


Fifteen-Year Prevalence, Trajectories, and Predictors of Body Dissatisfaction From Adolescence to Middle Adulthood



Shirley B. Wang¹ , Ann F. Haynos², Melanie M. Wall^{3,4},
Chen Chen⁵, Marla E. Eisenberg⁶, and Dianne Neumark-Sztainer⁷

¹Department of Psychology, Harvard University; ²Department of Psychiatry, University of Minnesota;

³Department of Biostatistics, Columbia University; ⁴Department of Psychiatry, Columbia University; ⁵Mental Health Data Science, Research Foundation for Mental Hygiene; ⁶Division of General Pediatrics and Adolescent

Health, Department of Pediatrics, University of Minnesota; and ⁷Division of Epidemiology and Community Health, School of Public Health, University of Minnesota

Clinical Psychological Science
1–13

© The Author(s) 2019

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/2167702619859331

www.psychologicalscience.org/CPS



Abstract

Body dissatisfaction is common in adolescence and associated with negative outcomes (e.g., eating disorders). We identified common individual trajectories of body dissatisfaction from midadolescence to adulthood and predictors of divergent patterns. Participants were 1,455 individuals from four waves of Project EAT (Eating and Activity in Teens and Young Adults), a population-based, 15-year longitudinal study. Aggregate body dissatisfaction increased over 15 years, which was largely attributable to increases in weight. Growth mixture modeling identified four common patterns of body dissatisfaction, revealing nearly 95% of individuals experienced relatively stable body dissatisfaction from adolescence through adulthood. Baseline depression, self-esteem, parental communication/caring, peer dieting, and weight-based teasing predicted differing trajectories. Body dissatisfaction appears largely stable from midadolescence onward. There may be a critical period for body image development during childhood/early adolescence. Clinicians should intervene with clients experiencing body dissatisfaction before it becomes chronic and target depression, self-esteem, parent/child connectedness, and responses to teasing and peer dieting.

Keywords

body dissatisfaction, trajectories, adolescence, longitudinal, population-based, open materials

Received 8/17/18; Revision accepted 3/7/19

Body dissatisfaction is highly prevalent among adolescents; studies have found that 24% to 46% of adolescent girls and 12% to 26% of adolescent boys report marked dissatisfaction with their bodies (Bucchianeri, Arikian, Hannan, Eisenberg, & Neumark-Sztainer, 2013; Neumark-Sztainer, Goeden, Story, & Wall, 2004; Presnell, Bearman, & Stice, 2004; Stice & Whitenton, 2002). Of concern, these fairly common attitudes are associated with a variety of negative outcomes. Body dissatisfaction prospectively predicts disordered eating (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006; Stice & Shaw, 2002) and diagnosed eating disorders (Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004; Rohde, Stice, & Marti, 2015). Body dissatisfaction also predicts overweight/obesity (Haines, Neumark-Sztainer, Wall, & Story, 2007; Loth, Watts, van den Berg, & Neumark-Sztainer, 2015; van den

Berg & Neumark-Sztainer, 2007). In addition, body dissatisfaction longitudinally predicts other psychological concerns, such as low self-esteem (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006), depressive symptoms (Holsen, Kraft, & Røysamb, 2001), and suicidal ideation (Kim & Kim, 2009), and is concurrently associated with impairment in health-related and subjective quality of life (Mond et al., 2013) and functional impairment in domains of work, home, and social relationships (Mond & Hay, 2007).

Corresponding Author:

Shirley B. Wang, Department of Psychology, Harvard University, 33 Kirkland Ave., Cambridge, MA 02138
E-mail: shirleywang@g.harvard.edu

Given the distress and impairment associated with body dissatisfaction, it is important to understand how prevalence of these attitudes varies throughout the life span in order to know when to most optimally intervene. Most studies examining body dissatisfaction have followed individuals through adolescence and young adulthood, finding that aggregate levels of body dissatisfaction increase throughout adolescence (midteens; Johnson & Wardle, 2005; Rodgers, McLean, Marques, Dunstan, & Paxton, 2016) as well as from adolescence to young adulthood (mid-20s) for both males and females (Eisenberg, Neumark-Sztainer, & Paxton, 2006; Quick, Eisenberg, Bucchianeri, & Neumark-Sztainer, 2013). However, little is known about how body dissatisfaction shifts after early adulthood, as individuals enter their 30s. The mid-20s and mid-30s are distinct developmental stages, with shifting life roles and social relationships, different career responsibilities, and changes in body shape and weight as age increases (Arnett, 2000; Tiggemann & Lynch, 2001; Whitbourne & Skultety, 2002). Few studies have examined changes in body dissatisfaction during adulthood developmental periods, and results from this literature are mixed. Whereas some studies have shown body dissatisfaction to increase with age as men and women enter adulthood (Neumark-Sztainer et al., 2018; Quick et al., 2013), others have found that women become more accepting and satisfied with their bodies over time (Heatherton, Mahamedi, Striepe, Field, & Keel, 1997; Keel, Baxter, Heatherton, & Joiner, 2007). These mixed findings suggest that there may be heterogeneity within lifetime body dissatisfaction patterns.

Indeed, the majority of studies conducted to date have examined composite time courses in body dissatisfaction as well as predictors of population-level body dissatisfaction, which do not permit detection of heterogeneity in the trajectories of body dissatisfaction. Although these approaches can be valuable in examining population trends over time, collapsing disparate body dissatisfaction patterns could mask subgroup trends. For example, stable low and high (or increasing and decreasing) patterns of body dissatisfaction among subgroups of the population, when combined, could generate population-level trajectories demonstrating stable average levels of body dissatisfaction. Likewise, variables that predict population-level averages of body dissatisfaction may not predict differing individual body dissatisfaction trajectories. Latent modeling of time course heterogeneity has the potential to complement population-level statistics by empirically identifying common trends to body dissatisfaction over time.

Indeed, these methods have been applied to identify subgroups of individuals with increasing, decreasing, or stable eating disorder symptoms and behaviors through early adolescence and young adulthood, who

have been found to demonstrate distinct patterns on transdiagnostic (e.g., negative urgency, depressive symptoms) and eating-disorder-specific risk factors (e.g., thinness expectancies; Allen, Byrne, Oddy, & Crosby, 2013; Pearson & Smith, 2015). A recent study also derived trajectories of body dissatisfaction among girls throughout early adolescence, finding common patterns of high, moderate-increasing, moderate-decreasing, and low body dissatisfaction (Rodgers et al., 2016). However, to the best of our knowledge, no research to date has used these techniques to examine at an individual rather than aggregate level whether there are different common time courses of body dissatisfaction from adolescence through adulthood. Such latent trajectory analyses can provide important information about whether different individuals experience peak levels of body dissatisfaction at different time points and can thereby inform key intervention points.

In addition, there has been little research to identify risk and protective factors that predict different patterns of body dissatisfaction. Previous researchers have examined body dissatisfaction over 5-year (Eisenberg et al., 2006) and 10-year (Quick et al., 2013) periods using data from the first three waves of the data set being used in the current study, Project EAT (Eating and Activity in Teens and Young Adults), a 15-year longitudinal study examining eating, weight, and psychological variables among adolescents and young adults. Results from these analyses have shown that at a population level, lower self-esteem and greater body dissatisfaction, depression, weight teasing and pressure to diet, and body mass index (BMI) during adolescence predict increases in body dissatisfaction over time. These predictors have generally been examined independently, although as a linear combination, these variables (along with demographics) accounted for approximately 27% of the variance in body dissatisfaction at 10-year follow-up. However, it is not clear whether these same risk factors would predict specific patterns of body dissatisfaction (e.g., persistent or later onset of body dissatisfaction) in addition to the presence or severity of body dissatisfaction in adulthood. Identifying predictors of distinct trajectories may be particularly important if they assist in identifying which individuals might go on to follow more clinically problematic (e.g., chronic or increasing body dissatisfaction) or less concerning (e.g., consistently low or decreasing body dissatisfaction) patterns among individuals who initially present with similar levels of body dissatisfaction.

