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**PREDICTORS OF GIRLS' SELF-INITIATED DIETING AND PATTERNS OF
WEIGHT CONTROL BEHAVIOR IN CHILDHOOD AND ADOLESCENCE**

A Dissertation in
Nutritional Sciences
by
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ABSTRACT

Forty percent of pre-adolescent girls report self-initiated dieting, with that number rising to three-quarters among adolescent girls. Despite the wide variety of both healthy (e.g. increase vegetable intake) and unhealthy (e.g. use of diuretics) weight control behaviors that can be considered part of “dieting,” it is unclear what children and adolescents are doing when they report dieting. The purpose of the present research was to extend our knowledge of predictors and patterns of girls’ self-reported dieting behavior in late childhood and adolescence. Participants included 197 non-Hispanic white girls and their biological parents in central Pennsylvania followed from age 5y-15y. Data were collected across the 10-year period, with assessments every 2 years. The aim of study 1 was to examine the influence of parental encouragement to diet on the emergence of early (by 11y) and adolescent (between 11y and 15y) dieting. All measures of parental encouragement to diet (maternal, paternal, combined) predicted the emergence of early dieting, but not adolescent dieting. In addition, parental encouragement to diet predicted increases in girls’ BMI percentiles between the ages of 9 and 15, but only among girls who reported dieting. In Study 2, latent class analysis was used to identify patterns of weight control behaviors in the current sample at age 15. Four patterns were identified, Non-dieters, and three dieting groups: Lifestyle, Dieters, and Extreme Dieters. The Non-dieters did not endorse using any weight control behaviors, and the three dieting groups increased in the number and severity of their weight control behaviors, from the Lifestyle group who only reported increasing exercise and fruit and vegetable intake, to the Extreme Dieters who reported using all the behaviors, with over half reporting use of at least one unhealthy behavior. The three dieting groups were also different on a number of concurrent individual characteristics (e.g. BMI, depression), with differences

between the groups observed as early as 5y. One of the intended purposes of dieting is to influence dietary intake. Thus, different patterns of weight control behaviors may be associated with different changes in intake. When dietary intake was examined, girls in the Extreme Dieters group had the lowest self-reported intake but consumed significantly more in the laboratory. The aim of Study 3 was to extend the findings of Study 2 to examine the association between patterns of weight control behaviors and family, friend, and media factors. Significant family factors included family functioning, priority of family meals, and maternal weight-teasing. Significant friend factors included weight-teasing and dieting. Sensitivity to media was significant. When all the factors were examined in a combined model, family functioning, friends' dieting, and media sensitivity remained significant predictors of membership in a dieting group relative to the Non-dieters. Overall, the results of the present study indicate that for adolescent girls, dieting is an umbrella term for a wide variety of behaviors, and that types of dieters (e.g. Lifestyle, Dieters, and Extreme Dieters) are different on a number of individual characteristics and family, friend, and media factors. Taken together, these findings emphasize the need for a multidimensional prevention and interventions, addressing risk factors for dieting and use of unhealthy and extreme weight control behaviors at the individual, family, friend, and community (e.g. media) levels.

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Chapter 1

GENERAL INTRODUCTION

The thin ideal, omnipresent in our society, has caused body weight to become a “normative discontent” for both young girls and women [1]. The perceived discrepancy between actual weight status and the thin ideal can lead to the “normative discontent” with weight and to increased body dissatisfaction [1-3]. Body dissatisfaction and weight concerns are common by middle childhood, with many children already expressing a desire to be thinner and a fear of becoming fat [4]. Girls as young as 5y are aware of dieting behaviors [5], and girls report the emergence of “dieting” or wanting to lose weight by middle childhood [6]. Estimates suggest that 40% of pre-adolescent school-aged children have reported attempting “dieting” [7], with that number rising to roughly two-thirds among adolescent girls [8]. Many girls, regardless of whether they are overweight or normal weight, report “dieting” in an attempt to achieve the thin ideal [9, 10]. However, self-initiated dieting among children and adolescents is often not successful, and may increase risk for greater long-term weight gain [11], and for the development of subclinical disordered eating and clinical eating disorders [12] and depression [13]. Self-reported dieting in adolescents is associated with other risky behaviors, and is related to increased sexual activity, and increased drug, tobacco, and alcohol use even after controlling for weight status [14]. Thus, it is important to understand the factors involved in the etiology and persistence of dieting.

What is dieting?

One methodological limitation is that there is no standard definition of “dieting.” For health professionals, dieting refers to changes in eating patterns for the purpose of weight loss or weight maintenance [15]. However, the phrasing of the question influences the

prevalence of adults classified as dieters. Neumark-Sztainer and colleagues [9] examined responses to different variations of questions about dieting (e.g. current dieting, regular dieting, doing anything to lose weight) There was wide variation in the prevalence of dieting between the different phrasing of dieting questions, with more women (78%) responding yes to “do you do anything to lose weight?” than to current (31%) or regular (18%) dieting. Other definitions of dieting include aspects that go beyond weight-loss behaviors to include cognitions. Lowe [16] contends that there is a “dieting” mindset that goes beyond food restriction to include preoccupation with weight and perceived deprivation.

Additionally, it is also not clear what children and adolescents are doing when they report that they are “dieting.” For example, some children and adolescents may report that they are dieting when they are simply reporting cognitive desires to restrict food intake without participating in any dieting behaviors [17]. For others, dieting may mean engaging in extreme weight control behaviors, while for others it may just be healthy lifestyle changes that are consistent with current dietary guidance [15, 18]. There have been a few studies designed to examine how adolescents define dieting. Nichter [19] found that there was a distinction between “dieting” and “watching what you eat,” suggesting that adolescents view dieting as more than just being careful about what one eats. Focus groups with adolescents revealed several general themes to the meaning of dieting [15]. Overall, the adolescents described dieting in behavioral terms. Dieting was described as a range of healthful eating behaviors (e.g. “eating healthier foods” and “eating less fat”) and unhealthful eating behaviors (e.g. “not eating” and “starving themselves”), with healthful behaviors mentioned more frequently. Many adolescents also considered other behaviors aimed at weight control,

such as increasing exercise, as “dieting.” Another less common theme was that “dieting” just meant trying to lose weight, but not necessarily expressed in terms of specific behaviors.

Thus, dieting is not a singular behavior, and a wide range of weight control behaviors can be included in self-reports of dieting. However, this information is lost when the data are collapsed into a dichotomous item. Dieting is a multidimensional construct, and needs to be examined as such. Given that that dieting is implicated as a causal factor for a number of disorders (e.g. obesity and weight gain, eating disorders, depression), in order to identify etiological factors it is necessary to distinguish between patterns of weight control behaviors. For example, girls who are using weight control behaviors that are consistent with weight management in the Dietary Guidelines for Americans might have different than those who use behaviors that may constitute subclinical disordered eating (e.g. use of unhealthy weight control behaviors such as laxative, diuretics, vomiting).

Risk and protective factors for dieting behavior

Based on an Ecological Systems Theory perspective [20], dieting behavior should be thought of using an interactive contextual perspective, looking not only at the individual context, but also at the broader-level contexts (e.g. familial and societal influences). Factors that influence dieting behavior include individual characteristics, and sociocultural characteristics such as family, friend, and media variables. Thus, in order to effectively understand dieting behavior, it is necessary to examine risk and protective factors not only at the individual-level, but also at the family, friend, and societal-levels (e.g. media).

Individual factors

Weight

Elevated weight status in childhood and adolescence is associated with greater weight concerns and levels of restraint and disinhibition [21]. This makes sense, given that girls who are of an elevated weight status will be farther away from the thin-ideal, and thus may feel greater discontent about their weight. Girls who were overweight at 5y had higher levels of disinhibited eating, dietary restraint, weight concern, body dissatisfaction [22], and increased dieting at 9y [23]. While overweight adolescents report more frequent dieting and use of unhealthy weight control behaviors than normal weight adolescents, a high percentage of normal weight adolescent girls also report these behaviors [24].

Weight concerns and body dissatisfaction

Weight concerns are one of the strongest predictors of dieting and weight control practices among adolescents and adults [24-26], suggesting that it is not just absolute weight that is related to dieting behavior, but perceived weight. Weight concerns at 5y predict dietary restraint and dieting at 9y [23], which increase the risk for later dieting and eating pathology. Body dissatisfaction is a significant risk and maintenance factor in dieting and eating pathology [27]. Body dissatisfaction can have a negative impact on global self-worth, which also may support dieting behavior [28, 29].

