Risk Factors for Disordered Eating in Overweight Adolescents and Young Adults

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Received February 25, 2015; revisions received April 21, 2015; accepted May 15, 2015

Abstract

Objective To investigate risk factors for disordered eating among overweight youth, a subset of the population particularly at risk for such behaviors. Methods A population-based sample of overweight youth (n = 553) self-reported their disordered eating (binge eating, extreme weight control behaviors), depression-related symptoms, body dissatisfaction, and weight-related teasing at 5-year intervals spanning early/middle adolescence (Time 1; T1), middle adolescence/early young adulthood (Time 2; T2), and early/middle young adulthood (Time 3; T3). Results Using logistic regression, we found that T2 depression-related symptoms (p = .02) and body dissatisfaction (p = .01), and increases in body dissatisfaction from T1 to T2 (p = .03), predicted disordered eating incidence at T3. Conclusions Depression-related symptoms and body dissatisfaction appear to be important risk factors for disordered eating among overweight youth. Eating disorder prevention programs should address these factors along with behaviors maintaining or exacerbating excess weight status.

Key words: binge eating; disordered eating; overweight; risk factors; unhealthy weight control behaviors.

Approximately 32% of children and adolescents in the United States are overweight or obese (Ogden, Carroll, Kit, & Flegal, 2012). Pediatric obesity is a major public health concern given its tendency to track into adulthood (Guo, Wu, Chumlea, & Roche, 2002) and to transmit risk for negative medical (Reilly et al., 2003) and psychosocial (Puhl & Latner, 2007) outcomes. In particular, overweight youth are at elevated risk for engaging in disordered eating behaviors such as binge eating and extreme weight control behaviors (Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002; Neumark-Sztainer, Wall, Eisenberg, Story, & Hannan, 2006), which is concerning because these behaviors are often overlooked by clinicians.
increased risk for negative affect (Boutelle, Hannan, Fulker son, Crow, & Stice, 2010), perhaps because of their divergence from the current Western standards for attractiveness and related negative social experiences regarding their appearance (e.g., weight-based teasing; Jackson, Grilo, & Masheb, 2000). This constellation of symptoms may then perpetuate a cycle of restrictive eating practices (e.g., dieting, food avoidance) in an effort to achieve the “thin ideal,” and subsequent binge eating as a result of rigid and prolonged restraint (Stice, 2002). Eddy and colleagues (2007) tested this model in a sample of overweight treatment-seeking children and adolescents, and demonstrated that negative affect, teasing experiences, and thin ideal internalization all directly contributed to concurrent disordered eating symptoms (i.e., binge eating, shape concern, and weight concern). These cross-sectional data are supported by prospective data from our group, indicating that weight concerns and depressive symptoms predicted incident binge eating and extreme weight control behaviors among overweight adolescents over a 5-year interval (Neumark-Sztainer, Wall, Story, & Sherwood, 2009), and, from a separate study, that the combination of appearance concerns, depressive symptoms, body mass index (BMI), and dieting predicted incident binge eating over approximately 2 years of follow-up (Stice, Presnell, & Spangler, 2002). However, this previous work did not examine changes in predictors over time. It is critical to map the trajectory of risk factors over time to understand whether changes in these factors would elicit changes in the outcome of interest, which would provide support for targeting these factors in prevention programs.

In terms of maintenance, some (Tanofsky-Kraff et al., 2011) but not all (Stice & Agras, 1998) research has suggested that greater initial disordered eating symptoms and depressive symptoms predict persistent disordered eating in childhood and adolescence. Furthermore, recent work by our group showed that worsening psychosocial functioning (e.g., body satisfaction, depression-related symptoms) over time predicted persistent binge eating during adolescence and young adulthood (Goldschmidt, Wall, Loth, Bucchianeri, & Neumark-Sztainer, 2014). It is unclear, however, whether these findings apply to populations particularly at risk for disordered eating, such as those with excess body weight, which could inform the selection of intervention targets included within selective prevention programs.

