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Lifestyle Health Behavior Correlates of Intuitive Eating in a Population-Based Sample of Men and Women

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Abstract

The aim of this observational study was to examine how lifestyle health behaviors hypothesized to influence attunement to internal cues (breakfast consumption frequency, physical activity, yoga practice, sleep, and recreational screen time) are cross-sectionally related to intuitive eating (IE). Data from 765 men and 1,009 women (M_{age} = 31.1±1.7 years) who participated in Project EAT-IV (Eating and Activity in Teens and Young Adults) were analyzed with sex-stratified linear regression models adjusted for age, race/ethnicity, socioeconomic background, and parent status. Sociodemographic-adjusted mean levels of each health behavior by sex were generated at low (one standard deviation below the mean), average (at the mean), and high (one standard deviation above the mean) levels of IE to facilitate interpretation of regression results. Among women only, more frequent breakfast consumption (p = .02), more time spent practicing yoga (p = .03), more sleep (p = .004), and less recreational screen time (p = .01) were each significantly associated with higher IE after adjusting for sociodemographic characteristics. Compared to women with low IE, women with high IE reported, on average, eating breakfast 0.3 more days a week, practicing 12 more minutes of yoga per week, getting 12 more minutes of sleep per night, and engaging in 18 fewer minutes of recreational screen time per day. Results suggest that these modifiable health behaviors may be valuable targets for interventions to increase IE among women, though longitudinal research is needed to elucidate the temporality of these associations.

Keywords

intuitive eating; health behaviors; physical activity; yoga; sleep; screen time

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Introduction

The intuitive eating (IE) framework emphasizes eating according to internal hunger and satiety cues (versus external rules; Tribole & Resch, 2020). Growing cross-sectional, longitudinal, and intervention research demonstrates promising associations between IE and health-related indices and behaviors. For instance, IE is cross-sectionally associated with less recurrent binge eating (Linardon et al., 2020), as well as with greater fruit and vegetable intake and self-reported weight stability in adults (Christoph et al., 2021; Tylka et al., 2020). Longitudinally, higher IE in adolescence predicts lower odds of depressive symptoms, poor self-esteem, body dissatisfaction, unhealthy weight-control behaviors, and binge eating in young adulthood (Hazzard et al., 2021). Similarly, IE interventions have reduced disordered eating and weight-bias internalization and improved emotional functioning, body appreciation, and life satisfaction (Burnette & Mazzeo, 2020; Schaefer & Magnuson, 2014; Van Dyke & Drinkwater, 2014). Thus, IE appears to confer a range of psychosocial benefits, but less is known regarding potential determinants of IE.

Although perhaps best known for its focus on using hunger and satiety cues to guide eating, IE is a ten-principle framework that emphasizes cultivating attunement to all bodily sensations (e.g., feeling tired, having a full bladder) and removing obstacles to this attunement (Tribole & Resch, 2020). For example, one of the ten principles of the IE framework focuses on encouraging physical activity that feels good (Tribole & Resch, 2020). In the IE model, general body cue awareness is considered to be important cross-training for strengthening one's ability to detect biological hunger and satiety cues (Tribole & Resch, 2020). According to Tribole and Resch, the authors who introduced the IE framework, adequate self-care is fundamental to the cultivation of body cue awareness, such that when basic needs are not met, the ability to notice, respond to, and discriminate between internal cues can be disrupted (Tribole & Resch, 2020). For instance, inadequate sleep could lead to eating in the absence of hunger to regulate emotions or gain energy (Tribole & Resch, 2020). Similarly, excess recreational screen time can divert attention away from internal cues and lead to distracted eating or missed meals (Tribole & Resch, 2020). Conversely, adequate sleep, consistent meals (e.g., regular breakfast consumption), and regular, enjoyable physical activity may improve emotional and physical functioning and enhance attunement (Tribole & Resch, 2020). Yoga represents a form of physical activity that may be particularly important for cultivating attunement to internal cues, given that mindful attunement to the body during practice is a central aspect of the practice of yoga (Piran & Neumark-Sztainer, 2020).