Psychological well-being

Links between measures of psychological well-being and dieting behavior are seen in both children and adolescents. In children, not only do depressive symptoms increase risk for later eating pathology [30], but depressive symptoms precede the emergence of dieting [6]. In adolescents, depressive symptoms are associated with dieting, disordered eating, and the

use of unhealthy weight control behaviors [31]. Similarly, self-esteem has been implicated as a strong correlate of frequent dieting and disordered eating [32].

Temperament

Temperament is based on individual differences in emotional reactivity and regulation, is ‘stable and enduring’ across childhood [33], and is related to child health and adjustment. Inhibitory control is defined as the ability to restrain a dominant response and instead perform a subdominant response [34]. While inhibitory control increases from middle childhood to adolescence [35], rank-order differences in inhibitory control are relatively stable over time [36]. Inhibitory control is an important factor in dieting success [37] and in early weight gain [38]. Other aspects of temperament, such as negative emotionality and lower persistence scores, have also been identified as early predictors of later eating pathology [39].

Sociocultural Factors

Stice et al. [40] have proposed that there are three primary sources of sociocultural influence on adolescent weight concerns and dieting behavior: family, peers (friends), and the media.

Family

There is mixed evidence for intergenerational transmission of ideas about weight and dieting between parents and children. Levels of dietary restraint [41] and weight concerns [42] are similar between mothers and daughters. Parents may serve as models of eating and dieting behaviors for their children, though results have been mixed. In one sample of adolescent girls, girl-reported mother-dieting, but not father dieting, was related to daughter use of unhealthy and extreme weight control behaviors [43]. Children’s responses to what

their mother, but not father, would do if she were fat were related to their reported dieting behavior [44]. On the other hand, Thelen and Cormier [29] found no significant associations between mothers' and fathers' reports of dieting and those of their daughters.

Parents who are concerned about their child's obesity proneness may exert more control over eating behavior [45], potentially through early use of restrictive feeding practices, and later use of weight-teasing and encouragement to diet. Motivation behind using these controlling behaviors is that parents may want to help their child lose weight in order to improve their physical appearance [46], thus transmitting a thin ideal to their child that may also influence dieting behavior [29]. Preliminary evidence indicates that restrictive feeding practices predict the emergence of dieting in childhood by age 11, but do not predict the emergence of dieting during adolescence [47]. Parents report using higher levels of encouragement to diet with overweight children, but also encourage normal weight adolescents to diet [48]. Parents may be responding to the normative developmental increases in body fat that occur for girls during the transition from childhood to adolescence [49]. However, parents also report encouraging their child to diet in childhood [29], prior to most of these normative changes in body fat and the emergence of secondary sexual characteristics. Many studies [26, 50], but not all [48] have found that parental encouragement to diet predicts dieting during adolescence

Weight-teasing is prevalent among families of adolescents [24, 51, 52], with over half of girls reporting some weight-teasing by their family in some samples [43]. While overweight girls reported more frequent family weight-teasing, girls who are normal weight are also teased by their family about their weight [43]. Family weight-teasing is a risk factor for the later use of unhealthy weight control behaviors [53]. Weight-teasing in adolescents has

also been associated with several psychological comorbidities, including depressive symptomologies [54] depression, and lower self-esteem in adolescents [55] and with poorer emotional well-being in adulthood [56].

Family environment

Families can also affect dieting behavior through their influence on the home environment (e.g. family meals and family functioning). Several characteristics of high family functioning, such as positive and open communication, connectedness, warmth, and unconditional acceptance have been identified as associated with decreased odds of dieting, and use of unhealthy and extreme weight control behaviors [57]. As expected, in families where parents use high level of psychological control, the protective effect of high family functioning against dieting and use of unhealthy weight control behavior is weakened [57].

Family meals provide the opportunity for parental role modeling of healthy and eating behaviors, and provide an opportunity for parents to observe their child's eating behavior to notice any disordered or maladaptive behaviors. The protective effect of family meals against dieting behavior among adolescents withstands the majority of potential effect modification from other family-level variables that may affect dieting behavior (e.g. weight-teasing) [58]. After controlling for other family-level variables such as family functioning, family meal frequency and priority were consistently negatively associated with the use of extreme and unhealthy weight control behaviors [59]. In a large sample of adolescents, family meals were protective against frequent dieting even in the presence of maternal dieting and family weight teasing [60]. Family meals have other positive health-related benefits. The family meal has been implicated as both a proxy and a vehicle for increased family functioning [61]. Increased family meal frequency has been also identified broadly as a protective factor for

high-risk behaviors such as substance abuse and risky sexual activity [62]. Increased family meal frequency in adolescence has also been associated with higher diet quality both concurrently [63, 64] and in young adulthood [65], and is also protective against the development of overweight and obesity in young adulthood [66].

Friends

Increasing susceptibility to peer influence and decreasing sensitivity to parental influence are hallmarks of the developmental transition as children become adolescents [67]. In fact, adolescents report that their friends', but not mother's or fathers', dieting was an important cause of their dieting behavior [3]. Adolescent girls report that they feel like they can talk openly with their friends about eating and weight concerns [3]. Friend influences operate through both direct pressure to be thin (e.g. weight-teasing), and through modeling of dieting behavior.

Social norms dictate that if enough people within a group participate in a given attitude or behavior, the attitude or behavior is more likely to be accepted as a social norm [68]; thus, girls may be dieting to fit in [69]. Girls who perceived their friends as more likely to diet were more likely to report dieting [70]. Paxton and colleagues found that friendship cliques shared similar levels of body image, dietary restraint, and use of extreme weight control behaviors [69]. Weight-related attitudes and behaviors among friends and peers have been shown to be related to a number of aspects of adolescent dieting behavior, including the emergence of dieting, chronic dieting, and use of unhealthy weight control behaviors [69]. The effects persist, as peer dieting behavior in adolescence was a risk factor for use of extreme weight control behavior five years later in young adulthood [53]. There has been less research on friend weight-teasing, with limited studies suggesting that friend weight-teasing

is also an important influence in dieting behavior. Retrospectively, female college students reported that peers were the worst culprits of appearance-related teasing during childhood and adolescents [71], and self-reported hurtful peer teasing about weight was a significant predictor of dieting [72].

Media influence

Images of women in the media are thinner than the average woman [73] and have been noted as often thinner than criteria for anorexia [74]. The images that adolescents are exposed to showcase ideals that are unattainable to most of them. This repeated exposure to specific media content allows the viewer to accept this as reality [75]. Negative body comparisons to women in the media starts early and are already present as young as 8y [76]. A meta-analysis found that overall, exposure to the thin-ideal in the media was related to increased body dissatisfaction, stronger internalization of the thin ideal, and increased disordered eating and eating disorder symptomology [75]. Specifically, most experimental research suggests that acute exposure to thin images in both print (e.g. magazine ads) [77] and digital media (e.g. television shows, music videos) increases body dissatisfaction [78]. Most (e.g.[79, 80]) but not all (e.g.[81]) cross-sectional studies have found that adolescents' self-reports of media exposure were associated with dieting and disordered eating behaviors. Exposure to thin-ideal media has lasting negative effects [80]; the frequency of magazine reading has been shown to predict the use of healthy, unhealthy, and extreme weight control behaviors five years later in female adolescents [82].

The influence of dieting on dietary intake

Adolescence is considered a “nutritionally vulnerable period” as it is a period of change in lifestyle habits and food choices due to increasing independence and autonomy

[83]. By definition, dieting is intended to influence dietary intake. For this reason, it is necessary to examine the influence of dieting behaviors on dietary intake and diet quality. However, associations between reported dieting and dietary intake are inconsistent. Earlier research indicated that dieters, classified using a yes/no dichotomy, are less likely to meet recommended amounts of micronutrients [84], and consume lower amounts of nutrient-dense foods [85]. Woodruff and colleagues [86] found that overall diet quality was lower among Canadian adolescents who reported dieting and weight concerns compared to those who did not report dieting or weight concerns. Similar results were found when dieters were classified by their frequency of dieting attempts. Non-dieters were less likely to consume “healthy” foods compared to either intermittent dieters or frequent dieters [87]. However, these results might only apply when “dieting” is categorized as a yes/no dichotomy. In contrast, when dieting was examined comparing moderate self-reported dieters (use of a method other than vomiting or use of diet pills) and extreme self-reported dieters (use of vomiting or diet pills) [88], moderate dieters reported consuming more servings of fruits and vegetables and fewer servings of high fat foods than either non-dieters or extreme dieters. Taken together, this suggests that there is no global effect of “dieting” on energy and nutrient intake, and necessitates the need for additional research to examine how different types of dieting and dieting behavior influence dietary intake.