Therefore, the current study aimed to build on these previous findings by empirically deriving common individual trajectories of body dissatisfaction over a 15-year period from early to middle adolescence and ending in adulthood, using data from Project EAT-I, -II, -III, and -IV. In addition, this study examined whether particular risk

and protective factors (e.g., social and individual variables) predicted these different trajectories of body dissatisfaction. Although we did not have specific hypotheses about the exact nature of individual trajectories, we did expect, on the basis of previous research (Rodgers et al., 2016), that initially high or low levels of body dissatisfaction would be largely maintained. Likewise, we hypothesized that psychological and environmental variables, including greater depression, parental dieting, and peer dieting, as well as less self-esteem and parental communication/caring would predict more severe trajectories. This knowledge of how body dissatisfaction varies across the life span for different individuals as well as what factors in adolescence predict the problematic trajectories (e.g., chronic or increasing body dissatisfaction) can aid in increasing specificity for the timing and targets of prevention and intervention efforts for various mental-health concerns.

Method

Study design and population

The current study used data from four waves of Project EAT. The sample for the current study included 1,455 participants (847 women, 589 men) who responded at each of the four waves (in middle/high school and 5, 10, and 15 years later). Participants were originally recruited in 1998 from middle schools and high schools in the Minneapolis/St. Paul metropolitan area ($N = 4,746$; mean age = 14.8 ± 1.6 years) and completed in-person surveys and anthropometric measures as part of a cross-sectional study (Project EAT-I; Neumark-Sztainer, Croll, et al., 2002; Neumark-Sztainer, Story, Hannan, & Croll, 2002). Given growing research interest in the eating- and weight-related health of young people, a decision was made to follow participants from the original sample. Because of privacy, this follow-up was restricted to only those who had provided sufficient contact information at Project EAT-I ($n = 3,672$ of $4,746$, 77%).

Follow-up assessments were conducted at 5-year intervals by sending mailed invitations to all baseline participants with usable contact information at Project EAT-II (Time 2; 2003–2004; $n = 2,516$; mean age = 19.4 ± 1.7 years) and Project EAT-III (Time 3; 2008–2009; $n = 2,287$; mean age = 25.3 ± 1.7 years); response rates per time point ranged from 60% to 70%. For Project EAT-IV, invitations were sent only to participants who had completed surveys at either or both Times 2 and 3 (Time 4; 2015–2016; $n = 1,830$; mean age = 31.0 ± 1.6 years), and accordingly, responders represent only 50% of those with usable contact information from baseline. Additional details of the methodology have been published previously (Haynos et al., 2018; Neumark-Sztainer, Wall, Eisenberg, Story, & Hannan, 2006; Neumark-Sztainer, Wall, Larson,

Eisenberg, & Loth, 2011). All study protocols were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee.

Of relevance to the current analysis using all four time points, Time 4 surveys were completed by 1,455 of the 1,902 participants who had previously completed surveys at Time 1, Time 2, and Time 3 (76.5%). Attrition from the cohort over time has not occurred completely at random, and thus to account for missing data, we used previously developed nonresponse weights for longitudinal analyses of Project EAT-I through -IV (Puhl et al., 2017) that account for differential attrition (see Data Analytic Plan section) and provide estimates representative of the original Project EAT-I sample. After weighting, there were no significant differences between the analytic sample and the Time 1 full sample on these Time 1 variables ($ps > .20$). In the current weighted sample, 46.9% of participants were White, 19.0% were African American, 19.2% were Asian, 5.2% were Hispanic, 3.5% were Native American, and 6.2% were mixed or other/race ethnicity. Participants were of low (16.8%), middle-low (18.5%), middle (25.6%), middle-high (22.3%), and high (12.5%) socioeconomic status.

Survey development

The original Project EAT-I survey was developed on the basis of focus groups with adolescents (Neumark-Sztainer, Story, Perry, & Casey, 1999), an extensive literature review, content reviews by multidisciplinary experts and adolescents, and pilot testing. To allow for longitudinal comparisons, main items from this baseline survey and earlier survey waves (Projects EAT-II and EAT-III) were retained on the Project EAT-IV survey. Test-retest reliability was examined in a subsample of 103 participants who took the EAT-IV survey twice over a period of 1 to 4 weeks.

Measures

Outcome variable. Body dissatisfaction was assessed with a 10-item scale adapted from the Body Shape Satisfaction Scale (Pingitore, Spring, & Garfield, 1997). Participants responded to items asking about their satisfaction with various body parts (e.g., "How satisfied are you with your . . . height, weight, body shape, waist, hips, thighs, stomach, face, body build, shoulders?") on a scale from 1 (*very dissatisfied*) to 5 (*very satisfied*), with no labels for options 2, 3, or 4. Items were reverse-scored and summed for a total score; higher scores corresponded to greater body dissatisfaction (range = 10–50; $\alpha = .92$). This scale has demonstrated good discriminant, convergent, and predictive validity among all age and gender groups in prior studies conducted by our group (Neumark-Sztainer,

Wall, et al., 2006; Paxton et al., 2006). This scale also has demonstrated good test–retest reliability over 2 weeks ($r_s = .68-.77$).

Predictor variables. A number of psychological and environmental variables at baseline were examined as predictors of body dissatisfaction trajectory.

Depressive symptoms. Depressive symptoms were assessed using Kandel and Davies’s (1982) six-item scale. Participants responded to items asking about depressed mood (e.g., “During the past 12 months, how often have you been bothered or troubled by feeling unhappy, sad, or depressed?”) using a 3-point scale from 1 (*not at all*) to 3 (*very much*). A total score was calculated by summing responses to all items; higher scores indicated greater depressive symptoms (range = 6–18; $\alpha = .84$). This measure demonstrated adequate test–retest reliability ($r_s = .31-.72$) and also has shown good concurrent validity (Kandel & Davies, 1982).

Self-esteem. Self-esteem was assessed with a six-item scale adapted from the Rosenberg Self-Esteem Scale (Rosenberg, 1965). The current study omitted two positive and two negative items from the original 10-item measure to reduce participant burden. Participants indicated how strongly they agreed with statements (e.g., “At times I think that I am no good at all”) using a scale from 1 (*strongly disagree*) to 4 (*strongly agree*). All items were reverse-scored, and a total score was calculated by summing responses to all items; higher scores indicated higher self-esteem (range = 6–24; $\alpha = .85$). Supporting the validity of the adapted scale, correlations between the adapted and full scales with disordered eating, perfectionism, and depressed mood previously were shown to be nearly identical (van den Berg, Mond, Eisenberg, Ackard, & Neumark-Sztainer, 2010).

Parental dieting. Parental dieting was assessed with four items asking participants about their perceptions of their parents’ eating habits (e.g., “My mother/father diets to lose weight or keep from gaining weight”). Participants responded using a scale from 1 (*not at all*) to 4 (*very much*). A total score was calculated by averaging responses to all items; higher scores indicated more parental dieting and encouragement from parents to diet. This measure has shown good test–retest reliability over 2 weeks ($r_s = .60-.64$) as well as good concurrent and predictive validity in associations with unhealthy weight control behaviors (Neumark-Sztainer et al., 2010) and predicting future body dissatisfaction (Quick et al., 2013).