Therefore, in theory, greater use of behaviors that may cultivate attunement to internal cues (e.g., yoga practice) and lower use of attunement-disrupting behaviors (e.g., excess screen time) would be associated with greater IE. Despite this theoretical framework, however, no research to our knowledge has examined such health behaviors as correlates of IE. Investigating how lifestyle health behaviors that are theorized to have the potential to influence body cue awareness are associated with IE is important, as doing so may provide evidence for the original IE model introduced by Tribole and Resch (Tribole & Resch, 2020) and could inform future health promotion efforts. Therefore, the objective of this observational study was to examine cross-sectional associations between health behaviors that may have the potential to influence attunement to internal cues (i.e., breakfast consumption frequency, moderate-to-vigorous physical activity [MVPA], yoga practice, sleep, and recreational screen time) and IE in men and women. As previous research suggests that IE's associations with other health attitudes and behaviors differ by sex (e.g., Smith et al., 2020), we examined associations between health behaviors and IE separately among men and women. We expected more frequent breakfast consumption, more MVPA, yoga practice, and sleep, and less recreational screen time to correlate with higher IE. However, given that IE had not previously been examined in relation to the lifestyle health behaviors examined in the present study, we did not have specific hypotheses regarding sex differences.

Methods

Participants

Data for the present study were collected as part of Project EAT-IV (Eating and Activity in Teens and Young Adults), the fourth wave of a population-based study following adolescents into young adulthood. A total of 4,746 middle school and high school students at 31 public schools in the Minneapolis-St. Paul metropolitan area of Minnesota participated at the original assessment in 1998–1999 (Neumark-Sztainer, Croll, et al., 2002; Neumark-Sztainer, Story, et al., 2002). In 2015–2016, when participants were young adults, those who had responded to at least one of two previous follow-up surveys were invited to complete the Project EAT-IV survey (Larson et al., 2018; Neumark-Sztainer et al., 2018). Survey data at EAT-IV were collected from 1,830 of the initial participants (66.1% of those with valid contact information). After excluding 56 participants (3.1% of those who participated in EAT-IV) who did not provide sufficient item-level data for the present analyses, the final analytic sample for this study included 1,774 participants (765 men and 1,009 women). Study protocols were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee, and participants provided informed consent.

Attrition across waves of the Project EAT study did not occur at random. Thus, in all analyses, inverse probability weighting (IPW) based on response propensities (Little, 1986) was used to account for missing data due to attrition. IPW is the recommended method for handling missing data due to attrition in cohort studies, where individuals have missing values for all items on surveys they do not respond to (Seaman & White, 2013). IPW minimizes potential response bias due to missing data and allows for extrapolation back to the original EAT-I school-based sample. Response propensities (i.e., the probability of responding to the Project EAT-IV survey) were estimated using a logistic regression of response at EAT-IV on several predictor variables from the baseline Project EAT-I survey, including demographics, weight status, and parental living situation. Weighting resulted in estimates representative of the sociodemographic make-up of the original school-based sample, thereby allowing results to be more generalizable to the population of young people in the Minneapolis-St. Paul metropolitan area. In the weighted analytic sample for the present study, the mean age at EAT-IV was 31.1±1.7 years, and participants were 49.6% Non-Hispanic White, 18.8% Non-Hispanic Black/African American, 18.6% Asian/Asian American, 5.9% Hispanic/Latinx, and 7.2% mixed or other race/ethnicity. The weighted distribution of the analytic sample across categories of socioeconomic background based primarily on parental educational attainment (assessed at baseline) was: 18.1% low, 18.8% low-middle, 26.6% middle, 23.3% high-middle, and 13.2% high. Roughly half (51.7%) of participants had children at EAT-IV.

Survey Measures

The EAT-IV survey was based on the initial Project EAT survey (Neumark-Sztainer, Croll, et al., 2002; Neumark-Sztainer, Story, et al., 2002) and modified based on life-course theory (Maternal and Child Health Bureau, 2010) to assess sociodemographic and behavioral variables related to eating practices and physical activity. The EAT-IV survey was also modified to include emerging topics of interest, such as IE, that were not assessed in the initial Project EAT survey. Scale psychometric properties (i.e., Cronbach's alphas) were examined in the full analytic sample, and test-retest reliability was assessed in a subgroup of 103 participants who completed the EAT-IV survey twice within a period of one to four weeks. Measures used in the present study are described in Table 1.