Dissertation broad aims

Despite the breadth of research on predictors and consequences of dieting, we are still limited in our understanding of what patterns of weight control behaviors define dieting for adolescent girls, and how various sociocultural factors influence dieting behavior. As shown in the conceptual framework (see Figure 1.1), the current dissertation presents three studies

using different methodological approaches that will extend our knowledge of predictors and patterns of girls' self-reported dieting behavior in late childhood and adolescence. Together, the three studies will address predictors of dieting behavior from an Ecological Systems Theory [20] perspective, examining risk factors at the individual, family, friend, and societal levels. Specifically, the current dissertation includes studies that: 1) examine the influence of maternal, paternal, and combined parental encouragement on the emergence of dieting before and after 11y, 2) describe and predict patterns of weight control behaviors in 15y girls, and (3) examine the influence of family, friends, and the media on patterns of weight control behavior in 15y girls. All three of the proposed studies will use data from Early Dieting in Girls, a longitudinal study of girls and their parents who were followed from 5-15y. The primary aim of the research was to chart the development of the controls of food intake among girls, with particular attention to the onset of dieting.

Study 1, entitled *Parental encouragement of dieting promotes daughters' early dieting*, examined the influence of parental encouragement to diet on the emergence of daughters' self-reported dieting. The first aim was to examine the influence of parent-reported encouragement to diet, examined as maternal, paternal, and combined parental, encouragement on the emergence of self-reported daughters' early dieting (by 11y) and dieting during adolescence (between 11y and 15y). The second aim was to examine how maternal and paternal encouragement to diet predicts changes in BMI percentile in self-reported early dieters, adolescent dieters, and non-dieters.

Because a wide variety of weight control behaviors may be used by self-reported dieters, Study 2, entitled *Patterns of weight control behavior among 15y girls*, was designed to describe what weight control practices 15y girls are using when they report dieting for

weight control. The first aim of this study was to identify distinct patterns of self-reported weight control behaviors, identified using French's comprehensive list of weight control behaviors [87], in 15y girls using latent class analysis (LCA). Latent class analysis (LCA) is a person-centered measurement method used to identify an underlying latent grouping variable that is not observed but can be inferred from a set of measured indicators, individual weight control behaviors in this case. This approach has been used to examine patterns of reported weight control behaviors in adults [89, 90]. Once the patterns of weight control behavior were identified, the second aim was to identify individual predictors of weight control group membership. Due to the longitudinal nature of Early Dieting in Girls, we were interested in examining both antecedent (e.g. BMI at 5y, inhibitory control at 7y) and concurrent (e.g. BMI at 15y, depression at 15y) predictors of weight control group membership. One of the intended purposes of dieting is to influence dietary intake. However, as previously mentioned, associations between reported dieting and dietary intake are inconsistent, due in part to inconsistencies in classification of dieting. Thus, the third aim was to examine to examine weight control group differences in both self-reported dietary intake and weighed dietary intake. Self-reported intake was assessed using 3 multiple-pass 24h dietary recalls. Weighed intake was assessed from both a standard lunch meal and in the eating in absence of hunger protocol (EAH) [91].

Study 3, entitled *Family, friends, and media factors predict differences in patterns of weight control behavior among adolescent girls*, will build on the aforementioned findings that family, friend, and media all affect dieting behavior. The current study will expand on the extant literature by exploring relationships between several sociocultural factors (e.g. priority of family meals, media influence, and the patterns of weight control behavior,

identified in study 2. This will be done by examining both the independent and combined influence of family, friend, and media factors on patterns of weight control group membership at 15y.

Study 1 Aim: To examine the influence of encouragement to diet on the emergence of early and adolescent dieting

Study 3 Aim: To examine family, friend, media associations with weight control group membership

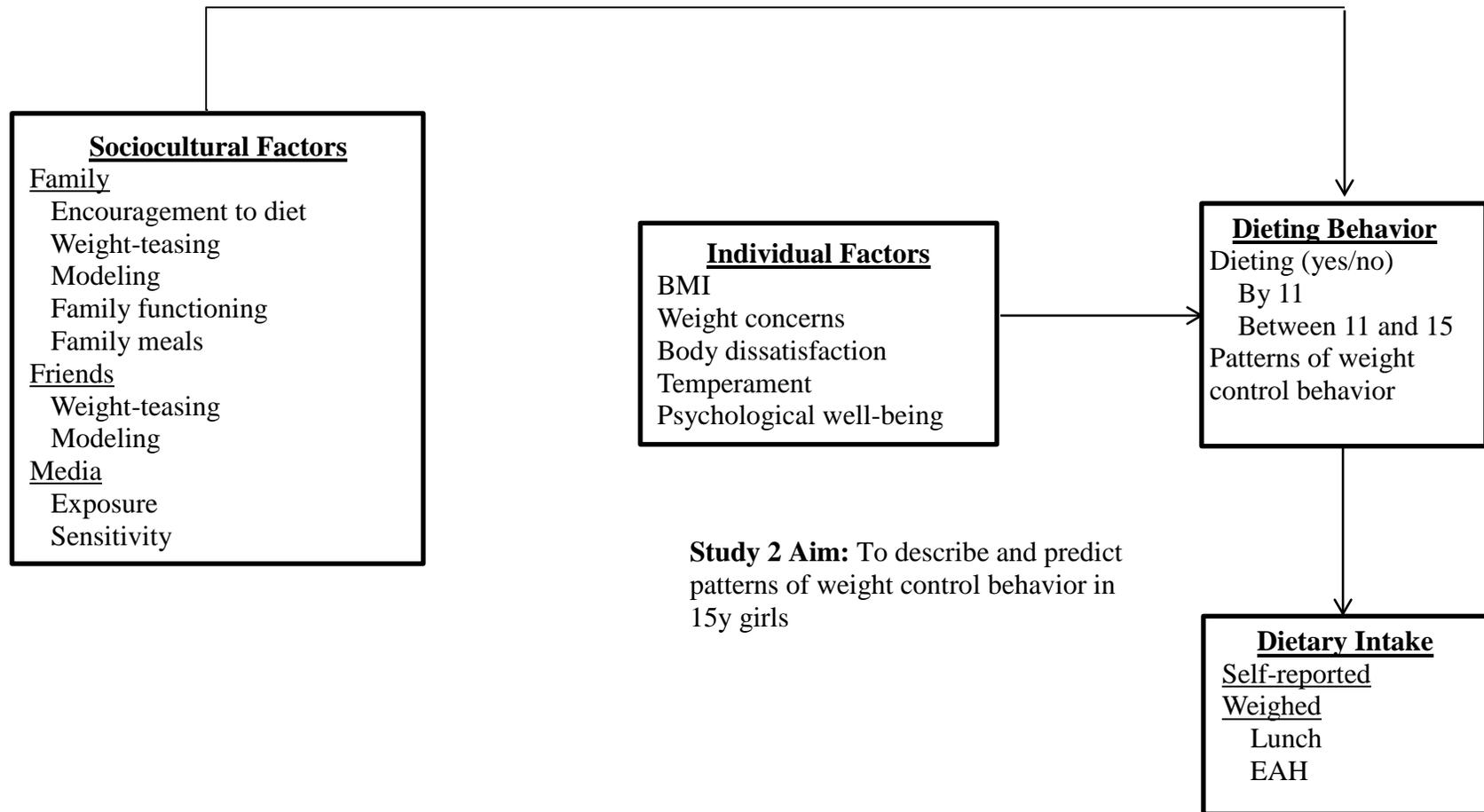


Figure 1.1 Conceptual framework for dissertation studies 1, 2, and 3

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CHAPTER 2

Parental Encouragement of Dieting Promotes Daughters' Early Dieting

Abstract

Dieting to lose weight is common among female adolescents. This research investigated the association between maternal and paternal encouragement to diet and their daughters' self-reported "early dieting" (prior to age 11y) and adolescent dieting (between 11y and 15y), and how parental encouragement to diet is related to changes in daughter BMI percentiles.

