



Published in final edited form as:

J Adolesc Health. 2016 October ; 59(4): 391–396. doi:10.1016/j.jadohealth.2016.03.011.

Factors Predicting an Escalation of Restrictive Eating during Adolescence

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Abstract

Purpose—To examine longitudinal risk factors and short-term risk correlates for the development of extreme forms of restrictive eating among adolescent dieters.

Methods—Data from Project EAT, a population-based study of 2,516 students aged 12-18, were collected in 1998-1999 (Time 1) and 5 years later (Time 2). Within this sample, 243 adolescents who reported dieting but not engaging in disordered forms of restrictive eating (e.g., fasting, skipping meals) at Time 1 were followed to determine the self-reported psychological, familial, and social variables predicting initiation of disordered restrictive eating at Time 2. To investigate short-term risk correlates of initiating disordered restrictive eating, the same risk factors were also compared cross-sectionally at Time 2 between the dieters who had and had not initiated disordered restrictive eating. Poisson regression models with robust standard errors were fit for each predictor adjusted for covariates.

Results—Depressive symptoms and low self-esteem were significantly associated with the initiation of disordered restrictive eating in both longitudinal and cross-sectional analyses. Poor family communication/caring and maternal dieting significantly predicted long-term risk for escalating restrictive eating severity; whereas, individual body image issues (i.e., weight concerns, body dissatisfaction) and social concerns (i.e., weight-related teasing, peer dieting) were significant short-term correlates of initiating disordered restrictive eating.

Conclusions—Depressive symptoms and low self-esteem may be especially important targets for risk identification and prevention for disordered restrictive eating. Intervening upon family influences may decrease long-term risk, while intervening upon body image and responses to social influences may decrease short-term risk for disordered restrictive eating.

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There are no conflicts of interest to disclose.

Keywords

restrictive eating; dieting; eating disorder; anorexia nervosa

Which Factors Predict Escalation of Restrictive Eating during Adolescence?

Dieting is common among youths; more than 50% of adolescents and young adults endorse dieting [1]. For some, typical dieting patterns (e.g., reducing intake or making healthy food substitutions), can progress to more disordered patterns characterized by restrictive eating (i.e., limiting caloric and/or nutrient consumption in a manner that is inadequate for the long-term weight management and/or health) [2]. Behaviors characteristic of restrictive eating (e.g., skipping meals or fasting) have been linked with negative outcomes [3,4] and identified as more harmful than moderate dieting practices [5]. Further, a subset of dieters develops eating disorders characterized by marked dietary restriction, including anorexia nervosa (AN). Individuals who engage in these most extreme patterns of restrictive eating are at higher risk for negative psychological and physical consequences [6,7], including elevated mortality from physical complications and suicide [8].

However, among those who diet, a much smaller percentage of individuals transition to engaging in unhealthy or extreme weight control [9] and very few develop an eating disorder characterized by extreme restriction [10]. Indeed, dieting behavior results in markedly different pathways for certain individuals: some dieters develop binge eating and/or overweight [9,11]; others diet without long-term consequences [12]; and others derive benefits from aspects of dieting [12,13]. It is possible that such divergent consequences of dieting may result from distinctive psychological and socio-environmental risk profiles.

Little is known about what influences individuals who progress from dieting to more disordered forms of restrictive eating. However, several risk factors for developing an eating disorder characterized by extreme restrictive eating (e.g., AN) have been identified. These include: (1) *psychological risk factors*, such as depression, low self-esteem, weight and shape concerns, and body dissatisfaction [14,15]; (2) *familial risk factors*, such as family discord, parental dieting, and parental encouragement to diet [16,17]; (3) and *social risk factors*, such as deficient social support, general or weight-specific peer teasing, and peer dieting [17–19]. While existing studies have expanded the field's understanding of risk factors, they are limited by narrowly focusing on development of a particular disorder (e.g., AN) and over-utilization of clinic-based samples. Thus, these samples may not be represent the general population and may reflect a small portion of the individuals who develop destructive restrictive eating. Furthermore, several studies have relied upon retrospective self-report, which is inherently flawed, for identification of risk factors.