Statistical Analysis

Descriptive statistics were calculated, and *t*-tests were conducted to examine differences by sex in health behaviors and IE. Cross-sectional associations between health behaviors and IE were examined in linear regression models, with health behaviors examined as independent variables in separate models and IE examined as the dependent variable. While interactions between sex and health behaviors were not statistically significant (p=.07 for breakfast consumption frequency, p=.29 for MVPA, p=.20 for yoga practice, p=.53 for sleep, p=.28 for recreational screen time), prior research suggests that there are sex differences in how IE is related to other health attitudes and behaviors (e.g., Smith et al., 2020). Based on prior evidence of such sex differences, an *a priori* decision was made to stratify all regression models by sex. Age, race/ethnicity, socioeconomic background, and parent status were included in regression models as covariates to account for potential confounding. These covariates were hypothesized *a priori* to be potential confounders, as prior literature suggests that lifestyle health behaviors and IE differ by age (Ruzanska & Warschburger, 2017; Tan et al., 2018), race/ethnicity (Denny et al., 2013; Krueger et al., 2011), socioeconomic background (Denny et al., 2013; Lantz et al., 1998), and parent status (Dinkel et al., 2021). Distributions of residuals were inspected visually and did not indicate any substantial deviations from normality. To aid in interpretation of results, effect sizes were assessed via Cohen's f^2, where an effect size of 0.02 is considered small, 0.15 is medium, and 0.35 is large (Cohen, 1988). To further facilitate meaningful interpretation of regression results, adjusted mean levels of health behaviors at low (defined as one standard deviation below the mean), average (defined as the mean), and high (defined as one standard deviation above the mean) IE levels were then computed from analogous regression models in which IE was included as the independent variable and health behaviors were examined as the dependent variables. The orientation of regression models was reversed for the computation of adjusted means in order to present differences across variables with meaningful units (e.g., hours of sleep per night) rather than presenting differences across IE scores. All analyses incorporated IPWs to account for missing data due to attrition across survey waves; missing data at the item level were not imputed given that the item-level missing rate was less than 5% and thus considered nominal (Dong & Peng, 2013). Analyses were conducted using Stata 16.1, with the threshold for statistical significance set at $p<.05$.

Results

The mean IE score in this sample was 2.9±0.6 (possible range: 1–4), with similar scores across men and women ($p=.70$). Men reported, on average, more MVPA (5.0±4.1 hours/week versus 3.6±3.4 hours/week among women, $p<.001$) and recreational screen time (3.3±1.9 hours/day versus 3.0±1.9 hours/day among women, $p=.02$) than women. Conversely, women reported, on average, more frequent breakfast consumption (4.8±2.3 days/week versus 4.1±2.5 days/week among men, $p<.001$), more time spent practicing yoga (0.4±0.9 hours/week versus 0.2±0.7 hours/week among men, $p<.001$), and more sleep (8.1±1.1 hours/night versus 7.9±1.2 hours/night among men, $p<.001$) than men.

Cross-Sectional Associations Between Health Behaviors and Intuitive Eating

Among women only, more frequent breakfast consumption, more time spent practicing yoga, more sleep, and less recreational screen time were each significantly associated with higher IE after adjusting for age, race/ethnicity, socioeconomic background, and parent status (Table 2). Effect sizes were less than small for each of these associations, as indicated by Cohen's f^2 values of 0.01. Compared to women with low IE, women with high IE reported, on average, eating breakfast 0.3 more days a week, practicing 12 more minutes of yoga per week, getting 12 more minutes of sleep per night, and engaging in 18 fewer minutes of recreational screen time per day. No significant associations were observed for MVPA or among men.

Discussion

This study examined a range of health behaviors that the IE framework theorizes may influence attunement to internal cues in relation to IE in a population-based sample of men and women. Results among women supported our hypotheses that more frequent breakfast consumption, more yoga practice, more sleep, and less recreational screen time would correlate with higher IE, though our hypothesis that greater levels of MVPA would also correlate with higher IE was not supported. Our hypotheses were not, however, supported among men.

This study was the first to our knowledge to examine lifestyle health behaviors as correlates of IE and therefore provides some preliminary support for the theoretical framework underlying IE (Tribole & Resch, 2020), at least among women. That is, women who reported greater engagement in activities posited to cultivate internal cue attunement (breakfast consumption frequency, yoga practice, and sleep) and lower levels of an activity posited to disrupt internal cue attunement (recreational screen time) exhibited higher IE. Conversely, we did not find support for this theoretical framework among men. The differences in our findings across men and women cohere with prior evidence that IE is more strongly associated with dietary restraint and emotional eating among women than men (Smith et al., 2020), but the mechanisms underlying these differences are not clear. Although IE is theorized to be innate, it is also believed to be susceptible to decline over time secondary to exposure to sociocultural pressures (Tribole & Resch, 2020). Thus, given that females generally experience greater sociocultural pressures to conform to the thin body ideal than males (Esnaola et al., 2010), one possible explanation for the differences observed between men and women in the present study in associations between health behaviors/attitudes and IE is that IE may simply be more stable over time among males. More specifically, body cue awareness cross-training (i.e., where awareness of body cues within one domain facilitates body cue awareness in other domains) in domains such as physical activity and sleep may be less relevant in determining males' abilities to detect internal hunger and satiety cues if their attunement to eating-related internal cues is already strong. Supporting this idea, men generally report higher IE levels than women (Linardon et al., 2021), albeit not in the present study.