Participants in this study were 174 non-Hispanic white girls and their parents, assessed when daughters were age 9-, 11-, 13-, and 15y. The Parent Encouragement of Child Weight Loss Scale was used to measure encouragement to diet. Logistic regression was used to examine the relationship between parental encouragement to diet and daughters' reports of dieting by 11y and by 15y, adjusting for daughters' weight status at baseline. Compared to girls whose mothers didn't encourage dieting, girls who were encouraged to diet were twice as likely to diet by 11y; girls who were encouraged by their fathers were also twice as likely to diet by 11y. Girls who were encouraged to diet by both parents were 8 times more likely to report early dieting than girls who were not. Neither maternal nor paternal encouragement predicted the emergence of dieting during adolescence. Girls who dieted and had parental encouragement to do so had increases in BMI percentile from 9y to 15y. Findings reveal that parental encouragement to diet may be counterproductive and that parents need alternative approaches to promote healthy patterns of intake and growth among young girls.

Keywords: Encouragement to diet, dieting, maternal, paternal, children

Introduction

Dieting to maintain or lose weight is common among girls (Abramovitz & Birch, 2000; Davison, Markey, & Birch, 2000; Dixon, Adair, & O'Connor, 1996; Ricciardelli, McCabe, & Banfield, 2000). Girls as young as 5y are aware of dieting practices (Abramovitz & Birch, 2000), and girls report the emergence of dieting or wanting to lose weight by middle childhood, age 9y, (Sinton & Birch, 2005), suggesting that some early attempts at dieting may emerge prior to adolescence. Estimates suggest that roughly 40% of pre-adolescent school-aged children have attempted to diet to lose weight (Maloney, McGuire, Daniels, & Specker, 1989), with that number rising to roughly two-thirds of adolescent girls (Eaton et al., 2012).

Although overweight adolescents report more frequent dieting and use of weight control behaviors than normal weight adolescents, a high percentage of normal weight adolescent girls also report dieting (Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002), suggesting that even normal weight girls may be dieting to achieve the “thin ideal.” Because dieting is often not successful and may increase risk for the development of disordered eating (Hsu, 1996; Neumark-Sztainer et al., 2006; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999) and greater long-term weight gain (Field et al., 2003; Hill, 2004; Stice, Cameron, Killen, Hayward, & Taylor, 1999), it is important to understand the factors involved in the etiology of dieting. There are multiple factors that have been found to impact the onset of dieting in childhood and adolescence, including peer and media influence (Field, Camargo, Taylor, Berkey, & Colditz, 1999; Field et al., 2001; Levine, Smolak, & Hayden, 1994), and both direct and indirect parental influence (Dixon et al., 1996).

Parents shape both children's health-related behaviors and their food environments (Tinsley, 1992), thus playing a primary role in the development of eating behavior. Costanzo and Woody's (1985) domain-specific obesity proneness model posits that parents who are concerned about their child's obesity proneness may exert more control over eating behavior, potentially through use of restrictive feeding practices and encouragement to diet. This may have an influence on later eating and dieting behavior (Birch & Fisher, 1998). Motivation behind using these controlling behaviors reported by both mothers and fathers is that parents may want to help their child lose weight in order to improve their physical appearance (Striegel-Moore & Kearney-Cooke, 1994), thus, transmitting a thin ideal to their child that may also influence the emergence of dieting (Thelen & Cormier, 1995). Parents may also use these controlling behaviors in response to the child's developing sense of autonomy of control over their food choices (Bassett, Chapman, & Beagan, 2008).

Increases in body fat and the emergence of secondary sexual characteristics are normative changes that occur during the transition from childhood to adolescence, and may prompt the initiation of girls' dieting (Byely, Archibald, Graber, & Brooks-Gunn, 2000). Parents may also respond to these developmental changes with encouragement and information about dieting and weight control. Research also indicates that parents report using higher levels of encouragement to diet with overweight children (Fulkerson et al., 2002). However, normal weight adolescents are also encouraged to diet (Fulkerson et al., 2002), suggesting that the child's weight is not the only factor in eliciting encouragement to diet from the parent. Additionally, parental encouragement to diet often predicts dieting behavior even after controlling for daughters' weight status (Wertheim, 1999).

Parental encouragement to diet has been shown to start in childhood (Thelen & Cormier, 1995) and early adolescence and persist into late adolescence (Bauer, Laska, Fulkerson, & Neumark-Sztainer, 2011). Among adolescent girls, parental encouragement to diet predicts daughter dieting (Dixon et al., 1996; Strong & Huon, 1998). In these prior studies, parental encouragement was used as a general term, maternal and paternal encouragement were not assessed separately, and was assessed using daughters' reports. While Thelen and Cormier (1995) reported that levels of encouragement to diet are similar between mothers and fathers, there has been limited research examining the independent effects of maternal and paternal encouragement. Maternal encouragement to diet predicts adolescent daughters' dieting behavior (Huon, Lim, & Gunewardene, 2000). While evidence is limited, data from Project EAT indicated that paternal encouragement did not predict adolescent daughter dieting behavior after accounting for maternal encouragement (Neumark-Sztainer et al., 2010).

Less is known about how parental encouragement to diet predicts the emergence of dieting during childhood. Limited reports on parental encouragement to diet in children suggest that both maternal and paternal encouragement to diet are related to an increased frequency of dieting (Thelen & Cormier, 1995), but they did not examine the effect of paternal encouragement to diet on the emergence of dieting. Additionally, research is limited on the potential combined influence of having two parents encourage dieting. The cumulative risk hypothesis (Appleyard, Egeland, van Dulmen, & Sroufe, 2005) proposes that exposure to multiple risk factors increases the risk of an outcome, suggesting that combined encouragement to diet from both parents might be a predictor worth examining. A potential methodological limitation is that the majority of studies examining the influence of parental

encouragement on dieting have used children's perceived reports of parental encouragement (Dixon et al., 1996; Haines, Neumark-Sztainer, Wall, & Story, 2007; Huon et al., 2000) or have used a single item regarding the extent to which parents "encouraged their adolescent to diet to control his/her weight" (Fulkerson et al., 2002).

The primary aim of this study was to investigate maternal and paternal reports of encouragement to diet as independent predictors of the emergence of daughters' dieting attempts during childhood ("early dieting," by 11y) and during adolescence (between 11y and 15y), and when controlling for daughters' weight status. A secondary aim of this study was to determine if parental encouragement predicted change in daughters' BMI percentile from 9y to 15y, and if these effects differed for dieting that emerged early, during childhood, or in adolescence.

Research Methods

Participants

Participants at study entry included 197 non-Hispanic, white families living in Central Pennsylvania recruited as part of a longitudinal study of the health and development of young girls, concentrating on identifying familial predictors of individual differences among girls in the behavioral controls of food intake. Eligibility criteria for girls' participation at recruitment included living with the biological mother and father, the absence of severe food allergies or chronic medical problems affecting food intake, and the absence of dietary restrictions involving animal products. The sample was not recruited based on weight status. Parents and their 5y old daughter ($m = 5.4 \pm 0.4$ y) were recruited for participation into the study using flyers and newspaper advertisements. In addition, families with age-eligible female children within a five-county radius received mailings and follow-up phone calls

(Metromail Inc.). Families were assessed at baseline and then assessed every 2y at daughter age 7 (n=192), 9 (n=183), 11 (n=177), 13 (n=168), and 15 (n=167). Attrition was primarily due to family relocation outside of the area. Families with complete data from 9y to 11y (n=174) were included in this in the final sample predicting early dieting, and families with complete data from 9y to 15y were included in the final sample predicting adolescent dieting (n=110). No significant differences were found between the initial weight status of participants lost to follow-up (n=9) and of participants who completed the study at age 15 (n=165).

The Pennsylvania State University Human Subjects Institutional Review Board approved all study procedures, and parents provided consent for their family's participation before the study began.

Procedure

Parent Measures

Demographics. Maternal and paternal years of education and family income were self-reported at study entry. Parents selected their combined family income from the following: less than \$20,000; \$20,000-\$35,000; \$35,000-\$50,000; and greater than \$50,000.

Parent weight status (BMI). Parent heights and weights were measured at study entry by a trained staff member following procedures described by Lohman et al. (1988). All subjects were weighed and measured in light clothing without shoes. Height was measured in triplicate to the nearest 0.1 cm using a stadiometer. Weight was measured in triplicate to the nearest 0.1 kg on an electronic scale (Seca Corp, Birmingham, United Kingdom). Weight and height were used to calculate body mass index ($BMI = \text{weight (kg)}/\text{height (m}^2\text{)}$).