The current study aims to identify, within a population-based sample of adolescents and young adults, a range of psychosocial factors contributing to disordered eating incidence and persistence, beyond the effects of overweight alone. We sought to expand on our previous work (Neumark-Sztainer et al., 2009), which examined static predictors of disordered eating incidence during middle adolescence/early young adulthood among overweight individuals who were first assessed in early/middle adolescence by (1) extending the time frame to additionally examine static middle adolescence/early young adulthood predictors of disordered eating incidence in early/middle young adulthood; (2) examining changes in predictors from early/middle adolescence to middle adolescence/early young adulthood as predictors of disordered eating incidence in early/middle young adulthood; and (3) examining static and changing predictors of persistent disordered eating from early/middle adolescence through early/middle young adulthood to identify factors associated with the highest risk for more severe disordered eating. Identifying risk factors specific to overweight youngsters could ultimately assist with screening and prevention/early intervention efforts, which is important given the high prevalence and negative consequences of disordered eating behaviors within this population. We expected that depression-related symptoms, body satisfaction, and teasing experiences, and worsening of these symptoms over time, would be associated with the incidence and persistence of binge eating and extreme weight-control behaviors at follow-up, consistent with extant theories of disordered eating (Stice, 2002).

**Methods**

**Study Design and Population**

Participants were drawn from three waves of Project EAT (Eating Among Teens and Young Adults), a 10-year longitudinal study of eating, weight, and psychosocial factors among 1,902 young people in the Minneapolis/St. Paul metropolitan area of Minnesota (Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011). Public schools and school districts serving socioeconomically and racially/ethnically diverse communities were invited to participate. Data were collected during middle/late adolescence (Time 1; T1: 1998–1999) in health, physical education, and science classrooms, and at 5-year (Time 2; T2: 2003–2004; late adolescence/early young adulthood) and 10-year (Time 3; T3: 2008–2009; early/middle young adulthood) follow-up by mail or online. Of the original 4,746 Project EAT participants, 1,304 (27.5%) were lost to follow-up, primarily owing to missing contact information (n = 411) and no address found at follow-up (n = 712). The remaining 3,442 participants were invited to complete follow-up surveys. A total of 1,902 (55.3%) individuals completed surveys at all three time points. Consent procedures were completed in accordance with the request of each school district. Written parental consent was obtained for some schools, whereas in others, parents were required to return consent forms only if they did not want their child to participate. All study protocols were approved.
by University of Minnesota’s institutional review board.

The analytic sample included participants who were overweight or obese (BMI ≥ 85th percentile for age and sex; Kuczmaszki et al., 2000) at T1 or T2 (n = 553; M T1 BMI = 26.9 ± 5.0; T1 BMI range = 16.8–50.6 kg/m²). Of these 553 adolescents, 284 (51.4%) were overweight at both time points, whereas 133 (24.1%) were overweight only at T1, and 136 (24.6%) were overweight at T2 (but not T1). Participants were 14.8 ± 1.8 years, on average, at T1, mostly female (56.4%), and diverse in terms of race/ethnicity (42.6% White; 20.1% Black; 20.0% Asian-American; 6.7% Hispanic; and 10.6% other) and socioeconomic status (SES; approximately one-third across low, middle, and high categories).

Measures

Key items used in this article were consistent across the three study waves to facilitate examination of data longitudinally. A subsample of EAT-I participants (n = 161) completed identical versions of the survey approximately 2 weeks apart to calculate test–retest reliability.