Parental communication and caring. Parental communication and caring were assessed with two questions asking how comfortable participants felt talking to each

of their parents and two questions asking how much they felt their parents cared about them (e.g., “How much do you feel you can talk to your mother about your problems?”) rated on a 5-point scale from 1 (*not at all*) to 5 (*very much*). A total score was calculated by averaging responses to all four questions; higher scores indicated more communication and caring from parents (range = 1–5; $\alpha = .69$). For participants with missing data for one parent, these missing values were imputed with data from the other parent, allowing participants with data for only one parent to be included in analyses. This measure has shown good test–retest reliability over 2 weeks ($r_s = .70-.82$) as well as good concurrent and predictive validity in associations with self-esteem and depression (Ackard, Neumark-Sztainer, Story, & Perry, 2006) and predicting future body dissatisfaction (Quick et al., 2013).

Peer dieting. Peer dieting was assessed by asking participants how much they agreed with the statement, “Many of my friends diet to lose weight or keep from gaining weight”; participants responded using on a 4-point scale (1, *not at all*; 4, *very much*; Eisenberg, Neumark-Sztainer, Story, & Perry, 2005; Neumark-Sztainer, Wall, Story, & Perry, 2003). Higher scores indicated perceptions of more peer dieting; participants who responded “I don’t know” ($n = 188, 16.6\%$) were included in models with a dummy variable. This measure has shown adequate test–retest reliability over 2 weeks ($r = .40$) as well as good predictive validity in predicting future binge eating and extreme weight control behaviors (Neumark-Sztainer et al., 2007).

Weight teasing. Weight teasing was assessed with the question, “How often are you teased about your weight?” Participants responded on a 5-point scale from 1 (*never*) to 5 (*at least once a week*). This measure has shown good predictive validity for future obesity, binge eating, dieting, unhealthy weight-control behaviors, and body dissatisfaction (Puhl et al., 2017).

Covariates and moderators. Participants self-reported their gender, age, race/ethnicity, and socioeconomic status (SES) at baseline. Gender (male/female) and race/ethnicity (White, Black/African American, Hispanic or Latino, Asian American, Hawaiian or Pacific Islander, American Indian or Native American) were entered as categorical variables, and age was entered as a continuous variable. SES was entered as a continuous variable (low, low/medium, medium, medium/high, high) on the basis of indicators of parent education, work status, and public assistance (e.g., free school lunches, welfare, food stamps) using a series of decision rules in classification and regression trees (Neumark-Sztainer, Croll, et al., 2002). BMI was calculated according to the standard formula on the basis of self-reported height and weight at each assessment point. Self-reported BMI and measured BMI were highly correlated in

both male ($r = .88$) and female ($r = .85$) participants at baseline (Himes, Hannan, Wall, & Neumark-Sztainer, 2005), indicating that self-reported BMIs were largely accurate and valid. Because BMI percentile is the standard assessment measure for children and adolescents (Kuczmarski et al., 2000; Ogden, Carroll, Kit, & Flegal, 2012), we calculated, on the basis of the BMI \geq 85th percentile, a categorical overweight status variable to maintain consistency throughout the study (Kuczmarski et al., 2000) at Time 1 and Time 2 when participants were still mostly adolescents and as BMI \geq 25 at Time 3 and Time 4 when all participants were adults.

Data analytic plan

Population mean body dissatisfaction. We first tested for changes in longitudinal trends in the population-level mean body dissatisfaction using generalized estimating equations (GEE) to account for correlation within individuals across time. We fit two longitudinal models, both including categorical time, gender, and time by gender interaction. The first model controlled for age, baseline SES, and ethnicity/race, and the second model also controlled for overweight status at each time point.

Body dissatisfaction trajectories. Next, growth curve mixture modeling (GMM) with random intercept, slope, and quadratic terms examined trajectories of body dissatisfaction over time. This method allowed for identification of unobserved latent subclasses of individuals with similar patterns of longitudinal change in body dissatisfaction. GMMs were fit with and without controlling for overweight status at each time point. Full information maximum likelihood estimation was used to ensure all subjects, including those with some missing data, were included in the models. The best fitting number of classes in the GMM was determined using the Bayesian information criterion (BIC); lower BIC values indicated better model fit (Nylund, Asparouhov, & Muthén, 2007). Observed mean trajectories of body dissatisfaction from the GMM were calculated on the basis of the most likely trajectory class membership and frequencies and proportions in each class calculated by gender.

Predictors of body dissatisfaction trajectories. Multinomial logistic regressions, using the most likely trajectory class membership as the categorical outcome, examined the association with putative baseline risk and protective factors (depressive symptoms, self-esteem, parental dieting, parental communication and caring, peer dieting, weight teasing) controlling for age, gender, SES, ethnicity/race, and overweight status. Growth mixture models were fit using Mplus 7.4 (Muthén, & Muthén, 2012), and all other analyses were performed in SAS (Version 9.4). All analyses incorporated inverse probability weights (see below) to control for attrition.

Missing data. To account for missing data, because attrition from the baseline sample was not completely at random, we used inverse probability weighting (IPW; Little, 1986; Seaman & White, 2013) for all analyses (Little, 1986). IPW is the recommended method for handling missing data in longitudinal studies in which individuals who do not respond to surveys at various assessment time points have missing values on many variables (Seaman & White, 2013). IPW minimizes response bias that may be due to missing data and allows for extrapolation back to the original Project EAT-I school-based sample. Weights for IPW were derived as the inverse of the estimated probability that an individual responded at all four time points on the basis of several Time 1 covariates, including demographics, overweight status, parental living situation, and grades in school. Noncompleters were more likely than completers to be male, non-White, and overweight at baseline. However, after weighting, there were no significant differences between the completers and the original full sample on these baseline variables or body dissatisfaction ($ps > .20$).

Results

Population mean body dissatisfaction

Mean levels of body dissatisfaction across the four time points were higher for females than for males but with average levels at each time point that were near the middle of the range (see Fig. 1). Results from the first GEE model indicated that average body dissatisfaction increased slightly but significantly for both females ($\beta = 0.08$, 95% CI = [0.05, 0.11], $p < .001$) and males ($\beta = 0.09$, 95% CI = [0.05, 0.12], $p < .001$) over the 15-year period controlling for race, baseline SES, and age. This increase appeared to be largely attributable to increases in weight over the same time period; in the second GEE model, average body dissatisfaction still remained high, but the trend toward increasing body dissatisfaction over time was no longer significant after adjustment for overweight status at each time point for males ($p = .82$) or females ($p = .94$). Table S1 in the Supplemental Material available online presents full results from both GEE models.