Strengths of this study include the population-based nature and the large size of the sample. The inclusion of men, who have been included less often in IE research (Van Dyke & Drinkwater, 2014), is also a study strength, though results underscore the need for further research to identify facilitators and correlates of IE among men. The self-report nature of the data is a limitation of the study, however, and all participants were drawn from the Minneapolis-St. Paul metropolitan area, limiting the geographic generalizability of our findings. Importantly, the relationship between the examined lifestyle health behaviors and IE may be bidirectional, and it is also possible that health behaviors which support attunement to internal cues simply tend to pattern with IE among individuals who are generally more attuned internally. As EAT-IV was the first wave of the study to include a relatively comprehensive measure of IE, the cross-sectional nature of the data precludes the ability to establish temporality. Therefore, longitudinal research is needed to elucidate the directionality of the relationships between the examined health behaviors and IE.

In summary, the present study sheds light on modifiable health behavior correlates of IE and provides preliminary evidence supporting the self-care emphasis of the IE framework among women (Tribole & Resch, 2020). Findings from this study, along with consideration of potential barriers to engaging in attuned care of the body (e.g., limited time or financial resources that may impede access to regular breakfast consumption, yoga, and sleep), should be used to inform future IE interventions. The relatively small magnitudes of average differences in health behaviors corresponding to low versus high levels of IE suggest that even small improvements in these health behaviors could potentially correspond to meaningful improvements in IE, particularly at the population level. Although longitudinal research is needed to elucidate the temporality of the associations observed in this study, results point to breakfast consumption, yoga, sleep, and recreational screen time as potentially valuable targets to incorporate in interventions aiming to increase IE among women. Likewise, findings suggest that interventions aiming to modify these health behaviors may incidentally have favorable effects on IE among women.

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References

Burnette CB, & Mazzeo SE (2020). An uncontrolled pilot feasibility trial of an intuitive eating intervention for college women with disordered eating delivered through group and guided self-help modalities. International Journal of Eating Disorders, 53(9), 1405–1417. 10.1002/eat.23319 [PubMed: 32476164]

Christoph MJ, Hazzard VM, Järvelä-Reijonen E, Hooper L, Larson N, & Neumark-Sztainer D (2021). Intuitive eating is associated with higher fruit and vegetable intake among adults. Journal of Nutrition Education and Behavior, 53(3), 240–245. 10.1016/j.jneb.2020.11.015 [PubMed: 33423901]

Cohen J (1988). Statistical power analysis for the behavioral sciences (2nd ed). Lawrence Earlbaum Associates.

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(1), 13–19. 10.1016/j.appet.2012.09.029 [PubMed: 23063606]

Dinkel D, Lu K, John J, Snyder K, & Jacobson LT (2021). A cross-sectional examination of physical activity, sedentary time, and sleep between adults with and without children in the home using the national health and nutrition examination survey. Journal of Physical Activity and Health, 18(4), 391–399. 10.1123/JPAH.2020-0490 [PubMed: 33657529]

Dong Y, & Peng CYJ (2013). Principled missing data methods for researchers. SpringerPlus, 2(1), 1–17. 10.1186/2193-1801-2-222 [PubMed: 23419944]

Esnaola I, Rodríguez A, & Goñi A (2010). Body dissatisfaction and perceived sociocultural pressures: Gender and age differences. Salud Mental, 33(1), 21–29.