This study represents an extension of the existing literature by examining both long-term prospective predictors and short-term cross-sectional correlates for increasing the severity of restrictive eating from dieting to disordered restrictive eating within a racially/ethnically and socioeconomically diverse, population-based, non-clinical sample. In this study, we

examined the impact of putative psychological risk factors (i.e., depressive symptoms, low self-esteem, weight concerns, body dissatisfaction), familial risk factors (poor family communication and caring, mother's dieting, mother's dieting encouragement), and social risk factors (i.e. deficient social support, general peer teasing, peer teasing about weight and shape, and peer dieting) on whether adolescent dieters who denied baseline disordered restrictive eating transitioned to endorsing disordered restrictive eating at Time 2. We examined these relationships using two sets of analyses. First, to capture information regarding more distal risk factors, we conducted longitudinal analyses to determine whether risk factors at Time 1 predicted endorsement (versus denial) of disordered restrictive eating five years later at Time 2. Second, to capture information about proximal risk factors, we conducted cross-sectional analyses at Time 2, to determine the whether proximal correlates differentiated dieters who had initiated disordered restrictive eating from those who continued to avoid disordered restrictive eating at Time 2.

The combination of prospective and cross-sectional examinations of factors associated with the escalation from dieting to disordered restrictive eating was used to allow for more precise assessment of risk for developing disordered restrictive eating patterns at different stages of development and for better identification of prevention targets for these at-risk individuals. This information could be useful for providers of adolescent health care in determining which adolescent dieters are at risk for extreme restrictive eating behavior, and, therefore, well-suited for targeted prevention or early intervention efforts. This information could assist providers in identifying individuals for whom dieting should be especially discouraged.

Methods

Study Design and Participants

Participants were part of Project EAT, a longitudinal population-based cohort study investigating dietary intake, physical activity, weight control behaviors, weight status, and factors associated with these outcomes in a diverse sample of young people. In-class surveys were administered and height and weight measurements taken during the 1998-1999 school year (Time 1) among 4,746 junior and senior high school students (aged 11-18 years) at public schools in Minneapolis/St. Paul. Approximately five years later in 2003-2004 (Time 2), surveys were administered to participants who completed the baseline survey. At follow-up, 2,516 participants completed surveys, which represented 53.0% of the baseline sample and 68.4% of participants for whom follow-up contact information was available. Differential loss-to-follow up resulted in a sample that was more heavily female, white, and from a higher socioeconomic category compared to the original sample. As previously described [20], analyses were weighted using a response propensity method whereby the inverse of the estimated probability that an individual responded to the EAT-II survey was used. University of Minnesota's Institutional Review Board approved study protocols.

To examine predictors of disordered restrictive eating among a dieting group, the sample was restricted to adolescents who, at Time 1, reported dieting ($n = 1,047$), but did not report engaging in disordered restrictive eating ($n = 245$), and for whom data were available to assess disordered restrictive eating at Time 2 ($n = 243$). At Time 1, this sample was 65%

female, 64% white, with a mean age of 14.5 years; 45% were overweight and 45% were in the highest socioeconomic category (See Table 1). We compared the Time 1 dieters who denied versus endorsing disordered restrictive eating on demographic variables to determine how our sample differed from other dieters. The sample of Time 1 non-restrictive dieters included in this analysis consisted of a greater percentage of males, $\chi^2(1) = 25.05, p < .001$, and white individuals, $\chi^2(1) = 10.65, p = .001$, and lower percentage of individuals in the lowest socioeconomic category, $\chi^2(1) = 10.64, p = .001$, compared to the dieters engaging in restrictive eating practices at Time 1.

Survey Development and Measures

Development of the Project EAT survey was based on Social Cognitive Theory [21], focus groups with adolescents [22], extensive literature reviews, content reviews by multidisciplinary experts, and pilot testing. Test-retest reliability over a 2-week period was assessed for the bulk of measures at baseline in a diverse sample of 161 adolescents.

Dieting and Disordered Restrictive Eating—*Dieting* was assessed with the question: “How often have you gone on a diet during the last year?” Participants who reported any dieting during the past year were coded as dieters (Test-retest agreement [non-dieter versus dieter] = 82%) [23]. *Disordered restrictive eating* was established using answers to items about disordered eating behaviors [23] that referred to acts of restrictive eating, rather than other forms of disordered eating behavior (e.g., purging). Participants reported if they had engaged in any of the following restrictive eating behaviors in the past year: fasted, ate very little food, used a food substitute (i.e., nutrition powder or a special drink), skipped meals, or smoked more cigarettes for weight control purposes (Test-retest kappa's ranged from 0.50 to 0.68; a lower value of 0.44 was found for food substitutes). Individuals were coded into dichotomous groups representing those who engaged in disordered restrictive eating (i.e., endorsed any of the disordered restrictive eating behaviors) and those who did not engage in disordered restrictive eating (i.e., denied all of the disordered restrictive eating behaviors) within the past year.