Body dissatisfaction trajectories

GMM analyses with and without adjusting for overweight status supported a four-class solution as the best fitting model based on BIC (unadjusted GMM: two-class BIC = 39,692, entropy = .477; three-class BIC = 39,689, entropy = .61; four-class BIC = 39,687, entropy = .632; five-class BIC = 39,696, entropy = .773; GMM adjusted for overweight status: two-class BIC = 32,598, entropy = .9; three-class BIC = 32,603, entropy = .873; four-class BIC = 32,592, entropy = .714; five-class model would

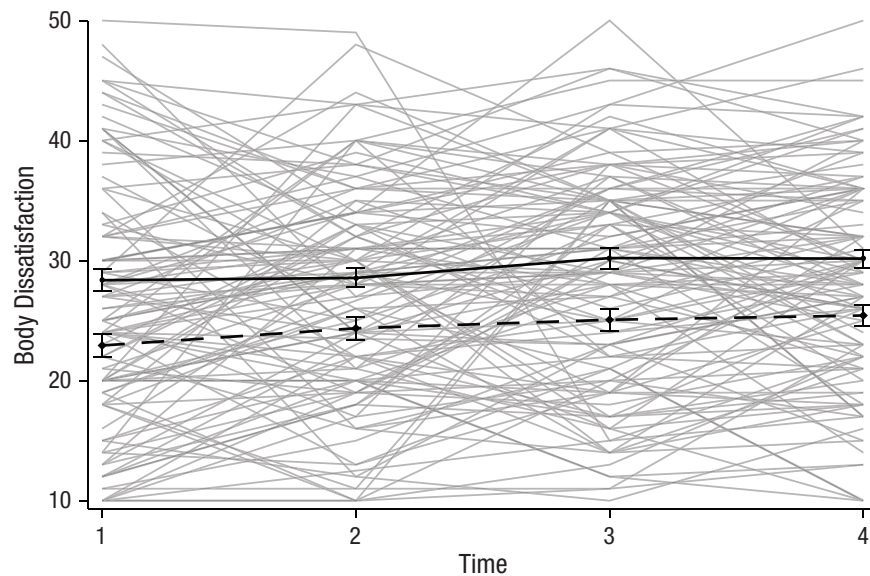


Fig. 1. Body dissatisfaction as a function of time. Higher scores indicate greater body dissatisfaction. Average levels of body dissatisfaction (broken black line = males; solid black line = females) are overlaid on spaghetti plots for a random subset of participants (light gray lines). Error bars indicate 95% confidence intervals. Data are adjusted for overweight status, age, socioeconomic status, and race. Body dissatisfaction was measured with a 10-item scale assessing participants' satisfaction with various body parts; higher scores indicate greater body dissatisfaction (range = 10–50). On average, participants were 14.9 years old at Time 1, 19.3 years old at Time 2, 25.2 years old at Time 3, and 31.0 years old at Time 4.

not converge after increasing starting values indicating possible poor fit); results of the unadjusted GMM are shown in Table 1 and Figure 2. The identified trajectories followed four patterns of body dissatisfaction (see Table S2 in the Supplemental Material for posterior probabilities of being assigned to each of the four classes). Compared with the other classes, Class 1 ($n = 900$) exhibited the most consistently low, though slightly increasing body dissatisfaction scores across all four time points and was labeled *consistently low, but slightly increasing*. Class 2 ($n = 46$) exhibited the lowest body dissatisfaction at Time 1 but then displayed a sharp increase at Time 2 and subsequent decrease at Times 3 and 4 and was labeled *low, but increasing, then*

decreasing. Class 3 ($n = 58$) exhibited moderately high body dissatisfaction at Time 1 but then displayed a sharp decrease and subsequent increase in body dissatisfaction at Times 2 and 4 (with relatively stable scores from Time 2 to Time 3) and was labeled *high, but decreasing, then increasing*. Compared with the other classes, Class 4 ($n = 451$) exhibited high body dissatisfaction at Time 1 and maintained consistently high body dissatisfaction (with slight decreases) across all four time points and was labeled *consistently high, but slightly decreasing*.

As shown in Table 1, a similar proportion of females were in Class 1 (consistently low, slightly increasing body dissatisfaction) and Class 4 (consistently high,

Table 1. Membership in Body Dissatisfaction Trajectories

Class	Overall ($N = 1,455$)	Female ($n = 858$)	Male ($n = 597$)
1 (consistently low, slightly increasing)	900 (60.0)	444 (48.0)	456 (71.4)
2 (low, but increasing, then decreasing)	46 (4.4)	25 (3.6)	21 (5.2)
3 (high, but decreasing, then increasing)	58 (4.2)	29 (3.9)	29 (4.5)
4 (consistently high, slightly decreasing)	451 (31.3)	360 (44.5)	91 (18.9)

Note: Values are n s or N (raw sample size) with, in parentheses, percentages weighted by nonresponse propensity weights to reflect original Time 1 sample population. Classes were derived from growth curve mixture modeling of common latent body dissatisfaction trajectories.

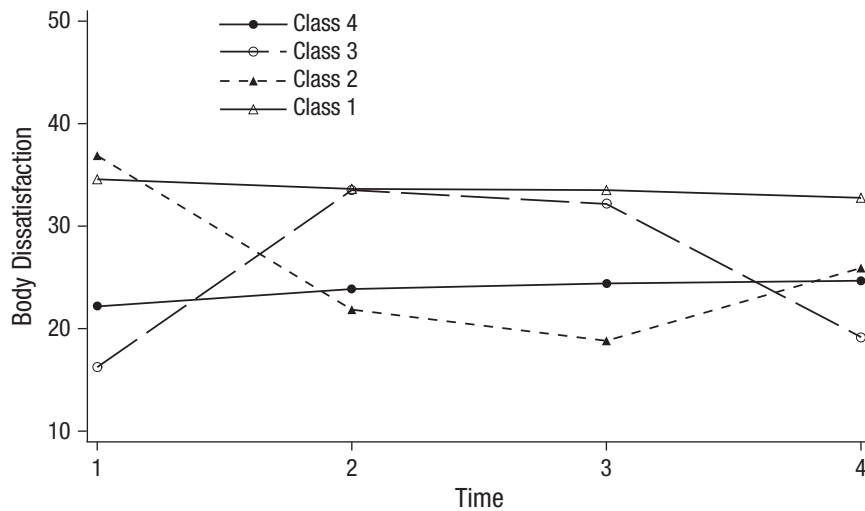


Fig. 2. Body dissatisfaction as a function of time, presented separately for four classes. Higher scores indicate greater body dissatisfaction. Data are adjusted for overweight status, age, socioeconomic status, and race. Body dissatisfaction was measured with a 10-item scale assessing participants' satisfaction with various body parts; higher scores indicate greater body dissatisfaction (range = 10–50). Class 4 = consistently high, but slightly decreasing ($n = 451$, 31.3%); Class 3 = high, but decreasing, then increasing ($n = 58$, 4.2%); Class 2 = low, but increasing, then decreasing ($n = 46$, 4.4%); and Class 1 = consistently low, but slightly increasing ($n = 900$, 60.0%). On average, participants were 14.8 years old at Time 1, 19.3 years old at Time 2, 25.2 years old at Time 3, and 31.0 years old at Time 4.

slightly decreasing body dissatisfaction), whereas a much higher proportion of males were in Class 1 than Class 4. Similar proportions of females and males were in Classes 2 (low, but increasing, then decreasing body dissatisfaction) and 3 (high, but decreasing, then increasing body dissatisfaction).

Predictors of body dissatisfaction trajectories

Multinomial logistic regression analyses examined predictors of membership in different body dissatisfaction trajectories. To reduce the number of comparisons and thus the potential for alpha inflation, we chose to conduct a small number of planned comparisons between classes of most theoretical interest on the basis of results from GMM trajectory analyses. First, to examine predictors of different trajectories among individuals who started out with similarly low body dissatisfaction at baseline but subsequently followed different trajectories, we examined predictors of classification in Classes 1 (consistently low, slightly increasing) and 2 (low, but increasing, then decreasing). Likewise, to examine predictors of different trajectories among individuals with comparably high body dissatisfaction at baseline but subsequently followed different trajectories, we examined predictors of classification in Classes 3 (high, but decreasing, then increasing) and 4 (consistently high, slightly decreasing). Finally, to determine

baseline characteristics that differentiated participants following the least and most problematic trajectories, respectively, we examined predictors of classification in Classes 1 and 4.