Anthropometric and Demographic Factors

Self-reported height and weight were used to determine BMI (kg/m²) percentiles, based on age- and sex-specific Centers for Disease Control and Prevention normative data (Kuczmaszki et al., 2000). Overweight referred to a BMI ≥ 85th percentile (Kuczmaszki et al., 2000) at T1 and T2, and a BMI ≥ 25 at T3. Self-report of height and weight was validated in a subsample of 125 Project EAT-III participants for whom height and weight was measured by trained research staff. Results showed high correlations between self-reported and measured BMI in males (r = .95) and females (r = .98). Age, sex, and race/ethnicity (Eaton, Brener, Kann, & Pittman, 2007) were based on self-report. Five levels of SES were based on the highest educational attainment by either parent, which appears to be a valid proxy for most adolescents and emerging young adults (Lien, Friesiad, & Klepp, 2001). Where this information was missing, eligibility for public assistance, eligibility for free/reduced-cost school meals, and parental employment status were used to infer SES (Neumark-Sztainer, Story, Hannan, & Croll, 2002).

Disordered Eating Behaviors

Binge eating was ascertained as follows: “In the past year, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you?” “During the times when you ate this way, did you feel you couldn’t stop eating or control what or how much you were eating?” (Yanovski, 1993). These items have adequate concurrent validity (published mean probability of reporting binge eating based on both questionnaire and self-monitoring data = 49.5%) and test–retest reliability (published kappa = .58; Nangle, Johnson, Carr-Nangle, & Engler, 1994) (present study test–retest agreement = 92% for overeating, 84% for loss of control). A positive response to both questions was classified as binge eating. Extreme weight control behaviors were assessed with the question, “Have you done any of the following things in order to lose weight or keep from gaining weight during the past year? (yes or no for each behavior).” Weight control behaviors categorized as “extreme” included “made myself vomit,” “used laxatives,” “used diuretics,” and “took diet pills” (present study percent agreement [yes vs. no] for test–retest data = 98%).

Psychosocial Factors

Depression-related symptoms were assessed via Kandel and Davies’ six-item scale for adolescents (Kandel & Davies, 1982), which inquires about the frequency of dysphoric mood, tension/nervousness, fatigue, worry, sleep disturbance, and hopelessness during the past year (published concurrent validity = .72, α = .79, and test–retest reliability = .76). Scores range from 6 to 18, with higher scores indicating greater depression-related symptoms (present study α = .84). Body dissatisfaction was measured using a modified version of the Body Shape Satisfaction Scale (Pingitore, Spring, & Garfield, 1997), in which respondents rate their satisfaction with 10 aspects of their body (e.g., height, weight, body shape, thighs). Scores range from 10 to 50, with lower scores reflecting greater dissatisfaction (published α = .88; present study α = .92). Teasing experiences were assessed via two items: “How often did any of the following things happen to you: (1) You were teased about your weight; (2) You were teased about your appearance.” Responses ranged from “never” to “at least once a week” (present study Spearman’s r for test–retest data on weight-related teasing = .47; appearance-related teasing = .59). These questions were combined to form a mean teasing index; higher scores indicate more frequent teasing experiences. Teasing questions were based on a previously validated questionnaire (published α = .88, concurrent validity range = .39–.48, and test–retest reliability = .90; Thompson, Cattarin, Fowler, & Fisher, 1995).

Statistical Analysis

Analyses focused on disordered eating incidence among overweight individuals at T3 (early/middle young adulthood), and disordered eating persistence among overweight individuals who were engaging in at least one disordered eating behavior (binge eating and/or extreme weight control behaviors) at T1 (early/
Results

Descriptive Characteristics
Of the 553 participants who were overweight at T1 or T2, 188 participants (34.0%) reported at least one disordered eating behavior at T1 or T2 (included in examination of disordered eating persistence), and 365 (66.0%) did not report any disordered eating at T1 and T2 (included in examination of disordered eating persistence). A total of 35 participants (11.0%) reported binge eating at T1, 58 (9.4%) reported binge eating at T2, and 93 (15.5%) reported binge eating at T3, while 46 participants (9.2%) reported extreme weight control behaviors at T1, 108 (20.1%) reported extreme weight control behaviors at T2, and 115 (21.8%) reported extreme weight control behaviors at T3 (please note that the ns for T1 and T2 do not sum to 188 owing to overlap in the reporting of these behaviors within and across time points).