Psychological Risk Factors—*Depressive symptoms* were assessed using six items from the Kandel and Davies Depressive Mood Scale (*Cronbach's α* = .82) [24]. *Self-esteem* was assessed using six items from the Rosenberg Self-Esteem scale (*Cronbach's α* = .79) [25]. *Weight concerns* were assessed with two items: “I think a lot about being thinner,” “I am worried about gaining weight” (4-point Likert scale: ranging from strongly disagree to strongly agree) (*Cronbach's α* = .87) [23]. *Body satisfaction* was assessed using items based on the Body Shape Satisfaction Scale [26]. Participants described satisfaction related to 10 different body parts using a 5-point Likert scale (*Cronbach's α* = .92).

Familial Risk Factors—*Family communication and caring* was assessed with four questions: “How much do you feel you can talk to your mother (father) about your problems? How much do you feel your mother (father) cares about you?” (4-point Likert scale: ranging from not at all to very much) (*Cronbach's α* = .69) [27]. *Mother's dieting* was assessed with the question, “My mother diets to lose weight or keep from gaining weight,” and *Mother's dieting encouragement* was assessed with the question, “My mother

encourages me to diet to control my weight” (4-point Likert scale: ranging from not at all to very much) [23]. *Mother's dieting* and *dieting encouragement* variables were dichotomized to facilitate comparison between those experiencing high versus low dieting exposure, whereby 0 = not at all/a little (low) and 1=somewhat/very much (high). We assessed only mother's dieting and weight concerns due to substantial missing data from questions assessing father's dieting and weight concerns.

Social Risk Factors—*Peer support* was assessed with the question, “Do you have one or more close friends who you can talk to about your problems?” (3-point Likert scale: Yes, always; Yes, sometimes; No) [28]. Very few adolescents reported no peer support; therefore, the variable was dichotomized into limited (0 = no/sometimes) and high (1 = always) peer support. *General teasing* was assessed with the question, “How often are you called names or insulted” and *Weight-related teasing* was assessed with the question, “How often are you teased about your weight” (5-point Likert scale: ranging from never to at least once a week) [29]. Teasing variables were dichotomized to group individuals who experienced teasing greater than once per year versus those who did not, consistent with prior analyses [30]. *Peer dieting* was assessed with the item, “Many of my friends diet to lose weight or keep from gaining weight” (4-point Likert scale: ranging from not at all to very much) [23]. This variable was dichotomized, whereby 0 = not at all/a little and 1=somewhat/very much.

Covariates—Age, gender, ethnicity, and household socioeconomic status (SES) were self-reported. *Ethnicity* was categorized into white and non-white, while *SES* (based primarily on parent education level) was classified as low, middle and high [31]. *Weight status* was assessed by calculating BMI from height and weight measured at Time 1 and self-reported at Time 2. Self-reports were highly correlated with measured height and weight in validation studies carried out in a subsample at baseline ($r = 0.88$ males; $r = 0.85$ females). We used Must et al. [32] classifications to categorize participants as overweight (BMI $\geq 85^{\text{th}}$ percentile for age and sex) or not overweight (BMI $< 85^{\text{th}}$ percentile for age and sex), as these authors provide values from childhood to adulthood.

Data Analysis

Longitudinal analyses were conducted to examine Time 1 risk factors and cross-sectional analyses were conducted to examine Time 2 correlates associated with initiating disordered restrictive eating at Time 2. To predict the factors that influenced whether or not an individual had initiated disordered restrictive eating at Time 2, separate modified Poisson regression models with robust standard errors were fit for each predictor adjusted for age, gender, ethnicity, SES, and weight status. First, longitudinal regressions were used to examine which Time 1 psychological (i.e., depressive symptoms, self-esteem, weight concerns, body dissatisfaction), familial (i.e., family communication and caring, mother's dieting, mother's dieting encouragement), and social (i.e., peer support, general teasing, weight-related teasing, and peer dieting) factors predicted disordered restrictive eating initiation (i.e., engaging in disordered restrictive eating versus denying disordered restrictive eating) at Time 2. Second, to assess proximal associations, cross-sectional regressions were used to examine whether Time 2 psychological, familial, and social factors were associated with whether or not an individual had newly initiated disordered restrictive eating. Results

are presented as Relative Risks and 95% Confidence Intervals. A p-value of 0.05 was considered statistically significant.

Results

Incidence of Progression from Dieting to Disordered Restrictive Eating

Within the sample of 243 adolescents, 55.6% ($n = 135$) reported initiating disordered restrictive eating, while the remainder ($n = 108$) did not report any disordered restrictive eating, at Time 2. Over half of the sample (56.8%) continued to endorse dieting at Time 2 and most (76.3%) individuals who had initiated disordered restrictive eating by Time 2 continued to endorse dieting.