Results from these analyses found that among participants with low baseline body dissatisfaction (Classes 1 and 2), peer dieting differentiated subsequent trajectories; individuals who reported high peer dieting were more likely to be in Class 2 (low, but increasing, then decreasing) than in Class 1 (consistently low). Elevated depressive symptoms, lower self-esteem, lower parental communication and caring, more peer dieting, and more weight teasing predicted classification in Class 4 (consistently high, slightly decreasing) versus Class 1 (consistently low, slightly increasing). No risk or protective factors differentiated individuals who started with high body dissatisfaction but followed subsequent trajectories (Class 3 vs. 4; see Table 2).

Discussion

The current study examined the prevalence and common trajectories of body dissatisfaction for males and females across 15 years from middle adolescence to adulthood. We identified four common patterns of change in body dissatisfaction as well as risk and protective factors predicting membership in these groups. We examined individual patterns in the naturalistic long-term time course of body dissatisfaction, and our results

Table 2. Predictors of Body Dissatisfaction Trajectories

Predictor	Class 2 vs. Class 1	Class 4 vs. Class 1	Class 4 vs. Class 3
Depressive symptoms	1.076 [0.948, 1.223]	1.261 [1.180, 1.346]	1.071 [0.949, 1.209]
Self-esteem	1.121 [0.944, 1.331]	0.752 [0.702, 0.804]	0.954 [0.860, 1.059]
Parental dieting	1.356 [0.875, 2.101]	1.217 [0.985, 1.505]	1.062 [0.707, 1.596]
Parental communication/caring	0.917 [0.805, 1.044]	0.874 [0.818, 0.934]	0.979 [0.868, 1.104]
Peer dieting	1.691 [1.155, 2.474]	1.390 [1.120, 1.724]	1.295 [0.877, 1.912]
Peer dieting (“don’t know”)	0.369 [0.065, 2.105]	2.020 [1.085, 3.760]	1.157 [0.327, 4.094]
Weight teasing	0.924 [0.626, 1.365]	1.300 [1.086, 1.556]	1.088 [0.802, 1.474]

Note: Values are odds ratios with 95% confidence intervals in square brackets, adjusted for age, gender, socioeconomic status, race, and overweight status at Time 1. Boldface type indicates significant odds ratios. We compared predictors of trajectories of individuals who started out with similar levels of body dissatisfaction but subsequently followed different trajectories (Class 2 vs. Class 1; Class 4 vs. Class 3) as well as the most and least problematic trajectories (Class 4 vs. Class 1). Predictors were assessed at baseline. Class 1 = consistently low, slightly increasing body dissatisfaction; Class 2 = low, but increasing, then decreasing body dissatisfaction; Class 3 = high, but decreasing, then increasing body dissatisfaction; Class 4 = consistently high, slightly decreasing body dissatisfaction.

indicated that among a diverse group of participants, body dissatisfaction remained relatively constant for the vast majority from adolescence to adulthood. When we examined individual trajectories, almost two thirds of participants experienced consistently low, though slightly increasing levels of body dissatisfaction that reflected the unadjusted mean population time course of this variable, and approximately one third of participants endorsed consistently high, though slightly decreasing levels of body dissatisfaction. These results may provide somewhat encouraging information for individuals with consistently high levels of body dissatisfaction because they indicate that this high dissatisfaction may slightly temper over time. On the other hand, individuals with consistently low levels of body dissatisfaction may experience slight increases in dissatisfaction over time. However, because the magnitude of the changes in these groups was small, these findings suggest that body dissatisfaction remains relatively stable, with some minor shifts, from middle adolescence to adulthood for nearly 95% of individuals. Even the small percentage of participants with periods of larger increases and decreases in body dissatisfaction (Classes 2 and 3) during late adolescence and early adulthood later returned to their original, midadolescent levels of body dissatisfaction as they entered adulthood, demonstrating that severity of body dissatisfaction in adulthood is largely determined before middle adolescence.

It is therefore possible that similar to other developmentally critical periods for various traits and behaviors, there is a critical period before midadolescence during which individuals develop their self-image, including body image, and learn to sense, perceive, and evaluate their bodies. Indeed, previous research documenting body image disturbances in youth (Lowe & Tiggemann, 2003; Spiel, Paxton, & Yager, 2012) suggest that a critical

period for body image may actually occur earlier in adolescence or even during childhood. Similar developmental stages have been identified as critical periods of risk for obesity in early childhood to midchildhood (Dietz, 1994) and for eating disorders during puberty (Baker, Thornton, Lichtenstein, & Bulik, 2012; Klump, 2013). Results from developmental twin studies also suggest different temporal patterns of genetic and environmental influences on body satisfaction; shared environment contributed significantly more variance to weight and shape concerns in preadolescence than mid-adolescence and adulthood, highlighting different developmental periods of vulnerability for development of body dissatisfaction (Klump et al., 2010). Moreover, previous body dissatisfaction trajectories derived by Rodgers and colleagues (2016) found a subgroup of early adolescents who already demonstrated persistent high body dissatisfaction across 14 months. If such a sensitive period of vulnerability for body dissatisfaction exists, this finding would indicate a crucial need to target body satisfaction in prevention and early intervention programs before midadolescence, especially given the wide range of negative psychosocial outcomes, such as eating disorders, obesity, and mood disturbances, associated with body dissatisfaction (Ackard, Croll, & Kearney-Cooke, 2002; Neumark-Sztainer, Paxton, et al., 2006; Neumark-Sztainer et al., 2010).

Moreover, as previous research also has identified common trajectories of increasing, decreasing, and consistent engagement in eating disorder behaviors during these developmental periods, targeting body dissatisfaction during childhood or early adolescence could reduce the likelihood of beginning or increasing eating disorder behaviors. In fact, research indicates that body dissatisfaction among individuals with eating disorders is remarkably resistant to change (Gusella, Butler,

Nichols, & Bird, 2003; Pauli, Aebi, Metzke, & Steinhausen, 2017), suggesting that clinicians should seek to intervene with clients experiencing body dissatisfaction before it becomes chronic. These findings also highlight a critical need to identify interventions that may be suitable in altering these seemingly intractable body dissatisfaction patterns. For instance, as increases in body dissatisfaction appeared closely tied to weight, promoting body acceptance at an early age may be vital in reducing body dissatisfaction.

By identifying several common time courses of body dissatisfaction, the current study also assisted in clarifying previous research that has provided discrepant information about whether body dissatisfaction increases, decreases, or remains stable throughout adolescence and adulthood (Heatherton et al., 1997; Keel et al., 2007; Reba-Harrelson et al., 2009). Our results suggested that not all individuals, even when stratified by gender, share a similar course of body dissatisfaction severity. Rather, the analyses identified several differing trajectories of stability and change in body dissatisfaction. The analysis approach used here allowed us to empirically derive subgroups of individuals who may have varying prevention and intervention needs.

Individual-level factors of depression and self-esteem as well as environmental-level factors of parental communication and caring, peer dieting, and weight teasing seem potentially important in predicting these trajectories. These variables differentiated participants with consistently low versus high dissatisfaction such that participants endorsing greater depression and lower self-esteem during adolescence as well as more peer dieting and weight teasing and less parental communication/caring were more likely to be chronically dissatisfied with their bodies. Likewise, participants reporting more peer dieting were more likely to experience fluctuations in low body dissatisfaction rather than persistent low body dissatisfaction over time. Because this trajectory showed sharp increases in body dissatisfaction during late adolescence, with subsequent decreases in adulthood, individuals in these group may be affected particularly by peer dieting, at least temporarily. Interventions aimed at reducing dieting at a group level among adolescents might be useful in reducing body dissatisfaction for this group during late adolescence. Note that these findings also suggest that depression, self-esteem, parental communication/caring, peer dieting, and weight-based teasing may be important predictors not only of future body dissatisfaction on average (Paxton, Eisenberg, & Neumark-Sztainer, 2006; Puhl et al., 2017; Quick et al., 2013) but also of long-term patterns of body dissatisfaction.

