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Research report

Age at dieting onset, body mass index, and dieting practices. A twin study ☆

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ABSTRACT

Objective: Using a twin study design, we sought to determine whether an early age at dieting onset is a risk factor for higher adult body mass index (BMI) or use of risky dieting practices, independent of genetic and familial factors. *Method:* Female twins ages 18–60 years ($N = 950$) from the University of Washington Twin Registry completed 2 surveys an average of 3 years apart. Analyses of individual twins and within-twin pairs tested associations of self-reported age at dieting onset with (1) adult BMI at baseline, (2) change in BMI between the two surveys and (3) risky dieting behaviors at baseline. *Results:* In analyses mimicking studies of unrelated individuals, an earlier age at dieting onset was associated with greater adult BMI ($p = 0.003$), higher Restraint Scale scores ($p < 0.001$), greater use of risky dieting behaviors ($p = 0.04$) and more weight cycling episodes ($p < 0.001$). In within-pair models that control for genetic and familial factors, the only significant association was between an earlier age at dieting onset and more weight cycling episodes ($p = 0.006$). *Discussion:* Underlying genetic and familial factors may influence associations of early dieting with higher adult BMIs and risky dieting practices in women.

Introduction

As obesity rates have increased worldwide, so has the use of dieting as a way to promote weight loss. Unfortunately, dieting has not been shown to be successful for long-term weight loss maintenance (Maclean, Bergouignan, Cornier, & Jackman, 2011). In fact, most dieters gain back what they lost, if not more weight, over time (Safer, 1991; Weiss, Galuska, Kettel Khan, Gillesppe, & Serdula, 2007). There is a large gender discrepancy in dieting as evidenced by a much greater prevalence of dieting in females as compared to males (Field et al., 2007). Additionally, the prevalence of dieting in women rises with increasing body mass index (BMI) (Kruger, Galuska, Serdula, & Jones, 2004). Moreover, it has been documented that women who diet are more likely to have lower body satisfaction independent of their weight status (Spear, 2006).

Nationwide, 46% of adolescents reported they have attempted to lose weight (YRBS, 2011). Additional studies have supported that dieting in adolescence is associated with unhealthy weight control behaviors and dieting as they progress into young adulthood (Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011). Longitudinal studies have found that weight control behaviors used in adolescence and pre-adolescence predict a higher BMI later in life (Field et al., 2003; Larson, Neumark-Sztainer, & Story, 2009; Neumark-Sztainer, Wall, Story, & Standish, 2011; Viner & Cole, 2006). Female adolescents who reported dieting had significantly larger gains in BMI over time as compared to nondieters (Field et al., 2007). Additionally, dieting adolescents are not only predisposed to greater weight gain and obesity in adulthood, but also to risky eating behaviors that may be the precursors of clinical eating disorders (Neumark-Sztainer et al., 2006).

Individuals who diet can engage in risky or healthful dieting behaviors. Risky dieting behaviors such as fasting and excessive exercising as well as use of diet pills, vomiting, or laxatives, are associated with less healthful dietary patterns and a greater tendency to remain or become overweight (Larson et al., 2009; Neumark-Sztainer, Wall, Story, et al., 2011). Adolescents who engage in risky eating behaviors have greater BMIs to start with and a greater change in BMI over time (Larson et al., 2009). Fortunately, the use of risky dieting behaviors in adolescent females has decreased in recent years (Neumark-Sztainer et al., 2012; YRBS, 2011).

All dieting practices occur in the setting of the considerable genetic influence on body weight (Ortega-Alonso, Pietiläinen, Silventoinen, Saarni, & Kaprio, 2012). In addition, other familial factors,

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such as learned eating habits, likely also contribute to an individual's weight. Dietary behaviors learned as a child generally continue on into adulthood (Scaglioni, Salvioni, & Galimberti, 2008). In particular, the parent's behavior, especially that of the mother, can have a strong influence on a child's eating behavior including specific eating styles, food selection and preference, and the self-regulation of food and energy intake (Scaglioni et al., 2008). Parental encouragement for their child to diet, especially on the part of mothers, was predictive of increased adolescent unhealthy weight control behaviors and added weight gain (Neumark-Szatiner et al., 2010; Neumark-Sztainer, Wall, Story, & Van Den Berg, 2008; Van den Berg, Keery, Eisenberg, & Neumark-Sztainer, 2010).

Although it is generally accepted that dieting is associated with greater weight gain over time and a greater BMI (Field et al., 2007; Savage, Hoffman, & Birch, 2009), the exact mechanism by which dieting influences weight gain is still unknown. For example, it is unclear if heavier people are more likely to diet and remain heavy, if dieting itself induces weight gain, or some interaction of the two whereby dieting induces excess weight gain in susceptible people. Some researchers have hypothesized that individuals predisposed to a greater weight are more likely to engage in unsuccessful dieting practices. Therefore, individuals predisposed to obesity may diet more often in order to control their affinity towards weight gain (Pietiläinen, Saami, Kaprio, & Rissanen, 2012). On the other hand, dieting may actually induce weight gain (Keski-Rahkonen et al., 2007; Pietiläinen et al., 2012).