Factors Associated with the Progression from Dieting to Disordered Restrictive Eating

Results of regression analyses are reported in Table 2. Both longitudinal (Time 1) and cross-sectional (Time 2) factors were associated with whether or not dieters had initiated disordered restrictive eating.

Longitudinal Regression Analyses—An examination of baseline psychological risk factors, found that elevated depression ($RR = 1.06$, $p = .006$) and lower self-esteem ($RR = 0.94$, $p = .002$) significantly predicted initiation of disordered restrictive eating among dieters by five-year follow-up (Time 2). For baseline familial risk factors, poorer family communication and caring ($RR = 0.96$, $p = .022$) and mother's dieting ($RR = 1.35$, $p = .014$) predicted initiation of disordered restrictive eating by Time 2. None of the Time 1 social risk factors were associated with increased probability of initiating disordered restrictive eating by Time 2.

Cross-sectional Regression Analyses—When risk factors were examined proximally as correlates in cross-sectional analyses at Time 2, when study participants were older, a somewhat different pattern emerged. For psychological risk factors, elevated depression ($RR = 1.06$, $p < .001$) and lower self-esteem ($RR = 0.94$, $p < .001$) continued to be associated with disordered restrictive eating; however, at Time 2, elevated weight concerns ($RR = 1.22$, $p < .001$) and lower body satisfaction ($RR = 0.98$, $p < .001$) also differentiated dieters who had initiated disordered restrictive eating from those continuing to avoid disordered restrictive eating. None of the familial risk factors were significantly associated with initiating restrictive eating at this assessment point, but two social risk factors, weight-related teasing ($RR = 1.48$, $p = .001$) and peer dieting ($RR = 1.48$, $p = .022$), emerged as significant correlates of initiating disordered restrictive eating.

Discussion

There has been limited research examining risk factors related to the development of extreme restrictive eating behavior from the common experience of dieting. Existing research on this topic has been largely established through clinical samples and retrospective self-report. In this study, we investigated whether putative risk factors for disordered restrictive eating in early to middle adolescence predicted whether dieters escalated restrictive eating by late adolescence/young adulthood. In order to capture information about

distal risk factors and proximal correlates, we examined the impact of psychological, familial, and social risk factors longitudinally (from Time 1 to Time 2) and cross-sectionally (at Time 2). The results suggested that two psychological risk factors, depressive symptoms and low self-esteem, were associated with disordered restrictive eating in both sets of analyses. Otherwise, a different pattern of findings emerged between these models, with familial risk factors (i.e., poor family communication and caring, mother's dieting) emerging as predictive of disordered restriction only in the longitudinal model, and individual body image (i.e., weight concern, low body satisfaction) and social (i.e., weight-related teasing, peer dieting) variables emerging as associated with disordered restriction only in the cross-sectional model.

The first conclusion that can be drawn from these findings is that general psychological distress (e.g., depressive symptoms, low self-esteem) is a particularly important risk factor for escalating restrictive eating over time. These findings are consistent with studies that have reported negative affectivity and general psychiatric distress to be predictors for the development [33] and maintenance [34] of disorders characterized by disordered restrictive eating. Other research has found general psychological distress to predict a range of eating concerns beyond restrictive eating [11,23], as well as psychiatric concerns unrelated to disordered eating [33]. Therefore, though not tested directly in this study, findings from other studies suggest that psychiatric distress predictors may act as transdiagnostic risk factors across populations.

There are important clinical implications pertaining to these findings. The results suggest that prevention programs aiming to intervene upon escalating restrictive eating problems between early adolescence and early adulthood might benefit from targeting general psychiatric distress in addition to addressing content specific to disordered eating. The majority of eating disorder prevention programs focus on disorder-specific targets, such as eating concern and body image [35]. The results of this study suggest that the additional target of reducing general psychiatric distress may enhance certain prevention targets. Second, these findings suggest that elevated depressive symptomology and low self-esteem may be more effective markers of long- and short-term risk among adolescent dieters for developing disordered restrictive eating than disorder-specific markers (e.g., weight concerns, body dissatisfaction). Therefore, screening for depressive symptoms and low self-esteem may assist providers in identifying individuals for whom preventative interventions for restrictive eating may be most helpful and dieting recommendations may be especially harmful.