Given that body dissatisfaction, self-esteem, and depressive symptoms are all facets related to self-concept and identity, these findings also bolster the idea that a

sensitive window before middle adolescence may exist for developing a healthy self-concept, and it may be interesting for future research to consider whether trajectories of self-esteem and depression mirror those derived for body dissatisfaction in the current study. It is also possible that other variables, including those not assessed at baseline in the current study (e.g., trauma), may predict differing body dissatisfaction trajectories; however, the relatively small number of participants in Classes 2 (low, but increasing, then decreasing) and 3 (high, but decreasing, then increasing) may have limited our ability to detect all but the most robust predictors. Future studies with larger sample sizes examining factors, including interactions of factors and gender differences between factors, that predict differing trajectories could provide important information about why some but not all individuals experience significant fluctuations in body dissatisfaction in late adolescence and early adulthood.

Results from the current study highlight the urgent need for early prevention and intervention for body dissatisfaction among both male and female youth. To this end, several prevention programs have shown promising results in reducing body dissatisfaction. For example, *New Moves*, a school-based program designed to promote positive weight-related health, was implemented within physical education classes in high schools and significantly improved body satisfaction and self-worth among adolescent girls (Neumark-Sztainer et al., 2010). Likewise, a self-esteem enhancement program called *Everybody's Different* has been shown to reduce body dissatisfaction among adolescents (O'Dea, 2004; O'Dea & Abraham, 1999). Internet-based intervention programs, such as *Student Bodies*, also have shown efficacy in reducing body dissatisfaction among college women at high risk for eating disorders (Taylor et al., 2006). Results of the current study suggest that these programs, which have been developed and tested in adolescence and early adulthood, should be tested with younger cohorts (e.g., childhood, early adolescence), when body dissatisfaction may be more malleable. Moreover, these results suggest that approaches further aimed at enhancing self-esteem, decreasing depression, increasing parent/child connectedness, and reducing and responding effectively to weight-based teasing and peer dieting may be particularly influential in altering body dissatisfaction over time. Continued research examining whether existing or novel prevention programs are effective in altering long-term body dissatisfaction trajectories or promoting consistently low body dissatisfaction trajectories could have important clinical implications on how to intervene before body dissatisfaction becomes chronic.

This study had a number of strengths, including the use of advanced empirical modeling to classify

individuals into distinct groups based on common response patterns across time. The large sample of racially, ethnically, and socioeconomically diverse participants also improved the generalizability of our findings. In addition, the current study's 15-year longitudinal design allowed us to identify trajectories of change from adolescence to adulthood, an age group that has been underrepresented in the body dissatisfaction literature. However, there were also study limitations, including study attrition from baseline to follow-up assessments. Although a large portion of attrition was due to insufficient contact information for participants as a result of the original cross-sectional design, response rates in the current study are in some cases lower than other longitudinal studies (e.g., 63% retention rate in Fontaine et al., 2008; 73% retention rate in Keel et al., 2007). In addition to not having collected strong contact information at baseline because of the original cross-sectional design, factors such as the young developmental stage of Project EAT participants at baseline, greater residential mobility, and distrust of research among ethnically/racially diverse and lower income communities may have contributed to lower response rates in the present study. Compared with the baseline sample, participants who completed all four assessments were more likely to be female, White, and nonoverweight, which may have biased the analyses. To account for any systematic differences between participants who did and did not respond to all surveys, we adjusted estimates using population weights to be more representative of the original sample. Further, many items comprising the body dissatisfaction scale (e.g., satisfaction with waist, hips, thighs, stomach, etc.) may be biased toward stereotypically feminine concerns and may not accurately assess body image in men, who may be more concerned with muscularity than thinness (Griffiths, Murray, & Touyz, 2013). Although additional items assessing male body image were included in Project EAT-IV, these were not available at earlier time points.

Data collection also occurred across a time with significant societal changes, including greater Internet usage and development and spread of social media alongside increased attention to body acceptance messages (Karazsia, Murnen, & Tylka, 2017; Poushter, 2016). These environmental-level changes may be a possible factor influencing the results of the current study, such that increased access to messages on the Internet and social media during development from adolescence to adulthood may have exerted unique effects on the current data that would not be present for other cohorts at different times. In addition, all data were based on self-report. Future research should use multimethod approaches, including interview and biological data, to assess the full spectrum of male and female body dissatisfaction and factors that contribute

to differing trajectories of body dissatisfaction. Finally, average scores in the high body dissatisfaction group were between 30 and 40 (out of a full range of 10–50), indicating that participants in this group were more dissatisfied than satisfied (but perhaps not extremely dissatisfied). However, previous research has found that higher scores on this body dissatisfaction measure are associated with significantly worse clinical outcomes (e.g., greater eating disorder behaviors, worse depressive mood, lower self-esteem; Neumark-Sztainer, Paxton, et al., 2006; Paxton et al., 2006), indicating that high scores on this measure are clinically meaningful.

The current study contributes new information about patterns of body dissatisfaction over key developmental periods. Largely, body dissatisfaction during adulthood appears to be formed and fixed before middle adolescence, even for individuals who experience brief periods of increasing or decreasing body dissatisfaction during the transition through late adolescence and early adulthood. These findings indicate that there may be a critical period for body dissatisfaction occurring in childhood or early adolescence. Further research is needed to examine these intriguing possibilities, which could enhance our understanding of the ways in which body image is developed and maintained as well as inform the implementation of targeted body dissatisfaction interventions for youth in critical developmental periods.

Action Editor

Kelly L. Klump served as action editor for this article.

Author Contributions

S. B. Wang and A. F. Haynos took the lead in writing the manuscript and incorporating revisions from other authors. M. M. Wall and C. Chen performed the data analysis and assisted in data interpretation and manuscript writing. D. Neumark-Sztainer led the original cohort study and contributed to revisions of the manuscript. All of the authors contributed to development of the research question and provided critical revisions. All of the authors approved the final manuscript for submission.

ORCID iD

Shirley B. Wang  <https://orcid.org/0000-0002-8583-3014>

Declaration of Conflicting Interests

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

Funding

This study was supported by National Heart, Lung, and Blood Institute Grant R01-HL116892 (to D. Neumark-Sztainer). S. B. Wang is supported by National Science Foundation Graduate Research Fellowship Grant DGE-1745303. A. F. Haynos received

support from National Institute of Mental Health Grants T32-MH082761 and K23-MH112867. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Heart, Lung, and Blood Institute, the National Institutes of Health, the National Institute of Mental Health, or the National Science Foundation.

Supplemental Material

Additional supporting information can be found at <http://journals.sagepub.com/doi/suppl/10.1177/2167702619859331>

Open Practices



All materials have been made publicly available via University of Minnesota Epidemiology & Community Health Research and can be accessed at <http://www.sphresearch.umn.edu/epi/project-eat/#survey>. The complete Open Practices Disclosure for this article can be found at <http://journals.sagepub.com/doi/suppl/10.1177/2167702619859331>. This article has received the badge for Open Materials. More information about the Open Practices badges can be found at <https://www.psychologicalscience.org/publications/badges>.