Predictors of Disordered Eating Incidence
T3 (early/middle young adulthood) disordered eating incidence was associated with sex ($\chi^2 (1, N=383) = 5.54; p = .02$), with overweight females more likely than overweight males to display disordered eating incidence. T3 disordered eating incidence also was associated with race/ethnicity ($\chi^2 (5, N=383) = 24.92; p < .001$), such that overweight Hispanic and “other” individuals were less likely to display disordered eating incidence, whereas overweight Black individuals were more likely to display disordered eating incidence. T3 disordered eating incidence was not associated with age, SES, or BMI (all $p > .05$).

T2 (middle adolescence / early young adulthood) disordered eating-related symptoms (odds ratio [OR] = 1.14; 95% confidence interval [CI] = 1.02–1.27; $p = .02$) and body dissatisfaction (OR = 1.05; 95% CI = 1.01–1.08; $p = .01$) each predicted incident disordered eating behaviors among overweight individuals at T3, after controlling for age, sex, race/ethnicity, SES, BMI, and BMI change. T2 teasing experiences was not a significant predictor ($p = .25$; see Table 1).

Increased body dissatisfaction (OR = 1.05; 95% CI = 1.00–1.08; $p = .03$) from T1 (middle adolescence) to T2 predicted incident disordered eating behaviors among overweight individuals at T3, after controlling for age, sex, race/ethnicity, SES, BMI, BMI change, and baseline body dissatisfaction, depression-related symptoms, and teasing experiences. Thus, each one-unit increase in body dissatisfaction predicted a 5% greater odds of disordered eating incidence among overweight youth who did not report disordered eating behaviors at T1 or T2. Neither changes in depression-related symptoms ($p = .42$) nor teasing experiences ($p = .23$) from T1 to T2 were significant predictors.

Predictors of Disordered Eating Persistence
Disordered eating persistence at T3 was associated with sex ($\chi^2 (1, N=202) = 4.67; p = .03$), such that overweight females were more likely than overweight males to display disordered eating persistence. Disordered eating persistence was not associated with race/ethnicity, age, SES, or BMI (all $p > .05$).

T2 body dissatisfaction predicted increased odds of persistent disordered eating among overweight individuals at T3 at a trend level (OR = 1.05; 95% CI = 0.99–1.10; $p = .06$). T2 depression-related symptoms, body dissatisfaction, and teasing experiences were all nonsignificant in predicting disordered eating among overweight individuals at T3 ($p > .05$).
Further, none of the T1 to T2 changes in body dissatisfaction, depression-related symptoms, or teasing experiences were associated with increased odds of persistent disordered eating among overweight individuals at T3 (all \( p > .11 \)).

### Discussion

The current study aimed to investigate factors contributing to the incidence and persistence of disordered eating among overweight adolescents and young adults. We found that depression-related symptoms and body dissatisfaction in middle adolescence / early young adulthood, and increases in body dissatisfaction from early/middle adolescence to middle adolescence / early young adulthood, predicted incident disordered eating among overweight individuals in early/middle adolescence to middle adolescence / early young adulthood, which highlights these factors as relevant targets to incorporate into eating disorder prevention programs for overweight individuals. In terms of predictors of persistent disordered eating, body dissatisfaction in middle adolescence / early young adulthood tended to predict persistent disordered eating from early/middle adolescence or middle adolescence / early young adulthood through early/middle young adulthood (although findings were not statistically significant), suggesting that this may be an important construct to assess among overweight individuals already engaging in disordered eating to identify those who may be at highest risk for more chronic disordered eating symptoms. Taken together, results support the important role of depression-related symptoms and body dissatisfaction as risk factors for disordered eating (Stice, Ng, & Shaw, 2010) by extending findings to an exclusively overweight sample, and suggest that these factors should be addressed in obesity interventions to prevent eating disorders and further weight gain.