The discrepancies related to long-term risk factors and short-term correlates of disordered restrictive eating are consistent with prior research. Other research has found that that familial risk factors have a more substantial impact on disordered eating earlier in adolescence [36], whereas peer influences gain importance in late adolescence/early adulthood [37]. Additionally, there is evidence that parents have greater impact on long-term decision making, whereas peers influence more short-term decision-making among adolescents [38]. Further, peer pressures related to weight and shape accelerate towards later adolescence and early adulthood [39]. This could explain why family factors were significant only in the longitudinal models and social factors were significant only in the

cross-sectional models. The results also indicate that concerns more specifically related to weight and body image were associated with restrictive eating only in closer proximity to initiating disordered restrictive eating. This could suggest that generalized distress becomes more specifically focused on eating disorder-relevant stimuli in the time immediately preceding onset of disordered restriction. Overall, these findings suggest that different prevention targets may be more impactful at varying time points in reference to the onset of restrictive eating or stage of development. Enhancing family communication and caring and altering mother's modeling of restrictive eating may be important for decreasing long-term risk of disordered restrictive eating while altering responses to social pressures for thinness and internalized body image concerns may be important for decreasing short-term risk for disordered restrictive eating.

This study has notable strengths. Whereas the majority of prior studies investigating risk factors for disordered restrictive eating utilized retrospective self-report methods and clinical samples limited by diagnosis, the current study examined risk factors prospectively over an extended time period (i.e., 5 years), as well cross-sectionally, among a large and diverse community sample. This reduces methodological concerns associated with retrospective self-report and enhances confidence in the generalizability of the findings.

There are also study limitations. First, though we examined risk factors over what has been identified as the highest risk period for initiating disordered eating [33], the majority of dieters had already begun engaging in disordered restrictive eating by Time 1. Therefore, the results of this study may only apply to dieters who initiate restrictive eating behavior at a later time (after early to middle adolescence), and may not capture the influences that affect individuals who initiate restrictive eating earlier. Specifically, due to the idiosyncrasies of our sample, these results may not extend to many female, non-white, and low-income individuals. Second, the sample included some Time 1 dieters who engaged in other disordered eating patterns (e.g., binge eating, purging), although they did not engage in restrictive eating. It remains unclear whether non-restrictive dieters engaging in other disordered eating patterns would have different risk profiles than dieters not engaging in any disordered eating behaviors. Third, while the cross-sectional analyses potentially provide information about proximal risk factors of disordered restrictive eating, they could also be interpreted as providing information regarding the consequences of disordered restrictive eating, since the temporal order of the risk correlates and disordered restrictive eating could not be established in these analyses. Fourth, the cross-sectional risk factors were captured at a different stage of development (late- adolescence to early adulthood) compared to the longitudinal risk factors (early- to middle- adolescence); therefore, it is difficult to disentangle the impact of distal versus proximal risk from the impact of risk at different stages of development. Finally, this study relied on self-report to assess restrictive eating, although this construct is difficult to capture accurately through self-report [40]. Future studies examining risk factors for escalating restrictive eating severity would benefit from multiple prospective assessments, assessment beginning at younger ages with individuals free of all disordered eating, and objective measures of disordered restrictive eating (e.g., laboratory test meal).

The results of this study suggest that a substantial number of adolescents who diet develop more disordered forms of restrictive eating and that psychological, familial, and social factors may increase the risk of escalating of disordered restrictive eating. The study provides additional context for understanding factors that contribute to negative consequences from dieting during adolescence.

Acknowledgements

This study was supported by grant number R01HL084064 from the National Heart, Lung, and Blood Institute (PI: Dianne Neumark-Sztainer). AFH and CMP were supported by post-doctoral training fellowship T32MH082761 from the National Institute of Mental Health (PI: Scott Crow). AWW was supported by a fellowship from the Canadian Institutes of Health Research. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NHLBI, NIMH, or the NIH. All parties who contributed to this work are included as authors.