Parent encouragement of daughters' dieting. Maternal and paternal encouragement of daughter dieting was assessed when daughters were 9-, 11-, 13-, and 15y using the Parent Encouragement of Child Weight Loss Scale. This measure was created for this study due to the lack of a previously validated measure on the topic, and is partially described by Davison and Deane (2010). The measure contains 15 items assessing the ways in which parents encourage their child to lose weight, and includes items about food intake and physical activity, for example: "Have you talked to your daughter about the things she could do to lose weight?" For each item, responses were measured on a 4-point scale (1=definitely not; 2=not really; 3=a little; 4=a lot/definitely). At each time point, a mean score across all 15 items was created to reflect the level of encouragement to diet at that time point. In order to get a measure of the number of times the parent reported encouraging dieting during the current study (ranging from 0, never, to 4, at ages 9, 11, 13, and 15), a measure of the consistency of encouragement for maternal and paternal encouragement was created. This was done by classifying parents as a dichotomous yes/no (did encourage dieting/did not encourage dieting) at each time of assessment. A mean score across all items greater than or equal to 2 represents parental encouragement to diet at that time of assessment. To examine the cumulative influence of having both parents encourage dieting, a measure of combined parental encouragement was created using the dichotomous measure of encouragement at each time of assessment. Response options include 'neither,' 'either,' or 'both,' and reflect parental encouragement to diet at least once during the study period. The internal consistency coefficient for parental encouragement of dieting, for both mothers and fathers, was $\alpha=.72$ or higher for all times of assessment.

Daughters' Measures

Weight status (BMI percentile). Height and weight were measured at daughter age 9, 11, 13, and 15 by a trained staff member following procedures described by Lohman (1988). Girls were dressed in light clothing and measured without shoes. Height was measured in triplicate to the nearest 0.1 cm using a Shorr Productions stadiometer (Irwin Shorr, Olney MD). Weight was measured in triplicate to the nearest 0.1 kg using a Seca Electronic Scale (Seca Corp, Birmingham, United Kingdom). BMI (weight (kg)/height (m)²) scores were generated based on height and weight measurements and were used to calculate BMI percentiles. Age- and sex-specific BMI percentiles were calculated using the 2000 CDC Growth Charts; overweight was defined as a BMI > 85th percentile on the basis of a standardized reference criteria (Kuczmarski et al., 2000).

Dieting. Girls' self-reported dieting attempts were assessed at 9-, 11-, 13-, and 15y using a dichotomous yes/no item, "Have you ever dieted?" Girls were told that they should think of a diet as "whenever you eat less or exercise more in order to lose weight." Anyone who reported a "yes" response at any time point was coded a "yes" at all subsequent time points due to the survival-curve nature of the emergence of dieting. Daughters were classified as 'early dieters' if they first reported dieting by age 11, as adolescent dieters if they first reported dieting at 13 or 15 or as 'never dieted' if they did not report dieting by age 15. Responses to "have you ever dieted?" were confirmed by weight loss behaviors reported on an adapted French Weight Loss Scale (French, Perry, Leon, & Fulkerson, 1995).

Statistical Analyses Plan

All data analyses were performed using SAS version 9.2 (SAS Institute Inc., Cary, NC). Descriptive statistics were computed for parental (maternal, paternal, and combined)

encouragement of dieting, daughters' dieting, and daughter BMI percentile. Chi-square was used to test the relationship between maternal and paternal encouragement to diet. Statistical significance was defined as $p \leq 0.05$.

The primary aim of this study was to assess whether parental encouragement predicts the emergence of daughters' reports of early dieting (by 11y) and dieting during adolescence (between 11y and 15y). Dieting was assessed as a binary variable: e.g., if daughter first dieted (vs. did not diet) by 11y, or if daughter first dieted between 11y and 15y (vs. did not diet). As such, logistic regression was used to predict the emergence of both early dieting and the emergence of dieting between 11y and 15y. In all logistic regression models, odds ratios and 95% confidence intervals were reported. In addition, to account for the role of weight status on dieting, daughter BMI percentile at 9y (baseline) was included as a stable covariate in all models. Mother education, father education, mother BMI, father BMI were tested individually as covariates in a logistic regression model with early dieting as the outcome and daughter BMI percentile as a stable covariate. The latter was included in all models because we wanted to identify additional covariates that were statistically significant while in the presence of daughter BMI percentile, however no additional covariates were significant and thus were not entered in the following models. Models were run separately for maternal and paternal encouragement to investigate the independent contributions of maternal and paternal encouragement on the emergence of dieting. For the model predicting early dieting, a cumulative score of maternal encouragement at 9y and 11y, representing the consistency of maternal encouragement (range: 0-2), was entered as the predictor. Next, this model was repeated and adjusted for daughter BMI percentile at 9y. The same steps were repeated to test for the influence of paternal encouragement at 9y and 11y. Lastly, for the model predicting

the emergence of dieting between 11y and 15y, a cumulative score of maternal encouragement at 9y, 11y, 13y, and 15y, representing the consistency of maternal encouragement (range: 0-4), was entered as the predictor. This model was repeated and adjusted for daughters' BMI percentile at 9y. The same steps were repeated to test for the influence of paternal encouragement, and combined parental encouragement (neither, either, both). In the models predicting dieting that emerged between 11y and 15y, daughters who reported dieting by 11y were excluded to restrict the models to daughters whose dieting emerged after 11y. As a result, there are fewer families in these models than there were in the early dieting models. Daughters who responded "yes" to "have you ever dieted?" but did not report engaging in any of the listed weight loss behaviors, were removed from the data and the data were reanalyzed. Removing these daughters did not change the results, and thus these daughters remained in the analyses.

The secondary aim was to determine if parental encouragement predicts change in daughters' BMI percentile from 9y to 15y, and if these effects differed by when dieting emerged (early dieting vs. dieting during adolescence). To do this, the sample was split into two groups based on when dieting emerged: emergence of dieting by 11y, and emergence of dieting between 11y and 15y. A third group was created for girls who reported having not dieted from 9y to 15y. Next hierarchical linear regression (HLR) models were run separately for each dieting group. HLR was chosen to allow for the estimation of unique R^2 estimates for parental encouragement. In each model, daughters' BMI percentile at 9y was entered in step 1, which permitted us to examine change in BMI percentile from 9y to 15y. In step 2, the consistency of maternal encouragement from 9y to 15y (range: 0-4) was entered as the

main predictor. Lastly, these models were rerun with paternal encouragement as the main predictor.

Results

Background, daughters' dieting, and parental encouragement characteristics

Sample daughter dieting and parental encouragement characteristics are shown in **Table 2.1** and reveal that the percentage of daughters who reported that they had ever dieted increased steadily from 9 y to 15 y. About 30% of girls reported early dieting (by 11y) and nearly half of girls reported dieting for the first time during adolescence; more than three quarters of girls reported dieting by 15y; 30% of the girls were overweight at 9y, decreasing to 21% at 15y. Daughter BMI percentile at age 9 was significantly positively correlated with higher levels of both maternal encouragement to diet ($r = .56$, $p < .0001$) and paternal ($r = .58$, $p < .0001$) encouragement to diet. Similar patterns of associations between concurrent daughter BMI percentile and maternal/paternal encouragement to diet were found at daughter ages 11, 13, and 15. Both maternal and paternal encouragement to diet differed by daughters' weight status at 9y; 69% of overweight 9y daughters were encouraged to diet by their mothers, compared with only 10% of 9y normal weight daughters. Similarly, 73% of 9y overweight daughters were encouraged to diet by their father, compared with only 13% of 9y normal weight daughters. Maternal and paternal encouragement of dieting were significantly correlated ($r = .61$, $p < .0001$) at daughter age 9, but there were families in which only one parent reported encouragement to diet. As shown in **Table 2.1**, parental encouragement was the highest among early dieters. Of the early dieters, 44% were encouraged by both parents. All

daughters who received encouragement to diet from both parents reported dieting during the study, and 91% of the girls who were encouraged to diet by one parent were dieters.