Twin studies provide a unique opportunity to examine the questions related to body weight and weight loss practices, because they can control for the strong genetic influence on body weight as well as the familial influences on eating behaviors. This is because monozygotic (MZ) twins share 100% of their genetic background and dizygotic (DZ) twins share, on average 50%. If raised together in the same household, each member of the pair (MZ or DZ) shares the same familial environment. When twin characteristics are compared to the other twin within a pair, the shared family environment is controlled for. Similarly, genetic background is controlled for in MZ pairs and partially controlled for in DZ pairs.

The primary aim of this study is to determine the associations of age at dieting onset with both BMI, in cross-sectional and longitudinal analyses, and dieting practices, among female twins. We hypothesized that an earlier age at dieting onset would be associated with a greater BMI at baseline and over time as well as with the use of various risky dieting practices, regardless of genetic predispositions. In other words, we proposed that initiation of dieting behaviors at an early age would be an individual environmental factor that promotes both weight gain and unhealthy dieting behaviors.

Methods

Participants

Participants for this study were female twins, aged 18–60 years from the University of Washington Twin Registry. Both male and female twins from Washington State have been recruited from driver's license and ID applications since the 2002 mailed invitation letter and recruitment survey (Afari et al., 2006). A more detailed survey that included questions about dieting practices and eating behavior, the University of Washington Twin Registry Health Survey, was mailed out to everyone in the Registry in 2006 and repeated in 2008; this survey achieved a 55% response rate. A subsequent follow-up survey, administered since 2010 with a response rate of 74% (Strachan et al., 2013), was used for the longitudinal assessment of BMI. The variable duration of time between these 2 survey administrations resulted in an average longitudinal follow-up period of approximately 3 years.

After excluding women over age 60, twins who did not live together prior to age 18, and twins with a history of weight loss surgery, 950 eligible women who had completed both the initial and the follow-up survey were used in analyses. Of these, 464 were individual twins and 486 were members of the 243 complete pairs (66% MZ, 30% DZ, 4% indeterminate).

Measures

Body mass index

Baseline BMI (kg/m^2) was calculated from self-reported weight and height provided in the 2006 survey, based on the questions "how tall are you without shoes?" and "how much do you weigh without clothes or shoes?" Time 2 BMI was calculated from self-reported height and weight from the 2010 follow-up survey. The question asked, "What is your current height (in feet and inches) and weight (in pounds)?" Change in BMI was the difference between BMI at Time 2 and baseline. We performed a reliability study among 78 Registry participants enrolled in a separate study to compare self-reported to measured BMI. Self-reported and measured BMI were strongly correlated with each other (regression slope coefficient = 0.96; 95% confidence interval: 0.92, 0.99). The mean absolute difference between self-reported BMI and measured BMI was $-0.22\ kg/m^2$ (95% confidence interval: −0.51, 0.08) reflecting a slight underestimation of BMI.

Zygosity

All twins completed a questionnaire about childhood similarity to assess zygosity (Strachan et al., 2013). Studies show that questions about childhood similarity in twin pairs can be used to correctly differentiate among monozygotic (MZ) and dizygotic (DZ) twin pairs with an accuracy that is ~95% of that achieved by using biological indicators (Eisen, Neuman, Goldberg, Rice, & True, 1989).

Restrained eating

The Restraint Scale is a 10-item self-report questionnaire used to assess restrained eating (Herman & Polivy, 1980). People who score high on the scale exhibit frequent dieting, disinhibited eating, and body dissatisfaction (van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007). Questions focus on weight fluctuations and feelings about eating behaviors and current weight such as "Would a weight fluctuation of 5 lb affect the way you live your life?"; "How conscious are you of what you are eating?"; "Do you have feelings of guilt after overeating?"; and "What is the maximum amount of weight you have ever lost in 4 weeks?" The validity of the Restraint Scale has been assessed, and while it was predictive of many behaviors, it may overestimate restraint in overweight individuals (van Strien et al., 2007). Specifically, normal-weight females score higher from their feelings of body dissatisfaction, whereas overweight and obese females achieve high scores due to the degree of weight loss or gained rather than excessive concern with weight or eating habits.

Dieting practices

People may institute a "diet" for many reasons besides losing weight. We defined "dieting" for this study as the participants' self-reported attempt to lose weight, acknowledging that we do not have information about whether the participants conceived of this attempted weight loss as a "diet" or how successful the weight loss attempt was. "Age at dieting onset" was defined from the self-reported, retrospective question "How old were you when you first attempted to lose weight?" Use of risky dieting behavior methods over the past 12 months was also assessed by self-report (CDC & NCHS, 1999). The lead-in question asked, "During the past