References

1. Neumark-Sztainer D, Story M, Hannan PJ, et al. Weight-related concerns and behaviors among overweight and nonoverweight adolescents: implications for preventing weight-related disorders. *Arch Pediatr Adolesc Med.* 2002; 156:171–8. [PubMed: 11814380]
2. Haynos AF, Fruzzetti AE. Initial evaluation of a single-item screener to assess problematic dietary restriction. *Eat Weight Disord EWD.* 2015; 20:405–13. [PubMed: 25412874]
3. Neumark-Sztainer D, Wall M, Story M, et al. Dieting and unhealthy weight control behaviors during adolescence: associations with 10-year changes in body mass index. *J Adolesc Health Off Publ Soc Adolesc Med.* 2012; 50:80–6.
4. Stice E, Davis K, Miller NP, et al. Fasting increases risk for onset of binge eating and bulimic pathology: a 5-year prospective study. *J Abnorm Psychol.* 2008; 117:941–6. [PubMed: 19025239]
5. Story M, Neumark-Sztainer D, Sherwood N, et al. Dieting status and its relationship to eating and physical activity behaviors in a representative sample of US adolescents. *J Am Diet Assoc.* 1998; 98:1127–35. 1255. [PubMed: 9787718]
6. Daee A, Robinson P, Lawson M, et al. Psychologic and physiologic effects of dieting in adolescents. *South Med J.* 2002; 95:1032–41. [PubMed: 12356104]
7. Mitchell JE, Crow S. Medical complications of anorexia nervosa and bulimia nervosa. *Curr Opin Psychiatry.* 2006; 19:438–43. [PubMed: 16721178]
8. Crow SJ, Peterson CB, Swanson SA, et al. Increased mortality in bulimia nervosa and other eating disorders. *Am J Psychiatry.* 2009; 166:1342–6. [PubMed: 19833789]
9. Neumark-Sztainer DR, Wall MM, Haines JI, et al. Shared risk and protective factors for overweight and disordered eating in adolescents. *Am J Prev Med.* 2007; 33:359–69. [PubMed: 17950400]
10. Ackard DM, Fulkerson JA, Neumark-Sztainer D. Stability of eating disorder diagnostic classifications in adolescents: five-year longitudinal findings from a population-based study. *Eat Disord.* 2011; 19:308–22. [PubMed: 22352971]
11. Goldschmidt AB, Wall M, Loth KA, et al. Which dieters are at risk for the onset of binge eating? A prospective study of adolescents and young adults. *J Adolesc Health Off Publ Soc Adolesc Med.* 2012; 51:86–92.
12. Lowe MR, Timko CA. Dieting: really harmful, merely ineffective or actually helpful? *Br J Nutr.* 2004; 92(Suppl 1):S19–22. [PubMed: 15384317]
13. Crerand CE, Wadden TA, Foster GD, et al. Changes in obesity-related attitudes in women seeking weight reduction. *Obes Silver Spring Md.* 2007; 15:740–7.
14. Jacobi C, Fittig E, Bryson SW, et al. Who is really at risk? Identifying risk factors for subthreshold and full syndrome eating disorders in a high-risk sample. *Psychol Med.* 2011; 41:1939–49. [PubMed: 21276276]
15. Nicholls DE, Viner RM. Childhood risk factors for lifetime anorexia nervosa by age 30 years in a national birth cohort. *J Am Acad Child Adolesc Psychiatry.* 2009; 48:791–9. [PubMed: 19564797]