References

- Ackard, D. M., Croll, J. K., & Kearney-Cooke, A. (2002). Dieting frequency among college females: Association with disordered eating, body image, and related psychological problems. *Journal of Psychosomatic research*, *52*, 129–136.
- Ackard, D. M., Neumark-Sztainer, D., Story, M., & Perry, C. (2006). Parent-child connectedness and behavioral and emotional health among adolescents. *American Journal of Preventive Medicine*, *30*, 59–66.
- Allen, K. L., Byrne, S. M., Oddy, W. H., & Crosby, R. D. (2013). Early onset binge eating and purging eating disorders: Course and outcome in a population-based study of adolescents. *Journal of Abnormal Child Psychology*, *41*, 1083–1096.
- Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, *55*, 469–480.
- Baker, J. H., Thornton, L. M., Lichtenstein, P., & Bulik, C. M. (2012). Pubertal development predicts eating behaviors in adolescence. *International Journal of Eating Disorders*, *45*, 819–826.
- Bucchianeri, M. M., Arikian, A. J., Hannan, P. J., Eisenberg, M. E., & Neumark-Sztainer, D. (2013). Body dissatisfaction from adolescence to young adulthood: Findings from a 10-year longitudinal study. *Body Image*, *10*, 1–7.
- Dietz, W. H. (1994). Critical periods in childhood for the development of obesity. *The American Journal of Clinical Nutrition*, *59*, 955–959.
- Eisenberg, M. E., Neumark-Sztainer, D., & Paxton, S. J. (2006). Five-year change in body satisfaction among adolescents. *Journal of Psychosomatic Research*, *61*, 521–527.
- Eisenberg, M. E., Neumark-Sztainer, D., Story, M., & Perry, C. (2005). The role of social norms and friends' influences on unhealthy weight-control behaviors among adolescent girls. *Social Science & Medicine*, *60*, 1165–1173.
- Fontaine, N., Carbonneau, R., Barker, E. D., Vitaro, F., Hébert, M., Côté, S. M., . . . Tremblay, R. E. (2008). Girls' hyperactivity and physical aggression during childhood and adjustment problems in early adulthood: A 15-year longitudinal study. *Archives of General Psychiatry*, *65*, 320–328.
- Griffiths, S., Murray, S. B., & Touyz, S. (2013). Disordered eating and the muscular ideal. *Journal of Eating Disorders*, *1*, Article 15. doi:10.1186/2050-2974-1-15
- Gusella, J., Butler, G., Nichols, L., & Bird, D. (2003). A brief questionnaire to assess readiness to change in adolescents with eating disorders: Its applications to group therapy. *European Eating Disorders Review*, *11*, 58–71.
- Haines, J., Neumark-Sztainer, D., Wall, M., & Story, M. (2007). Personal, behavioral, and environmental risk and protective factors for adolescent overweight. *Obesity*, *15*, 2748–2760.
- Haynos, A. F., Wall, M. M., Chen, C., Wang, S. B., Loth, K., & Neumark-Sztainer, D. (2018). Patterns of weight control behavior persisting beyond young adulthood: Results from a 15-year longitudinal study. *International Journal of Eating Disorders*, *51*, 1090–1097.
- Heatherton, T. F., Mahamedi, F., Striepe, M., Field, A. E., & Keel, P. (1997). A 10-year longitudinal study of body weight, dieting, and eating disorder symptoms. *Journal of Abnormal Psychology*, *106*, 117–125.
- Himes, J. H., Hannan, P., Wall, M., & Neumark-Sztainer, D. (2005). Factors associated with errors in self-reports of stature, weight, and body mass index in Minnesota adolescents. *Annals of Epidemiology*, *15*, 272–278.
- Holsen, I., Kraft, P., & Røysamb, E. (2001). The relationship between body image and depressed mood in adolescence: A 5-year longitudinal panel study. *Journal of Health Psychology*, *6*, 613–627.
- Jacobi, C., Hayward, C., de Zwaan, M., Kraemer, H. C., & Agras, W. S. (2004). Coming to terms with risk factors for eating disorders: Application of risk terminology and suggestions for a general taxonomy. *Psychological Bulletin*, *130*, 19–65.
- Johnson, F., & Wardle, J. (2005). Dietary restraint, body dissatisfaction, and psychological distress: A prospective analysis. *Journal of Abnormal Psychology*, *114*, 119–125.
- Kandel, D. B., & Davies, M. (1982). Epidemiology of depressive mood in adolescents: An empirical study. *Archives of General Psychiatry*, *39*, 1205–1212.
- Karazsia, B. T., Murnen, S. K., & Tylka, T. L. (2017). Is body dissatisfaction changing across time? A cross-temporal meta-analysis. *Psychological Bulletin*, *143*, 293–320.
- Keel, P. K., Baxter, M. G., Heatherton, T. F., & Joiner Jr, T. E. (2007). A 20-year longitudinal study of body weight, dieting, and eating disorder symptoms. *Journal of Abnormal Psychology*, *116*, 422–432.
- Kim, D. S., & Kim, H. S. (2009). Body-image dissatisfaction as a predictor of suicidal ideation among Korean boys and girls in different stages of adolescence: A two-year longitudinal study. *Journal of Adolescent Health*, *45*, 47–54.
- Klump, K. L. (2013). Puberty as a critical risk period for eating disorders: A review of human and animal studies. *Hormones and Behavior*, *64*, 399–410.