Daughter BMI percentile and early maternal and paternal encouragement predict daughter early dieting

As shown in **Table 2.2**, both early maternal and paternal encouragement were independent predictors of the emergence of daughter early dieting behavior (by age 11) and remained significant predictors after controlling for BMI percentile at 9y. Daughter BMI percentile at 9y was a significant independent predictor of early dieting in both the maternal and the paternal encouragement models, and remained significant after adding parental encouragement. The interaction between parental encouragement and daughter BMI percentile was not significant. Daughters who were encouraged to diet early by their mother were approximately twice as likely to report early dieting than daughters who were not encouraged to diet. Daughters who were encouraged to diet early by their fathers were approximately twice as likely to report early dieting than daughters who were not encouraged to diet.

Maternal and paternal encouragement does not predict the emergence of dieting during adolescence

As shown in **Table 2.2**, in contrast to the findings for early dieting, maternal encouragement of dieting was not a significant predictor of the emergence of daughter dieting during adolescence (between 11y and 15y) before ($p > .05$) or after ($p > .05$) adjusting for BMI percentile. Paternal encouragement to diet was a significant independent predictor of the emergence of daughter adolescent dieting ($p < .05$), but was no longer significant after adjusting for daughter's BMI percentile ($p > .05$).

Combined parental encouragement predicts early dieting, but not dieting during adolescence

As shown in **Table 2.3**, the measure of combined parental encouragement to diet was a significant independent predictor of early dieting, by 11y ($p < .001$). Similar results emerged after adjusting for daughter BMI percentile. Relative to cases in which neither parent encouraged dieting, after adjusting for BMI percentile, daughters who were encouraged early by both parents were 8 times more likely to report the emergence of dieting by 11y. In contrast, findings in Table 3 show that neither combined parental encouragement to diet nor daughter's BMI were significant predictors of the emergence of dieting in adolescence. The interaction between daughter BMI percentile at 9y and combined encouragement was not significant.

Parental encouragement to diet predicts greater increases in weight status from 9y to 15y among daughters who report dieting

Parental encouragement to diet predicted increases in BMI percentile from 9y to 15y among daughters whose dieting emerged by 11y or between 11y and 15y, but not among daughters who did not report dieting by 15y. In early dieters, maternal encouragement ($\beta = 6.2, p < .01; R^2 = .11$), but not paternal encouragement ($p > .05$), significantly predicted an increase in BMI percentile from 9y to 15y. Early dieters were predicted to increase 6.2 BMI percentiles per unit increase in maternal encouragement to diet. In daughters whose dieting emerged during adolescence, both maternal encouragement ($\beta = 4.2, p < .05; R^2 = .03$) and paternal encouragement ($\beta = 4.4, p < .05; R^2 = .03$) were significant predictors of an increase in BMI percentile from 9y to 15y. Adolescent dieters were predicted to increase 4.2 and 4.4 BMI percentiles per unit increase in maternal and paternal encouragement to diet,

respectively. In daughters who did not report dieting by 15y, neither maternal nor paternal encouragement was a significant predictor of the change in BMI percentile from 9y to 15y.

Discussion

This study investigated the influence of maternal and paternal encouragement to diet on daughters' early dieting and dieting during adolescence. In this sample, dieting among girls was prevalent from 9 to 15y. For some girls, dieting developed early, by age 11. Early encouragement of dieting by both mothers and fathers predicted greater risk of early dieting. In contrast, neither maternal nor paternal encouragement predicted the emergence of dieting during adolescence. Parental encouragement to diet predicted increases in girls' BMI percentiles between the ages of 9 and 15, but only among girls who reported dieting early or during adolescence. The findings indicate that parental encouragement to diet may have unintended negative effects, by promoting dieting and *increased* weight status.

Although self-reported dieting is normative among girls by adolescence, there is limited evidence suggesting that the intergenerational transmission of ideas about dieting and dieting practices, and the emergence of dieting, begin much earlier: 5-year old girls are already aware of dieting practices (Abramovitz & Birch, 2000), and report dieting attempts by middle childhood (Sinton & Birch, 2005). While not directly addressed in the current study, parents are models of strategies for weight loss that daughters may emulate; parents can influence their daughters by modeling maladaptive eating behaviors and by expressing concern about their own body dissatisfaction. There is a strong familial link between mothers' and adolescent daughters' weight concerns (Pike & Rodin, 1991) and levels of dietary restraint (Hill, Weaver, & Blundell, 1990), and between mothers' disinhibition and daughters' disinhibited eating (Cutting, Fisher, Grimm-Thomas, & Birch, 1999). In the

current study, both maternal and paternal encouragement to diet were significant independent predictors of early dieting, and remained significant after controlling for daughter BMI percentile. In the only previous study investigating parental encouragement to diet on dieting behavior in childhood, Thelen and Cormier (1995) noted that there was a significant correlation between both maternal and paternal encouragement to diet and daughters' reported dieting frequency. The current findings are consistent with this result and extend these findings to address whether parental encouragement to diet predicted the initiation of daughters' dieting. Findings from the current study support the idea that while mothers play a central role in the transmission of information about dieting (Abramovitz & Birch, 2000), fathers can also play an important role in the development of daughters' dieting behavior.

Despite the fact that parental encouragement to diet persisted and increased as the daughters became adolescents, parental encouragement did not predict the emergence of dieting during adolescence. This is in contrast to prior research suggesting that parental encouragement predicts dieting during adolescence (Dixon et al., 1996; Strong & Huon, 1998); however, in those studies, the authors did not measure when dieting emerged or distinguish between early dieters and adolescent dieters. In the current study, daughters who reported early dieting, prior to adolescence, were excluded from the models examining the emergence of dieting during adolescence. Due to our relatively small sample size, a larger sample is needed to confirm study findings. For example, it is also possible that parental encouragement to diet does not enhance adolescent girls' already heightened risk of dieting; parental encouragement may become less influential during adolescence as influence from peers and from the media becomes more normative (Eisenberg, Neumark-Sztainer, Story, & Perry, 2005; Levine, Smolak, & Hayden, 1994; Levine, Smolak, Moodey, Shuman, &

Hessen, 1994), though this has not been directly studied in the present study. Daughter weight status was not a significant predictor of the emergence of dieting during adolescence in the current sample. This may be because it is common for many girls, regardless of their weight status, to try to achieve the thin ideal, as reported by past studies (Neumark-Sztainer et al., 2002). Our finding that three-fourths of girls reported dieting by age 15 agrees with those previous findings.

Girls who were encouraged to diet by both parents were 8 times more likely to report early dieting relative to girls who were not encouraged to diet. The cumulative risk hypothesis suggests that exposure to multiple risk factors increases the risk of an outcome (Appleyard et al., 2005). When applied to our findings, it may be that girls' exposure to encouragement to diet from both mother and father increases the risk of dieting, over and above having one parent encourage dieting. In our sample, all girls who were encouraged to diet by both parents reported having dieted by age 15, with the majority of girls reporting having dieted by age 11. This implicates encouragement to diet from both parents as a very strong predictor of daughter early dieting.

As expected, girls with higher BMIs were more likely to be encouraged to diet both in childhood and in adolescence. While this result has not yet been shown in children, this is consistent with previous research showing that levels of maternal and paternal encouragement are higher among overweight adolescent girls (Fulkerson, 2002). Parents who are concerned about their child's obesity proneness are more likely to exert control over their child's eating (Costanzo & Woody, 1985) which might explain why parents are more likely to encourage overweight girls to diet. This study provides new information indicating that parental encouragement to diet predicted increases in BMI percentile from 9y to 15y, but

only among girls who reported initiating dieting attempts. Maternal encouragement predicted an increase in BMI percentile for early dieters, and both maternal and paternal encouragement predicted an increase in BMI percentile for adolescent dieters. While parents may be encouraging their daughter to diet because they are concerned about her weight status, findings from this study indicate that encouragement to diet may help support weight gain over time, which is in opposition to the intended purpose of encouragement to diet. However, since not all other potential influences were included as predictors, additional work is needed to confirm this finding. Additional studies with larger samples could improve the predictive effect of the encouragement to diet on change in weight, as the R^2 is significant but small in the current sample. One reason that parental encouragement to diet might not be a successful in helping children lose weight is that levels of inhibitory control have been associated with dieting success (Jansen & Vandenhout, 1991), and levels of self-regulation and inhibitory control are still developing in pre-adolescent girls (Hooper, Luciana, Conklin, & Yarger, 2004). This suggests that early attempts at dieting might not be successful, and thus encouraging these girls to diet may be problematic.