Our findings largely replicate results found across the weight spectrum (Rohde, Stice, & Marti, 2015), implying that prevention programs targeting those of elevated weight status may be effective by addressing similar risk factors as those designed for the general population. However, excess weight status presents an additional challenge for prevention programs in terms of reducing risk factors for disordered eating while simultaneously addressing unhealthy weight and/or weight gain. While some prevention programs targeting overweight youth have been shown to positively impact both risk factors for disordered eating and body weight (Doyle et al., 2008; Jones et al., 2014), effects are often modest. Thus, further research is needed to identify methods for strengthening existing prevention programs, particularly in light of evidence that depressive symptoms and body dissatisfaction may be considered “shared” risk factors for both overweight and disordered eating (Tanofsky-Kraff et al., 2014). For example, mindfulness-based approaches, which focus on both acceptance and change (Dimeff & Koerner, 2007), could be particularly useful in simultaneously improving current body satisfaction and depression-related symptoms while also promoting the adoption of healthier weight-related behaviors. More generally, mental and physical health promotion programs for adolescents and young adults may need to be broadened in scope to address the spectrum of factors impacting eating behaviors, body weight, and psychosocial functioning maximize their effectiveness.

Our findings differed somewhat by developmental period and disordered eating outcome. Depression-related symptoms in middle adolescence / early young adulthood emerged as a risk factor only for incident disordered eating, suggesting that these symptoms may be more appropriate targets for prevention (rather than early intervention) programs. Conversely, body dissatisfaction in middle adolescence / early

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**Table I. Adjusted Odds Ratios for Disordered Eating in Early/Middle Young Adulthood Based on Psychosocial Predictors**

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>Mean (SD)</th>
<th>Disordered eating incidence ( (n = 365) )</th>
<th>Disordered eating persistence ( (n = 188) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate (SE)</td>
<td>Odds ratio (confidence interval)</td>
<td>Estimate (SE)</td>
</tr>
<tr>
<td>Time 2 depression-related symptoms</td>
<td>11.5 (3.2)</td>
<td>0.13 (0.05) 1.14 (1.02–1.27); ( p = .02 )</td>
<td>0.04 (0.06) 1.04 (0.93–1.17); ( p = .48 )</td>
</tr>
<tr>
<td>Time 2 body dissatisfaction</td>
<td>30.9 (9.6)</td>
<td>0.04 (0.02) 1.05 (1.01–1.08); ( p = .01 )</td>
<td>0.05 (0.03) 1.05 (0.99–1.10); ( p = .06 )</td>
</tr>
<tr>
<td>Time 2 teasing experiences</td>
<td>2.1 (1.2)</td>
<td>0.15 (0.13) 1.17 (0.90–1.51); ( p = .25 )</td>
<td>0.13 (0.15) 1.14 (0.85–1.52); ( p = .38 )</td>
</tr>
<tr>
<td>Time 1 to Time 2 change in depression-related symptoms&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.8 (3.1)</td>
<td>0.05 (0.06) 1.05 (0.93–1.19); ( p = .42 )</td>
<td>0.01 (0.07) 1.00 (0.88–1.15); ( p = .99 )</td>
</tr>
<tr>
<td>Time 1 to Time 2 change in body dissatisfaction&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.5 (10.0)</td>
<td>0.04 (0.02) 1.05 (1.00–1.08); ( p = .03 )</td>
<td>0.04 (0.03) 1.04 (0.99–1.10); ( p = .11 )</td>
</tr>
<tr>
<td>Time 1 to Time 2 change in teasing experiences&lt;sup&gt;a&lt;/sup&gt;</td>
<td>−0.1 (1.4)</td>
<td>0.19 (0.15) 1.20 (0.89–1.62); ( p = .23 )</td>
<td>0.23 (0.15) 1.25 (0.93–1.70); ( p = .14 )</td>
</tr>
</tbody>
</table>

<sup>a</sup>Analyses additionally controlled for the baseline value of the change variable.