16. Hilbert A, Pike KM, Goldschmidt AB, et al. Risk factors across the eating disorders. *Psychiatry Res.* 2014; 220:500–6. [PubMed: 25103674]
17. Machado BC, Gonçalves SF, Martins C, et al. Risk factors and antecedent life events in the development of anorexia nervosa: a Portuguese case-control study. *Eur Eat Disord Rev J Eat Disord Assoc.* 2014; 22:243–51.
18. Keel PK, Forney KJ, Brown TA, et al. Influence of college peers on disordered eating in women and men at 10-year follow-up. *J Abnorm Psychol.* 2013; 122:105–10. [PubMed: 23025666]
19. Kim Y-R, Lim S-J, Treasure J. Different Patterns of Emotional Eating and Visuospatial Deficits Whereas Shared Risk Factors Related with Social Support between Anorexia Nervosa and Bulimia Nervosa. *Psychiatry Investig.* 2011; 8:9–14.
20. Neumark-Sztainer D, Wall M, Eisenberg ME, et al. Overweight status and weight control behaviors in adolescents: longitudinal and secular trends from 1999 to 2004. *Prev Med.* 2006; 43:52–9. [PubMed: 16697035]
21. Perry, CL.; Baranowski, T.; Parcel, GS. How individuals, environments, and health behavior interact: Social learning theory.. In: Glanz, K.; Lewis, FM.; Rimer, BK., et al., editors. *Health Behav. Health Educ. Theory Res. Pract.* Jossey-Bass; San Francisco, CA, US: 1990. p. 161-86.
22. Neumark-Sztainer D. The social environments of adolescents: associations between socioenvironmental factors and health behaviors during adolescence. *Adolesc Med Phila Pa.* 1999; 10:41–55.
23. Loth KA, MacLehose R, Bucchianeri M, et al. Predictors of dieting and disordered eating behaviors from adolescence to young adulthood. *J Adolesc Health Off Publ Soc Adolesc Med.* 2014; 55:705–12.
24. Kandel DB, Davies M. Epidemiology of depressive mood in adolescents: an empirical study. *Arch Gen Psychiatry.* 1982; 39:1205–12. [PubMed: 7125850]
25. Rosenberg, M. *Society and the adolescent self-image.* Princeton University Press; Princeton, NJ: 1965.
26. Pingitore R, Spring B, Garfield D. Gender differences in body satisfaction. *Obes Res.* 1997; 5:402–9. [PubMed: 9385613]
27. Resnick MD, Harris LJ, Blum RW. The impact of caring and connectedness on adolescent health and well-being. *J Paediatr Child Health.* 1993; 29(Suppl 1):S3–9. [PubMed: 8268019]
28. Hall-Lande JA, Eisenberg ME, Christenson SL, et al. Social isolation, psychological health, and protective factors in adolescence. *Adolescence.* 2007; 42:265–86. [PubMed: 17849936]
29. Thompson JK, Cattarin J, Fowler B, et al. The Perception of Teasing Scale (POTS): a revision and extension of the Physical Appearance Related Teasing Scale (PARTS). *J Pers Assess.* 1995; 65:146–57. [PubMed: 16367650]
30. Haines J, Neumark-Sztainer D, Eisenberg ME, et al. Weight teasing and disordered eating behaviors in adolescents: longitudinal findings from Project EAT (Eating Among Teens). *Pediatrics.* 2006; 117:e209–15. [PubMed: 16452330]
31. Sherwood NE, Wall M, Neumark-Sztainer D, et al. Effect of socioeconomic status on weight change patterns in adolescents. *Prev Chronic Dis.* 2009; 6:A19. [PubMed: 19080025]
32. Must A, Dallal GE, Dietz WH. Reference data for obesity: 85th and 95th percentiles of body mass index (wt/ht²) and triceps skinfold thickness. *Am J Clin Nutr.* 1991; 53:839–46. [PubMed: 2008861]
33. Jacobi C, Hayward C, de Zwaan M, et al. Coming to terms with risk factors for eating disorders: application of risk terminology and suggestions for a general taxonomy. *Psychol Bull.* 2004; 130:19–65. [PubMed: 14717649]
34. Mischoulon D, Eddy KT, Keshaviah A, et al. Depression and eating disorders: treatment and course. *J Affect Disord.* 2011; 130:470–7. [PubMed: 21109307]
35. Ciao AC, Loth K, Neumark-Sztainer D. Preventing eating disorder pathology: common and unique features of successful eating disorders prevention programs. *Curr Psychiatry Rep.* 2014; 16:453. [PubMed: 24821099]
36. Field AE, Javaras KM, Aneja P, et al. Family, peer, and media predictors of becoming eating disordered. *Arch Pediatr Adolesc Med.* 2008; 162:574–9. [PubMed: 18524749]

37. McCabe MP, Ricciardelli LA. A prospective study of pressures from parents, peers, and the media on extreme weight change behaviors among adolescent boys and girls. *Behav Res Ther.* 2005; 43:653–68. [PubMed: 15865919]
38. Wang A, Peterson GW, Morpheu LK. Who is more important for early adolescents' developmental choices? Peers or parents? *Marriage Fam Rev.* 2007; 42:95–122.
39. Bucchianeri MM, Arikian AJ, Hannan PJ, et al. Body dissatisfaction from adolescence to young adulthood: findings from a 10-year longitudinal study. *Body Image.* 2013; 10:1–7. [PubMed: 23084464]
40. Stice E, Cooper JA, Schoeller DA, et al. Are dietary restraint scales valid measures of moderate- to long-term dietary restriction? Objective biological and behavioral data suggest not. *Psychol Assess.* 2007; 19:449–58. [PubMed: 18085937]

Implications and Contribution

Findings suggest that depression and low self-esteem are important long-term risk factors and short-term correlates, family influences are important risk long-term risk factors, and body image and social concerns are important short-term correlates of escalating restrictive eating. Providers should attend to these factors when assessing risk for disordered restrictive eating.

