org/10.1016/j.appet.2012.09.029
20. Tylka TL, Calogero RM, Daníelsdóttir S (2019) Intuitive eating is connected to self-reported weight stability in community women and men. Eat Disord. https://doi.org/10.1080/10640266.2019.1580126
21. Tylka TL, Wilcox JA (2006) Are intuitive eating and eating disorder symptomatology opposite poles of the same construct? J Counsel Psychol 53:474–485. https://doi.org/10.1037/0022-0167.53.4.474
22. Tylka TL, Kroon Van Diest AM (2013) The Intuitive Eating Scale-2: item refinement and psychometric evaluation with college women and men. J Counsel Psychol 60:137–153. https://doi.org/10.1037/a0030893
23. Cole RE, Horacek T (2010) Effectiveness of the "My Body Knows When" intuitive-eating pilot program. Am J Health Behav 34:286–297. https://doi.org/10.5993/AJHB.34.3.4
24. Tylka TL (2006) Development and psychometric evaluation of a measure of intuitive eating. J Counsel Psychol 53:226–240. https://doi.org/10.1037/0022-0167.53.2.226
25. Tylka TL, Calogero RM, Daníelsdóttir S (2015) Is intuitive eating the same as flexible dietary control? Their links to each other and well-being could provide an answer. Appetite 95:166–175. https://doi.org/10.1016/j.appet.2015.07.004
26. Iannantuono AC, Tylka TL (2012) Interpersonal and intrapersonal links to body appreciation in college women: an exploratory model. Body Image 9:227–235. https://doi.org/10.1016/j.bodyim.2012.01.004
27. Dittmann K, Freedman M, Beddoe A, Waldrop J (2009) Body awareness, eating attitudes, and spiritual beliefs of women practicing yoga. Eat Disord 17:273–292. https://doi.org/10.1080/10640260902991111
28. Bacon L, Stern JS, Van Loan MD, Keim NL (2005) Size acceptance and intuitive eating improve health for obese, female chronic dieters. J Am Diet Assoc 105:929–936. https://doi.org/10.1016/j.jada.2005.03.011
29. Gagnon-Girouard M-P, Bégin C, Provencher V et al (2010) Psychological impact of a "Health-at-Every-Size" intervention on weight-preoccupied overweight/obese women. J Obes. https://doi.org/10.1155/2010/928097
30. Mensinger JL, Calogero RM, Stranges S, Tylka TL (2016) A weight-neutral versus weight-loss approach for health promotion in women with high BMI: a randomized-controlled trial. Appetite 105:364–374. https://doi.org/10.1016/j.appet.2016.06.006
31. Neumark-Sztainer D, Wall MM, Larson N et al (2012) Secular trends in weight status and weight-related attitudes and behaviors in adolescents from 1999 to 2010. Prev Med 54:77–81. https://doi.org/10.1016/j.ypmed.2011.10.003
32. Neumark-Sztainer D, Wall M, Fulkerson JA, Larson N (2013) Changes in the frequency of family meals from 1999 to 2010 in the homes of adolescents: trends by sociodemographic characteristics. J Adolesc Health 52:201–206. https://doi.org/10.1016/J.JADOHEALTH.2012.06.004
33. Seaman SR, White IR (2013) Review of inverse probability weighting for dealing with missing data. Stat Methods Med Res 22:278–295. https://doi.org/10.1177/0962280210395740
34. Little RJA (1986) Survey nonresponse adjustments for estimates of means. Int Stat Rev 54:139. https://doi.org/10.2307/1403140
35. Neumark-Sztainer D, Story M, Perry C, Casey MA (1999) Factors influencing food choices of adolescents: findings from focus-group discussions with adolescents. J Am Diet Assoc 99:929–937. https://doi.org/10.1016/S0002-8223(99)00222-9
36. Sallis JF, Owen N, Fisher EB (2008) Ecological models of health behavior. In: Glanz K, Rimer BK, Viswanath K (eds) Health behavior and health education: theory, research, and practice, vol 4. Josey-Bass, San Francisco, pp 465–485
37. Ackard DM, Neumark-Sztainer D, Story M, Perry C (2006) Parent–child connectedness and behavioral and emotional health among adolescents. Am J Prev Med 30:59–66. https://doi.org/10.1016/j.amepre.2005.09.013
38. Crow S, Eisenberg ME, Story M, Neumark-Sztainer D (2006) Psychosocial and behavioral correlates of dieting among overweight and non-overweight adolescents. J Adolesc Health 38:569–574. https://doi.org/10.1016/j.jadohealth.2005.05.019
39. Kandel DB, Davies M (1982) Epidemiology of depressive mood in adolescents. Arch Gen Psychiatry 39:1205–1212. https://doi.org/10.1001/archpsyc.1982.04290100065011
40. Rosenberg M (1965) Society and the adolescent self-image. Princeton University Press, Princeton (NJ)
41. Pingitore R, Spring B, Garfield D (1997) Gender differences in body satisfaction. Obes Res 5:402–409. https://doi.org/10.1002/j.1550-8528.1997.tb00662.x
42. Neumark-Sztainer D, Croll J, Story M et al (2002) Ethnic/racial differences in weight-related concerns and behaviors among adolescent girls and boys-findings from Project EAT. J Psychosom Res 53:963–974. https://doi.org/10.1016/S0022-3999(02)00486-5
43. Yanovski SZ (1993) Questionnaire on eating and weight patterns-revised (QEWP-R). Obes Res 1:319–324
44. Neumark-Sztainer D, Hannan PJ, Story M et al (2003) Family meal patterns: associations with sociodemographic characteristics and improved dietary intake among adolescents. J Am Diet Assoc 103:317–322. https://doi.org/10.1053/jada.2003.50048
45. Gibson RS (2005) Principles of nutritional assessment, 2nd edn. Oxford University Press, New York

46. Linardon J, Mitchell S (2017) Rigid dietary control, flexible dietary control, and intuitive eating: evidence for their differential relationship to disordered eating and body image concerns. Eat Behav 26:16–22. https://doi.org/10.1016/j.eatbeh.2017.01.008
47. Schmitt N (1996) Uses and abuses of coefficient alpha. Psychol Assess 8:350–353. https://doi.org/10.1037/1040-3590.8.4.350