The current study has several strengths. Our findings extend prior research and demonstrate the predictive relation between early maternal and paternal encouragement to diet and girls' early dieting in childhood. These findings add to the literature by providing information on the influence of parental encouragement to diet on the emergence of dieting during childhood and adolescence. In addition, the longitudinal data available in the current study allowed us to evaluate both the independent and combined influence of maternal and paternal encouragement to diet on daughters' dieting. The current study is not without limitations. One main limitation is the main predictor variable (maternal/paternal

encouragement of dieting) and the main outcome variable (dieting) are both subject to self-report bias, as some may be embarrassed by the nature of the question. Another limitation is that the measure of dieting used in this study does not capture reasons for dieting other than for weight loss. The sample was primarily non-Hispanic white two-parent families with middle to high incomes, which limits the generalizability of the findings to other groups at elevated risk for obesity as well as to mother-son or father-son dyads. Another limitation is that other factors that may support the emergence of dieting, such as media and peer influence, were not examined and thus cannot be ruled out potential contributing factors to the emergence of dieting.

In summary, maternal, paternal, and combined parental encouragement to diet predicted an increased likelihood of the emergence of daughters' early dieting in childhood, independent of weight status, but did not predict the emergence of daughters' dieting in adolescence. While dieting is a normative behavior, the current study adds to a growing body of research that dieting in childhood and adolescence, particularly in girls who were encouraged to diet by their parents, can lead to later weight gain. Less is known about the physical and psychological health risks associated with starting to diet early, prior to the onset of adolescence, with limited research suggesting that early dieting may have similar health risks as dieting during adolescence. Further, less is known about why parents encourage their child to diet, future work should examine parental characteristics that contribute to a parent's choice to encourage their child to diet, such as the parent's weight status and their own dieting history. However, more work is needed to determine alternatives approaches concerned parents can use. Recent research suggests that rather than using controlling feeding practices, parents who are concerned about their child's weight status

should focus on modeling healthy behaviors (Neumark-Sztainer et al., 2010; Pearson, Biddle, & Gorely, 2009); this would be a good starting point for developing alternative approaches to encouragement to diet.

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Table 2.1

Descriptive demographics, daughters' dieting, and parental encouragement

	Total Sample (n=167)	Early Dieters (n=55)	Adolescent Dieters (n=77)	Did not diet by 15 (n=35)
Daughter BMI percentile				
at 9	64.5 (27.1)	78.9 (22.1)	60.9 (26.1)	51.3 (27.0)
at 15	61.3 (25.1)	72.3 (23.6)	60.4 (22.7)	48.6 (25.8)
% with maternal encouragement				
by 11	21.0	45.5	12.8	5.6
by 15	32.3	N/A	20.5	13.9
% with paternal encouragement				
by 11	20.1	45.3	13.2	0
by 15	27.9	N/A	26.3	2.8
% with combined encouragement				
by 11	14.0	36.9	6.6	0
by 15	20.7	N/A	14.5	2.8

Early dieters reported dieting for the first time at 9y or 11y; adolescent dieters reported dieting for the first time at 13y or 15y. Parental encouragement measured at daughter 9-, 11-, 13-, and 15y. Percent daughters with maternal/paternal/combined encouragement represents parent report of encouragement at least once during the time period

Table 2.2

Predicting the emergence of daughters' early dieting and adolescent dieting from maternal and paternal encouragement of dieting, adjusting for BMI percentile at age 9

	Early Dieting		Adolescent Dieting	
	Maternal (n=174)	Paternal (n= 169)	Maternal (n=112)	Paternal (n=110)
Daughter BMI percentile	1.03 (1.01, 1.04)**	1.03 (1.01, 1.04)**	1.01 (0.99, 1.03)	1.01 (0.99, 1.02)
Daughter encouraged by:				
Mother	1.90 (1.08, 3.35)*		1.48 (0.79, 2.76)	
Father		2.15 (1.18, 3.91)*		3.10 (0.92, 10.42)

Early dieting refers to the emergence of self-reported dieting by 11y. Adolescent dieting refers to the emergence of dieting after 11y but by 15y. Daughters who reported dieting by 11y were excluded from the models examining the emergence of dieting during adolescence. Daughters' BMI percentile was measured at age 9y. Parental encouragement measured at daughter 9-, 11-, 13-, and 15y (only 9- and 11y used to predict early dieting) and represents the number of times the mother/father reported encouraging dieting. Data presented as odds ratios with 95% confidence interval in parentheses.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2.3

Predicting the emergence of daughters' early dieting and adolescent dieting in families where neither parent, either parent or both parents encouraged their daughter to diet, adjusting for daughters' BMI percentile at age 9

	Early Dieting (n= 169)	Adolescent Dieting (n=110)
Daughters' BMI Percentile	1.02 (.998, 1.04)	1.01 (.99, 1.02)
Dieting encouraged by:		
Neither parent	ref	ref
One parent	1.99 (.66, 5.96)	1.66 (.46, 5.88)
Both parents	8.30 (2.32, 29.68)**	5.34 (0.60, 47.25)

Early dieting refers to the emergence of self-reported dieting by 11y. Adolescent dieting refers to the emergence of dieting between 11y and 15y. Daughters who reported dieting by 11y were excluded from the models examining the emergence of dieting during adolescence. Parental encouragement measured at daughter 9-, 11-, 13-, and 15y (only 9- and 11y used to predict early dieting). The “neither” group was used as the reference group for comparisons. Data presented as odds ratios with 95% confidence interval in parentheses.

* $p < .05$, ** $p < .01$, *** $p < .001$

CHAPTER 3

Patterns of Weight Control Behavior among 15y Girls

Abstract

Objective: The objectives were to identify and predict patterns of weight control behavior in 15y girls and to examine weight control group differences in energy intake.

Method: Subjects included 166 girls assessed every 2 years from age 5 to 15. Latent class was used to identify patterns of weight control behaviors. Antecedent variables (e.g. inhibitory control at 7y), and concurrent variables (e.g. BMI at 15y, dietary intake) were included as predictors.

Results: LCA identified four classes of weight control behaviors, Non-dieters (26%), and three dieting groups, increasing in the number and severity of reported behaviors: Lifestyle (16%), Dieters (43%), and Extreme Dieters (17%). Levels of restraint, weight concerns, and dieting frequency increased across groups, from Non-dieters to Extreme Dieters. BMI at 5y and inhibitory control at 7y predicted weight control group at 15y; e.g. with every one-point decrease in inhibitory control, girls were twice as likely to be in the Extreme Dieters group than to be in the Non-dieters group. Girls in the Extreme Dieters group were more likely to be classified as under-reporters, and had lowest self-reported intake, but ate significantly more in the laboratory.

Discussion: Among 15y, “dieting” includes a range of both healthy and unhealthy behaviors. Risk factors for membership in a weight control groups are present as early as 5y. Patterns of intake in the laboratory support the view that lower reported energy intake by Extreme Dieters is likely due underreporting as an intent to decrease intake, not actual decreased intake.

INTRODUCTION

Dieting to lose or maintain weight is prevalent among both normal weight and overweight adolescents; estimates indicate that roughly two-thirds of adolescent girls report trying to lose weight ¹. Research has shown that self-reported dieting is often not successful, leading to greater long-term weight gain ², and may increase the development of subclinical disordered eating and clinical eating disorders ³. Multiple individual and psychosocial factors have been found to impact dieting in childhood and adolescence. These factors include peer and media influence ⁴, parent influences such as modeling dieting behavior ⁵ and direct encouragement to diet ⁶, and individual characteristics including elevated weight status ⁷ and depression ⁸. Additionally, while research has shown that weight concerns and dietary restraint are already present during middle childhood ¹¹, it is unknown how early individual characteristics influence later dieting during adolescence.

While dieting is often assessed as a singular behavior, a wide range of weight control behaviors can be included in self-reports of dieting. It is unclear what weight control behaviors girls are using when they report dieting. Dieting is a multidimensional construct; not all dieters will use the same set of weight control behaviors. In fact, French and colleagues ⁹ established a comprehensive list of weight control behaviors, which includes both healthy (e.g. increased fruits and vegetables, increased exercise), and unhealthy (e.g. use of appetite suppressants, skipping meals) weight control behaviors. However, this information is lost when the data are collapsed into a dichotomous item (e.g. yes/no dieting). By collapsing the data into a dichotomous measure you lose variability, thereby obscuring or masking associations of different combinations of weight control behaviors with potential predictors or consequences. Given that that dieting is implicated as a causal factor for a

number of disorders (e.g. obesity and weight gain, eating disorders)^{2,3}, it is necessary to explore etiological factors that link dieting to these disorders. Therefore, it is essential to distinguish between weight control behaviors that are consistent with healthy weight management (e.g. increase fruits and vegetables) from those that may constitute subclinical disordered eating (e.g. use of unhealthy weight control behaviors such as laxative, diuretics, and appetite suppressants) in order to determine which types of dieters might be at risk.