Table 1

Sociodemographic information and psychological, familial, and social risk factors of adolescents who diet but do not report disordered restrictive eating at Time 1

| | N | Mean/Percentage | SD/n | Range |
|---|-----|-----------------|------|-------|
| Sociodemographics | | | | |
| Age, years | 243 | 14.5 | 1.6 | 12-18 |
| Gender, % female | 158 | 65% | 152 | ---- |
| Race/ethnicity, % non-Hispanic white | 242 | 64.1% | 155 | ---- |
| SES | 237 | | | |
| Low | | 28.3% | 67 | ---- |
| Middle | | 27.0% | 64 | ---- |
| High | | 44.7% | 106 | ---- |
| BMI, % overweight | 227 | 44.9% | 102 | ---- |
| Psychological Risk Factors | | | | |
| Depressive symptoms | 237 | 11.5 | 2.7 | 7-21 |
| Self-esteem | 234 | 18.6 | 3.2 | 7-24 |
| Weight concern | 243 | 7.2 | 1.8 | 3-11 |
| Body satisfaction | 237 | 33.0 | 7.8 | 10-50 |
| Family Risk Factors | | | | |
| Family communication | 241 | 15.6 | 3.1 | 4-20 |
| Mother's dieting, % endorsing | 239 | 41.0% | 98 | 1-4 |
| Mother's dieting encouragement, % endorsing | 238 | 18.1% | 43 | ---- |
| Social Risk Factors | | | | |
| Peer support, % limited | 240 | 37.5% | 90 | ---- |
| General teasing, % once per year | 235 | 49.8% | 113 | ---- |
| Weight-related teasing, % once per year | 236 | 21.2% | 50 | ---- |
| Peer dieting, % endorsing | 237 | 30.0% | 71 | ---- |

*based on non-imputed data; sample sizes for each variable vary slightly due to missing data

Table 2

Psychological, familial and social risk factors and correlates associated with the initiation of disordered restrictive eating among adolescent dieters

| Risk of Initiating Disordered Restrictive Eating | | | | |
|--|--------------------------------------|--------------|--------------------------------------|-----------------|
| | Time 1 predictors ^{ab} | | Time 2 correlates ^{ac} | |
| | Relative Risk (95% CI) ^{ab} | p-value | Relative Risk (95% CI) ^{ab} | p-value |
| Psychological Risk Factors | | | | |
| Depressive symptoms | 1.06 (1.02-1.11) | 0.006 | 1.06 (1.03-1.10) | <.001 |
| Self-esteem | 0.94 (0.90-0.98) | 0.002 | 0.94 (0.92-0.97) | <.001 |
| Weight concern | 1.06 (0.99-1.13) | 0.107 | 1.22 (0.15-1.29) | <.001 |
| Body satisfaction | 0.99 (0.97-1.00) | 0.067 | 0.98 (0.96-0.99) | 0.001 |
| Familial Risk Factors | | | | |
| Family communication | 0.96 (0.93-0.99) | 0.022 | 1.01 (0.97-1.05) | 0.687 |
| Mother's dieting | | | | |
| Somewhat/Very much | 1.35 (1.06-1.71) | 0.014 | 0.99 (0.79-1.26) | 0.964 |
| Not at all/A little | 1.00 | | 1.00 | |
| Mother's dieting encouragement | | | | |
| Somewhat/Very much | 1.24 (0.94-1.64) | 0.132 | 1.25 (0.98-1.60) | 0.08 |
| Not at all/A little | 1.00 | | 1.00 | |
| Social Risk Factors | | | | |
| Peer support | | | | |
| Limited | 1.08 (0.84-1.40) | 0.553 | 0.98 (0.78-1.424) | 0.877 |
| High | 1.00 | | 1.00 | |
| General teasing | | | | |
| Yes, once per year | 1.19 (0.92-1.55) | 0.179 | 1.17 (0.94-1.47) | 0.167 |
| No | 1.00 | | 1.00 | |
| Weight-related teasing | | | | |
| Yes, once per year | 1.03 (0.77-1.39) | 0.823 | 1.48 (1.18-1.84) | 0.001 |
| No | 1.00 | | 1.00 | |
| Peer dieting | | | | |
| Somewhat/Very much | 1.17 (0.92-1.49) | 0.198 | 1.30 (1.04-1.63) | 0.022 |
| Not at all/A little | 1.00 | | 1.00 | |

^aModified Poisson regressions with robust standard errors weighted for loss to follow-up

^bLongitudinal models examine associations between Time 1 psychological, familial and social factors and initiation of disordered restrictive eat at Time 2, controlling for baseline age, gender, ethnicity, SES and weight status.

^cCross-sectional models examine associations between Time 2 psychological, familial and social risk factors and initiation of disordered restrictive eating at Time 2, controlling for baseline age, gender, ethnicity, and SES, and Time 2 weight status