Godin G, & Shephard RJ (1985). A simple method to assess exercise behavior in the community. Canadian Journal of Applied Sport Sciences. Journal Canadien Des Sciences Appliquees Au Sport, 10(3), 141–146. http://www.ncbi.nlm.nih.gov/pubmed/4053261 [PubMed: 4053261]

Haines J, Neumark-Sztainer D, Wall M, & Story M (2007). Personal, behavioral, and environmental risk and protective factors for adolescent overweight. Obesity, 15(11), 2748–2760. 10.1038/oby.2007.327 [PubMed: 18070766]

Hazzard VM, Telke SE, Simone M, Anderson LM, Larson NI, & Neumark-Sztainer D (2021). Intuitive eating longitudinally predicts better psychological health and lower use of disordered eating behaviors: findings from EAT 2010–2018. Eating and Weight Disorders, 26(1), 287–294. 10.1007/s40519-020-00852-4 [PubMed: 32006391]

Krueger PM, Saint Onge JM, & Chang VW (2011). Race/ethnic differences in adult mortality: The role of perceived stress and health behaviors. Social Science and Medicine, 73(9), 1312–1322. 10.1016/j.socscimed.2011.08.007 [PubMed: 21920655]

Lantz PM, House JS, Lepkowski JM, Williams DR, Mero RP, & Chen J (1998). Socioeconomic factors, health behaviors, and mortality: Results from a nationally representative prospective study of US adults. Journal of the American Medical Association, 279(21), 1703–1708. 10.1001/jama.279.21.1703 [PubMed: 9624022]

Larson N, Haynos AF, Roberto CA, Loth KA, & Neumark-Sztainer D (2018). Calorie labels on the restaurant menu: Is the use of weight-control behaviors related to ordering decisions? Journal of the Academy of Nutrition and Dietetics, 118(3), 399–408. 10.1016/j.jand.2017.11.007 [PubMed: 29325890]

Linardon J, Messer M, Helms ER, McLean C, Incerti L, & Fuller-Tyszkiewicz M (2020). Interactions between different eating patterns on recurrent binge-eating behavior: A machine learning approach. International Journal of Eating Disorders, 53(4), 533–540. 10.1002/eat.23232 [PubMed: 31998997]

Linardon J, Tylka TL, & Fuller-Tyszkiewicz M (2021). Intuitive eating and its psychological correlates: A meta-analysis. International Journal of Eating Disorders, 54(7), 1073–1098. 10.1002/eat.23509 [PubMed: 33786858]

Little RJ (1986). Survey nonresponse adjustments for estimates of means. International Statistical Review, 54(2), 139. 10.2307/1403140

Lytle LA, Pasch KE, & Farbakhsh K (2011). The relationship between sleep and weight in a sample of adolescents. Obesity, 19(2), 324–331. 10.1038/oby.2010.242 [PubMed: 20948522]

Maternal and Child Health Bureau. (2010). Rethinking MCH: The Life Course Model as an Organizing Framework. In U.S. Department of Health and Human Services https://www.hrsa.gov/ourstories/mchb75th/images/rethinkingmch.pdf

Meyer KA, Wall MM, Larson NI, Laska MN, & Neumark-Sztainer D (2012). Sleep duration and BMI in a sample of young adults. Obesity, 20(6), 1279–1287. 10.1038/oby.2011.381 [PubMed: 22282051]

Neumark-Sztainer D, Croll J, Story M, Hannan PJ, French SA, & Perry C (2002). Ethnic/racial differences in weight-related concerns and behaviors among adolescent girls and boys-findings from Project EAT. Journal of Psychosomatic Research, 53, 963–974. 10.1016/S0022-3999(02)00486-5 [PubMed: 12445586]

Neumark-Sztainer D, Hannan PJ, Story M, Croll J, & Perry C (2003). Family meal patterns: Associations with sociodemographic characteristics and improved dietary intake among adolescents. Journal of the American Dietetic Association, 103(3), 317–322. 10.1053/jada.2003.50048 [PubMed: 12616252]

Neumark-Sztainer D, MacLehose RF, Watts AW, Eisenberg ME, Laska MN, & Larson N (2017). How is the practice of yoga related to weight status? Population-based findings from Project EAT-IV. Journal of Physical Activity and Health, 14(12), 905–912. 10.1123/jpah.2016-0608 [PubMed: 28682698]

Neumark-Sztainer D, Story M, Hannan PJ, & Croll J (2002). Overweight status and eating patterns among adolescents: where do youths stand in comparison with the Healthy People 2010 objectives? American Journal of Public Health, 92(5), 844–851. 10.2105/ajph.92.5.844 [PubMed: 11988458]

Neumark-Sztainer D, Wall MM, Chen C, Larson NI, Christoph MJ, & Sherwood NE (2018). Eating, activity, and weight-related problems from adolescence to adulthood. American Journal of Preventive Medicine, 55(2), 133–141. 10.1016/j.amepre.2018.04.032 [PubMed: 29937114]