Note. Analyses controlled for demographic and anthropometric variables, and nonresponse sampling weights. Disordered eating = binge eating and/or extreme weight control behaviors. Time 1 = early/middle adolescence; Time 2 = middle adolescence / early young adulthood.

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young adulthood was a risk factor for both incident and persistent disordered eating (at a trend level) in early/middle young adulthood, suggesting that this may be a relevant target for both prevention and early intervention programs. Moreover, the current findings must be considered in light of our previous work (Neumark-Sztainer et al., 2009), which was conducted in a younger sample of overweight youth. In this earlier study, weight-related concerns in early/middle adolescence predicted disordered eating incidence 5 years later (consistent with our findings that increases in body dissatisfaction from early/middle adolescence through late adolescence/early young adulthood predicted disordered eating incidence in early/middle young adulthood), while depression-related symptoms were not found to promote risk. Taken together, body dissatisfaction appears to be a relevant construct to target in preventive interventions targeting individuals across the developmental spectrum, while depression-related symptoms may be more appropriate for young adults.

Our findings did not converge with previous evidence implicating weight-related teasing in risk for disordered eating among overweight youth (Eddy et al., 2007), which is remarkable because this was the only construct we examined that was specific to excess weight status (Hayden-Wade et al., 2005). This may reflect the low variability of teasing experiences in our sample, or alternatively, that other teasing-related factors (e.g., internalization of stigma) drive risk for disordered eating among overweight youth. Thus, future studies may benefit from assessing a greater range of teasing experiences and their effects to understand how these factors impact disordered eating risk among overweight youth.

The current study was marked by several strengths. These included the diverse, community-based sample, and longitudinal assessments occurring over 10 years of follow-up. Furthermore, to our knowledge, this is the first study to examine changes in risk factors over time, which is informative when selecting targets for prevention programs. However, several limitations are also worth mentioning. Because data were collected within a large epidemiological study, it was not feasible to use “gold-standard” measures and brief self-report measures were instead used to assess anthropometric and psychosocial variables (although it should be noted that self-reported and measured height and weight had good concordance in this sample; Himes, Hannan, Wall, & Neumark-Sztainer, 2005). Because of modest sample sizes, boys and girls were analyzed concurrently; given that females were more likely than males to report incident and persistent disordered eating, future studies should explore possible gender differences in risk factors among overweight young people. Similarly, diverging risk factors for binge eating and extreme weight control behaviors could not be investigated owing to the small numbers of participants engaging in only one of these behaviors, and this should therefore be examined further. Although data were collected in part during adolescence, we did not assess the effects of biological and genetic factors that increase risk for eating disorders during puberty (Klump, 2013; Trace, Baker, Penas-Lledo, & Bulik, 2013), which would be important in future studies. Finally, attrition between Time 1 and Time 2 was nonrandom; however, there was minimal attrition from Time 2 to Time 3, and the sample was weighted to reflect the constitution of the original EAT sample.

In summary, depression-related symptoms and body dissatisfaction appear to be important predictors of disordered eating among overweight adolescents and young adults. Eating disorder prevention programs for overweight individuals, as well as obesity interventions and primary prevention programs targeting shared risk for eating- and weight-related problems, should seek to simultaneously improve these psychological symptoms, along with factors contributing to excess weight status. Future research should replicate our findings and explore other potential constructs involved in shared risk for eating pathology and excess weight status among young people.

Funding
This work was supported by grant R01-HL084064 from the National Heart, Lung, and Blood Institute (to D.N-S.). ABG’s time was supported by KL2-RR025000 from the National Center for Research Resources and KAL’s time was supported by T32-MH082761 from the National Institute of Mental Health. 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 or the National Institutes of Health.

Conflicts of interest: None declared.

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