- Klump, K. L., Burt, S. A., Spanos, A., McGue, M., Iacono, W. G., & Wade, T. D. (2010). Age differences in genetic and environmental influences on weight and shape concerns. *International Journal of Eating Disorders, 43*, 679–688.
- Kuczmarski, R. J., Ogden, C. L., Grummer-Strawn, L. M., Flegal, K. M., Guo, S. S., Wei, R., . . . Johnson, C. L. (2000). CDC growth charts: United States. *Advance Data, 314*, 1–27.
- Little, R. J. (1986). Survey nonresponse adjustments for estimates of means. *International Statistical Review/Revue Internationale de Statistique, 54*, 139–157.
- Loth, K. A., Watts, A. W., van den Berg, P., & Neumark-Sztainer, D. (2015). Does body satisfaction help or harm overweight teens? A 10-year longitudinal study of the relationship between body satisfaction and body mass index. *Journal of Adolescent Health, 57*, 559–561.
- Lowes, J., & Tigemann, M. (2003). Body dissatisfaction, dieting awareness and the impact of parental influence in young children. *British Journal of Health Psychology, 8*, 135–147.
- Mond, J. M., & Hay, P. J. (2007). Functional impairment associated with bulimic behaviors in a community sample of men and women. *International Journal of Eating Disorders, 40*, 391–398.
- Mond, J., Mitchison, D., Latner, J., Hay, P., Owen, C., & Rodgers, B. (2013). Quality of life impairment associated with body dissatisfaction in a general population sample of women. *BMC Public Health, 13*(1), Article 92. doi:10.1186/1471-2458-13-92
- Muthén, L. K., & Muthén, B. O. (2012). *Mplus user's guide* (7th ed.). Los Angeles, CA: Author.
- Neumark-Sztainer, D., Croll, J., Story, M., Hannan, P. J., French, S. A., & 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.
- Neumark-Sztainer, D., Goeden, C., Story, M., & Wall, M. (2004). Associations between body satisfaction and physical activity in adolescents: Implications for programs aimed at preventing a broad spectrum of weight-related disorders. *Eating Disorders, 12*, 125–137.
- Neumark-Sztainer, D., Paxton, S. J., Hannan, P. J., Haines, J., & Story, M. (2006). Does body satisfaction matter? Five-year longitudinal associations between body satisfaction and health behaviors in adolescent females and males. *Journal of Adolescent Health, 39*, 244–251.
- Neumark-Sztainer, D., Story, M., Hannan, P. J., & 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*, 844–851.
- Neumark-Sztainer, D., Story, M., Perry, C., & Casey, M. A. (1999). Factors influencing food choices of adolescents: Findings from focus-group discussions with adolescents. *Journal of the American Dietetic Association, 99*, 929–937.
- Neumark-Sztainer, D., Wall, M. M., Chen, C., Larson, N., Christoph, M., & Sherwood, N. E. (2018). *Eating, activity, and weight-related problems across the life course from adolescence to adulthood: Prevalences and trajectories*. Manuscript submitted for publication.
- Neumark-Sztainer, D., Wall, M. M., Story, M., & Perry, C. L. (2003). Correlates of unhealthy weight-control behaviors among adolescents: Implications for prevention programs. *Health Psychology, 22*, 88–98.
- Neumark-Sztainer, D., Wall, M., Eisenberg, M. E., Story, M., & Hannan, P. J. (2006). Overweight status and weight control behaviors in adolescents: longitudinal and secular trends from 1999 to 2004. *Preventive Medicine, 43*, 52–59.
- Neumark-Sztainer, D., Wall, M., Larson, N., Eisenberg, M. E., & Loth, K. (2011). Dieting and disordered eating behaviors from adolescence to young adulthood: Findings from a 10-year longitudinal study. *Journal of the American Dietetic Association, 111*, 1004–1011.
- Neumark-Sztainer, D. R., Friend, S. E., Flattum, C. F., Hannan, P. J., Story, M. T., Bauer, K. W., . . . Petrich, C. A. (2010). New moves—preventing weight-related problems in adolescent girls: A group-randomized study. *American Journal of Preventive Medicine, 39*, 421–432.
- Neumark-Sztainer, D. R., Wall, M. M., Haines, J. I., Story, M. T., Sherwood, N. E., & van den Berg, P. A. (2007). Shared risk and protective factors for overweight and disordered eating in adolescents. *American Journal of Preventive Medicine, 33*, 359–369.
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling, 14*, 535–569.
- O'Dea, J. A. (2004). Evidence for a self-esteem approach in the prevention of body image and eating problems among children and adolescents. *Eating Disorders, 12*, 225–239.
- O'Dea, J. A., & Abraham, S. (1999). Association between self-concept and body weight, gender, and pubertal development among male and female adolescents. *Adolescence, 34*, 69–70.
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999–2010. *Journal of the American Medical Association, 307*, 483–490.
- Pauli, D., Aebi, M., Metzke, C. W., & Steinhausen, H. C. (2017). Motivation to change, coping, and self-esteem in adolescent anorexia nervosa: A validation study of the Anorexia Nervosa Stages of Change Questionnaire (ANSOCQ). *Journal of Eating Disorders, 5*, Article 11. doi:10.1186/s40337-016-0125-z
- Paxton, S. J., Eisenberg, M. E., & Neumark-Sztainer, D. (2006). Prospective predictors of body dissatisfaction in adolescent girls and boys: A five-year longitudinal study. *Developmental Psychology, 42*, 888–899.
- Paxton, S. J., Neumark-Sztainer, D., Hannan, P. J., & Eisenberg, M. E. (2006). Body dissatisfaction prospectively predicts depressive mood and low self-esteem in adolescent girls and boys. *Journal of Clinical Child and Adolescent Psychology, 35*, 539–549.
- Pearson, C. M., & Smith, G. T. (2015). Bulimic symptom onset in young girls: A longitudinal trajectory analysis. *Journal of Abnormal Psychology, 124*, 1003–1013.

- Pingitore, R., Spring, B., & Garfield, D. (1997). Gender differences in body satisfaction. *Obesity, 5*, 402–409.
- Poushter, J. (2016). Smartphone ownership and internet usage continues to climb in emerging economies. *Pew Research Center, 22*, 1–44.
- Presnell, K., Bearman, S. K., & Stice, E. (2004). Risk factors for body dissatisfaction in adolescent boys and girls: A prospective study. *International Journal of Eating Disorders, 36*, 389–401.
- Puhl, R. M., Wall, M. M., Chen, C., Austin, S. B., Eisenberg, M. E., & Neumark-Sztainer, D. (2017). Experiences of weight teasing in adolescence and weight-related outcomes in adulthood: A 15-year longitudinal study. *Preventive Medicine, 100*, 173–179.
- Quick, V., Eisenberg, M. E., Bucchianeri, M. M., & Neumark-Sztainer, D. (2013). Prospective predictors of body dissatisfaction in young adults: 10-year longitudinal findings. *Emerging Adulthood, 1*, 271–282.
- Reba-Harrelson, L., Von Holle, A., Hamer, R. M., Swann, R., Reyes, M. L., & Bulik, C. M. (2009). Patterns and prevalence of disordered eating and weight control behaviors in women ages 25–45. *Eating and Weight Disorders—Studies on Anorexia, Bulimia and Obesity, 14*, e190–e198.
- Rodgers, R. F., McLean, S. A., Marques, M., Dunstan, C. J., & Paxton, S. J. (2016). Trajectories of body dissatisfaction and dietary restriction in early adolescent girls: A latent class growth analysis. *Journal of Youth and Adolescence, 45*, 1664–1677.
- Rohde, P., Stice, E., & Marti, C. N. (2015). Development and predictive effects of eating disorder risk factors during adolescence: Implications for prevention efforts. *International Journal of Eating Disorders, 48*, 187–198.
- Rosenberg, M. (1965). *Society and the adolescent self-image* (Vol. 11). Princeton, NJ: Princeton University Press.
- Seaman, S. R., & White, I. R. (2013). Review of inverse probability weighting for dealing with missing data. *Statistical Methods in Medical Research, 22*, 278–295.
- Spiel, E. C., Paxton, S. J., & Yager, Z. (2012). Weight attitudes in 3- to 5-year-old children: Age differences and cross-sectional predictors. *Body Image, 9*, 524–527.
- Stice, E. (2002). Risk and maintenance factors for eating pathology: A meta-analytic review. *Psychological Bulletin, 128*, 825–848.
- Stice, E., & Shaw, H. E. (2002). Role of body dissatisfaction in the onset and maintenance of eating pathology: A synthesis of research findings. *Journal of Psychosomatic Research, 53*, 985–993.
- Stice, E., & Whitenton, K. (2002). Risk factors for body dissatisfaction in adolescent girls: A longitudinal investigation. *Developmental Psychology, 38*, 669–678.
- Taylor, C. B., Bryson, S., Luce, K. H., Cunning, D., Doyle, A. C., Abascal, L. B., . . . Wilfley, D. E. (2006). Prevention of eating disorders in at-risk college-age women. *Archives of General Psychiatry, 63*, 881–888.
- Tiggemann, M., & Lynch, J. E. (2001). Body image across the life span in adult women: The role of self-objectification. *Developmental Psychology, 37*, 243–253.
- van den Berg, P. A., Mond, J., Eisenberg, M., Ackard, D., & Neumark-Sztainer, D. (2010). The link between body dissatisfaction and self-esteem in adolescents: Similarities across gender, age, weight status, race/ethnicity, and socioeconomic status. *Journal of Adolescent Health, 47*, 290–296.
- van den Berg, P., & Neumark-Sztainer, D. (2007). Fat 'n happy 5 years later: Is it bad for overweight girls to like their bodies? *Journal of Adolescent Health, 41*, 415–417.
- Whitbourne, S. K., & Skultety, K. M. (2002). Body image development: Adulthood and aging. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: A handbook of theory, research, and clinical practice* (pp. 83–90). New York, NY: Guilford.