Pasch KE, Laska MN, Lytle LA, & Moe SG (2010). Adolescent sleep, risk behaviors, and depressive symptoms: Are they linked? American Journal of Health Behavior, 34(1), 237–248. 10.5993/ajhb.34.2.11 [PubMed: 19814603]

Piran N, & Neumark-Sztainer D (2020). Yoga and the experience of embodiment: a discussion of possible links. Eating Disorders, 28(4), 330–348. 10.1080/10640266.2019.1701350 [PubMed: 31922924]

Ruzanska UA, & Warschburger P (2017). Psychometric evaluation of the German version of the Intuitive Eating Scale-2 in a community sample. Appetite, 117, 126–134. 10.1016/j.appet.2017.06.018 [PubMed: 28645751]

Schaefer JT, & Magnuson AB (2014). A review of interventions that promote eating by internal cues. Journal of the Academy of Nutrition and Dietetics, 114(5), 734–760. 10.1016/j.jand.2013.12.024 [PubMed: 24631111]

Seaman SR, & White IR (2013). Review of inverse probability weighting for dealing with missing data. Statistical Methods in Medical Research, 22(3), 278–295. 10.1177/0962280210395740 [PubMed: 21220355]

Sirard JR, Bruening M, Wall MM, Eisenberg ME, Kim SK, & Neumark-Sztainer D (2013). Physical activity and screen time in adolescents and their friends. American Journal of Preventive Medicine, 44(1), 48–55. 10.1016/j.amepre.2012.09.054 [PubMed: 23253649]

Sirard JR, Hannan P, Cutler GJ, & Nuemark-Sztainer D (2013). Evaluation of 2 self-report measures of physical activity with accelerometry in young adults. Journal of Physical Activity and Health, 10(1), 85–96. 10.1123/jpah.10.1.85 [PubMed: 22241145]

Smith JM, Serier KN, Belon KE, Sebastian RM, & Smith JE (2020). Evaluation of the relationships between dietary restraint, emotional eating, and intuitive eating moderated by sex. Appetite, 155, 104817. 10.1016/j.appet.2020.104817 [PubMed: 32739329]

Tan SL, Storm V, Reinwand DA, Wienert J, de Vries H, & Lippke S (2018). Understanding the positive associations of sleep, physical activity, fruit and vegetable intake as predictors of quality of life and subjective health across age groups: A theory based, cross-sectional web-based study. Frontiers in Psychology, 9, 1–13. 10.3389/fpsyg.2018.00977 [PubMed: 29410639]

Tribole E, & Resch E (2020). Intuitive Eating: A Revolutionary Anti-Diet Approach (4th ed.). St. Martin's Press.

Tylka TL, Calogero RM, & Daníelsdóttir S (2020). Intuitive eating is connected to self-reported weight stability in community women and men. Eating Disorders, 28(3), 256–264. 10.1080/10640266.2019.1580126 [PubMed: 30821648]

Tylka TL, & Kroon Van Diest AM (2013). The Intuitive Eating Scale-2: Item refinement and psychometric evaluation with college women and men. Journal of Counseling Psychology, 60(1), 137–153. 10.1037/a0030893 [PubMed: 23356469]

Utter J, Neumark-Sztainer D, Jeffery R, & Story M (2003). Couch potatoes or French fries: Are sedentary behaviors associated with body mass index, physical activity, and dietary behaviors among adolescents? Journal of the American Dietetic Association, 103(10), 1298–1305. 10.1016/S0002-8223(03)01079-4 [PubMed: 14520247]

Van Dyke N, & Drinkwater EJ (2014). Relationships between intuitive eating and health indicators: Literature review. Public Health Nutrition, 17(8), 1757–1766. 10.1017/S1368980013002139 [PubMed: 23962472]

Watts AW, Rydell SA, Eisenberg ME, Laska MN, & Neumark-Sztainer D (2018). Yoga's potential for promoting healthy eating and physical activity behaviors among young adults: a mixed-methods study. International Journal of Behavioral Nutrition and Physical Activity, 15(1), 42. 10.1186/s12966-018-0674-4 [PubMed: 29720214]

Wolfson AR, Carskadon MA, Acebo C, Seifer R, Fallone G, Labyak SE, & Martin JL (2003). Evidence for the validity of a sleep habits survey for adolescents. Sleep, 26(2), 213–216. 10.1093/sleep/26.2.213 [PubMed: 12683482]

Highlights

- Women who ate breakfast more frequently had higher levels of intuitive eating (IE)
- Women who practiced more yoga and slept more also had higher IE
- Women who engaged in more recreational screen time had lower levels of IE
- No lifestyle health behavior correlates of IE were identified among men
- Interventions targeting the examined health behaviors may help improve IE in women

Table 1.

Descriptions of measures used in the present study

Measure	Description
Intuitive eating (IE)	Given the centrality of attunement to internal cues in our research question, we focused on the dimension of IE that pertains to reliance on hunger and satiety cues (in contrast to those pertaining to eating for physical rather than emotional reasons, unconditional permission to eat, or body-food choice congruence). IE was therefore assessed via the six-item Reliance on Hunger and Satiety Cues subscale of the Intuitive Eating Scale-2 (IES-2; Tylka & Kroon Van Diest, 2013), which is comprised of the following items: "I trust my body to tell me when to eat," "I trust my body to tell me what to eat," "I trust my body to tell me how much to eat," "I rely on my hunger signals to tell me when to eat," "I rely on my fullness (satiety) signals to tell me when to stop eating," and "I trust my body to tell me when to stop eating." Responses were recorded on a four-point Likert agreement scale (to prevent participant confusion on the Project EAT survey, the neutral response option in the IES-2 was omitted from the present study for consistency across other scales on the survey that used four-point scales). Responses were averaged, with higher scores indicating greater IE (McDonald's $\omega = .85$, test-retest reliability $r = .73$).
Breakfast consumption	This study examined breakfast consumption frequency as an indicator of consistent meals because the EAT-IV study did not assess consumption frequency for meals typically consumed at other times in the day. Breakfast consumption frequency was assessed with the item, "During the past week, how many days did you eat breakfast?". Response options were *never*, *1–2 days*, *3–4 days*, *5–6 days*, and *every day* (test-retest $r = .82$). Consistent with prior Project EAT research (e.g., Haines et al., 2007), responses of *never* were recoded as 0 days, responses of *every day* were recoded as 7 days, and responses reflecting ranges were recoded as the mid-point of the range (e.g., responses of *1–2 days* were recoded as 1.5 days) to transform breakfast consumption frequency into a continuous variable.
Moderate-to-vigorous physical activity (MVPA)	Items modified from the Godin-Shephard Leisure-Time Exercise Questionnaire (Godin & Shephard, 1985) were used to assess hours of weekly moderate and strenuous exercise. Response options were *none*, *less than ½ hour*, *½–2 hours*, *2 ½–4 hours*, *4 ½–6 hours*, and *6+ hours*; these items were previously validated against accelerometry data in a subsample of participants at EAT-III (Sirard, Hannan, et al., 2013). Consistent with prior Project EAT research (e.g., Haines et al., 2007), responses of *none* were recoded as 0 hours, responses of *less than ½ hour* were recoded as 0.3 hours, responses of *6+ hours* were recoded as 8 hours, and responses reflecting ranges were recoded as the mid-point of the range (e.g., responses of *½–2 hours* were recoded as 1.3 hours) to transform hours of moderate and strenuous exercise into continuous variables. MVPA was calculated as the sum of hours spent in moderate and strenuous exercise per week (test-retest $r = .84$).
Yoga practice	Participants indicated whether or not they had ever done yoga (test-retest agreement = 94%), and those who reported that they had ever done yoga and who reported practicing yoga over the past year were asked, "On average, how frequently did you do yoga over the past year?". Response options were *less than ½ hour/week*, *½ hour to less than 1 hour/week*, *1 hour to less than 2 hours/week*, *2–3 hours/week*, *4–6 hours/week*, *7–9 hours/week*, and *10+ hours/week* (test-retest $r = .74$). Consistent with prior Project EAT research (e.g., Neumark-Sztainer et al., 2017; Watts et al., 2018), participants who reported having never done yoga or having not practiced yoga over the past year were considered to practice 0 hours per week, responses of *less than ½ hour/week* were recoded as 0.3 hours per week, responses of *10+ hours/week* were recoded as 11 hours per week, and responses reflecting ranges were recoded as the mid-point of the range (e.g., responses of *2–3 hours/week* were recoded as 2.5 hours per week) to transform yoga practice frequency into a continuous variable.
Sleep	Participants were asked about their usual bedtime and wake time on both weekdays and weekends (test-retest r range: .61–.86), which were used to calculate average weekday and weekend sleep duration (Meyer et al., 2012). These items were drawn from a questionnaire previously used in studies of adolescent sleep (Lytle et al., 2011; Pasch et al., 2010), and similar questions have been significantly correlated with both sleep diaries and actigraphy (Wolfson et al., 2003). Overall average sleep duration per night was calculated as: ((weekday sleep duration × 5) + (weekend sleep duration × 2))/7.
Recreational screen time	Daily recreational screen time was assessed with the question, "Thinking of the past month, on average, how many hours of recreational screen (television, computer, video games) time do you have a day? This is in addition to work or school related screen time." Response options were *0 hours*, *½ hour*, *1 hour*, *2 hours*, *3 hours*, *4 hours*, and *5+ hours* (test-retest $r = .60$). Consistent with prior Project EAT research (e.g., Sirard, Bruening, et al., 2013; Utter et al., 2003), responses of *5+ hours* were recoded as 6 hours to transform recreational screen time into a continuous variable.
Sociodemographic characteristics	Participants self-reported their sex, age, race/ethnicity, indicators of socioeconomic background, and parent status (i.e., whether they have any children). Assessed indicators of socioeconomic background included parental educational attainment, parental employment status, and family receipt of public assistance, reported at the baseline survey during adolescence. Socioeconomic background was determined using these indicators as part of a classification and regression tree-based algorithm (Neumark-Sztainer et al., 2003).

Table 2.

Sociodemographic-adjusted associations between health behaviors and intuitive eating among men and women at EAT-IV

	Results from Regression Models with Intuitive Eating as the Dependent Variable			Health Behavior Adjusted Means (95% CIs) from Flipped Regression Models with Health Behaviors as the Dependent Variables		
	B **(95% CI)**	***p***	**Cohen's f^2**	**Low Level of Intuitive Eating**	**Average Level of Intuitive Eating**	**High Level of Intuitive Eating**
Men						
Days/week of eating breakfast	0.00 (−0.02, 0.01)	.63	< .01	4.3 (4.0, 4.5)	4.2 (4.1, 4.4)	4.2 (3.9, 4.4)
Hours/week of MVPA	0.00 (−0.01, 0.01)	.81	< .01	5.1 (4.6, 5.5)	5.0 (4.7, 5.3)	5.0 (4.6, 5.4)
Hours/week of yoga	0.00 (−0.07, 0.06)	.96	< .01	0.2 (0.1, 0.2)	0.2 (0.1, 0.2)	0.2 (0.1, 0.2)
Hours/night of sleep	0.04 (0.00, 0.09)	.05	.01	7.8 (7.7, 7.9)	7.9 (7.8, 7.9)	7.9 (7.8, 8.0)
Hours/day of recreational screen time	0.00 (−0.03, 0.02)	.86	< .01	3.2 (3.1, 3.4)	3.2 (3.1, 3.4)	3.2 (3.0, 3.4)
Women						
Days/week of eating breakfast	0.02 (0.00, 0.04)	.02	.01	4.6 (4.4, 4.8)	4.8 (4.6, 4.9)	4.9 (4.7, 5.1)
Hours/week of MVPA	0.01 (0.00, 0.02)	.06	< .01	3.4 (3.1, 3.7)	3.6 (3.4, 3.8)	3.7 (3.5, 4.0)
Hours/week of yoga	0.05 (0.01, 0.10)	.03	.01	0.3 (0.3, 0.4)	0.4 (0.3, 0.4)	0.5 (0.4, 0.5)
Hours/night of sleep	0.06 (0.02, 0.09)	.004	.01	8.0 (7.9, 8.1)	8.1 (8.1, 8.2)	8.2 (8.1, 8.3)
Hours/day of recreational screen time	−0.03 (−0.05, 0-.01)	.01	.01	3.2 (3.0, 3.3)	3.0 (2.9, 3.2)	2.9 (2.7, 3.1)

Note. CI = confidence interval; MVPA = moderate-to-vigorous physical activity. Intuitive eating was examined as a continuous variable in both sets of regression models, with scores ranging from 1–4. For the purpose of illustrating differences, low, average, and high intuitive eating levels are defined respectively as one standard deviation below the mean, at the mean, and one standard deviation above the mean. All results are adjusted for age, race/ethnicity, socioeconomic background, and parent status. Statistics are weighted to account for attrition over time and allow for extrapolation to the original population-based sample.