By definition, dieting is intended to influence dietary intake; however, associations between reported dieting and dietary intake are mixed, in part due to the inconsistent classification of dieting. For example, results of research assessing whether self-reported dieters had different patterns of intake than self-reported non-dieters indicate that dieters consume less nutrient-dense food¹⁰, and have lower overall diet quality¹¹. In contrast, in another study where the researchers classified self-reported dieters into either moderate (use of a method other than vomiting or use of diet pills) or extreme dieters (use of vomiting or diet pills)¹², moderate dieters reported consuming more servings of fruits and vegetables and fewer servings of high fat foods than either non-dieters or extreme dieters. Taken together, this suggests that more work is needed to explore the influence of dieting on dietary intake, and warrants the examination of differences in dietary intake by patterns of weight control behavior.

Using girls' responses to French's list of weight control behaviors as items in latent class analysis (LCA) provides the opportunity to identify distinct groups of patterns of weight control behaviors that may differ in terms of the number and types of behaviors involved. These groups may also differ in the predictors of group membership and in both self-reported and weighed dietary intake. Taken together, this will help provide researchers

with insight into what behaviors adolescent girls are using to help control their weight, and what the consequences of those behaviors might be. While this technique has not yet been used to describe dieting behaviors in adolescents, it has been used to examine patterns and predictors of specific weight control behaviors in adult women^{13,14} using the French Weight Control Scale⁹. The present study has 3 aims: 1) to use LCA to identify distinct patterns of weight control behaviors among 15y girls; 2) to explore weight control group differences in antecedent (e.g. BMI at 5y, inhibitory control at 7y) and concurrent (e.g. BMI at 15y, dietary restraint at 15y) variables; and 3) to examine latent class group differences in self-reported dietary intake from three 24h multiple-pass dietary recalls, including the extent of under reporting, and weighed intake at standard lunch meal and in the eating in absence of hunger protocol (EAH), obtained in a laboratory setting.

METHODS

Participants

Participants at study entry included 197 non-Hispanic, white families living in Central Pennsylvania recruited as part of a longitudinal cohort study of the health and development of young girls with one of the primary aims to obtain descriptive data on what girls are doing when they report dieting. Eligibility criteria for girls' participation at recruitment included living with the biological mother and father, the absence of severe food allergies or chronic medical problems affecting food intake, and the absence of dietary restrictions involving animal products. The sample was not recruited based on weight status. Parents and their 5y old daughter (mean age: 5.4 ± 0.4 y) were recruited for participation into the study using flyers and newspaper advertisements. In addition, families with age-eligible female children within a five-county radius received mailings and follow-up phone calls (Metromail Inc.).

Families were assessed at age 5, (N=192) study entry baseline, and then assessed every 2 years at daughter ages 7 (N=192), 9 (N=183), 11 (N=177), 13 (N=168), and 15 (N=167). Attrition was primarily due to family relocation outside of the area. One girl had missing weight control behavior data at 15, and thus the final sample had 166 girls and their families.

At study entry, the mean family income was \$35,000-\$50,000. Parents were well educated; mothers' mean level of education was 14.5 ± 2.3 years (range: 12-20y), and fathers' mean level of education was 14.7 ± 2.5 years (range: 12-20y). Parents were, on average, slightly overweight when the girls were 5y old; their mean BMI [wt(kg)/ht(m)²] was 26.4 ± 6.1 for mothers and 28.1 ± 4.4 for fathers. Only mothers were measured for height and weight at daughter age 15, and their mean BMI had increased to 28.4 ± 6.5 . The Pennsylvania State University Institutional Review Board approved all study procedures, and parents provided consent for their family's participation before the study began.

Measures

Antecedent predictors were included at the first time point of measurement in the study (BMI, body satisfaction, and self-competence at 5, inhibitory control at 7, fear of fat of 9). Pubertal status was assessed at age 11, as the median age of the onset of breast development is 10 years old¹⁵, and thus this will be the first time point of measurement with variability. All concurrent predictors (BMI, body fat percentage, restraint, disinhibition, weight concerns, dieting risk, self-esteem, depression, binge eating, dieting frequency) and concurrent dietary intake variables (self-reported, lunch, EAH) were assessed at 15y. Cronbach's alpha was used to assess internal consistency for all subscales with more than 2 items.

Weight control behaviors for LCA (age 15)

Dieting behavior was examined at age 15 as specific weight control behaviors, assessed by responses to the question, “Have you ever done any of the follow things to lose weight or to keep from gaining weight?” In the current study, 20 weight control behaviors from the comprehensive list developed by French et al.⁹ were selected as potential items to be used in the LCA. Behaviors were coded as healthy or unhealthy using French’s classification of the behaviors⁹. In order to reduce sparseness in the observed data contingency table, which is particularly important with a sample of this small size, similar items (e.g. eliminate snacking and eliminate sweets and junk) were combined if their correlation was high (~0.70). Thus, the following items were combined into superordinate factors: i) eliminating snacking, sweets, and junk food; ii) reducing the amount of food consumed and calories eaten. Due to the low prevalence (14%) of using at least one unhealthy strategies in the current sample, the unhealthy weight control behaviors (use of laxatives/enemas, diuretics, diet pills, or appetite suppressants, smoking cigarettes, or vomiting) were combined into a superordinate factor. Response options for each behavior were: never, rarely, sometimes, often, and always. Dichotomous indicators of each weight-control behavior were created for use in LCA models for this study: coded two (yes) if they engaged in healthy behaviors “sometimes” or more often and in unhealthy behaviors “rarely” or more often. To compare responses between use of weight control behaviors and reports of dieting, girls were also asked, “Have you ever dieted?”

Anthropometric measurement predictors

Height and weight were measured in triplicate when girls were 5 years old and 15 years old and were used to compute BMI scores. BMI percentiles were calculated using the

2000 CDC Growth Charts; overweight was defined as a BMI > 85th percentile on the basis of a standardized reference criteria ¹⁶. Pubertal status via breast development was measured at age 11 through visual inspection by a nurse who was trained by Dr. Herman-Giddens using the published training manual ¹⁷. Ratings were obtained for each breast on a scale of 1-5 (1=no development, 5= mature) using the Tanner rating system ¹⁸, and averaged together to create a mean pubertal status score.

Psychological well-being predictors

Children's perceived self-competence was measured at 5 years using The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children for 4-5 year olds ¹⁹. General competence is the mean of cognitive competence and physical competence. Self-esteem was measured at 15 years using a 10-item scale developed by Rosenberg ²⁰ and modified by O'Brien ²¹ designed to measure global self-esteem. Depression was measured at 15 years using the Center for Epidemiological Studies Depression Scale (CED-D) developed by Radloff ²². It is a 20-item self-report questionnaire. Good internal consistency was observed ($\alpha \geq 0.78$) for all psychological well-being predictors.

Temperament predictor

Girls' inhibitory control was assessed at 7 years by using the parent version of the Children's Behavior Questionnaire's Inhibitory Control subscale ²³. Inhibitory control is defined as the ability to restrain a dominant response and instead perform a subdominant response. Good internal consistency was observed for inhibitory control ($\alpha = 0.74$).

Eating and weight-related characteristics

Children's body satisfaction at 5 years was measured using an amended Body Satisfaction Scale ²⁴. The Body Satisfaction Scale originally consisted of a list of 16 body

parts, half involving the head and the other half involving the body. The amended version contains an additional 10 items concerning various body parts and reduced the response set to: “too little,” “too big,” “just right.” Fear of fat in children was assessed at 9 years using the personal fear of fat scale (5 items) on the Fear of Becoming Fat ²⁵. Dietary restraint and disinhibition were measured at 15 years using the original Dutch Eating Behavior Questionnaire (DEBQ). ²⁶ For this study, overall total disinhibition, defined as the sum of external and emotional disinhibition, was used as the measure of disinhibition. Weight concerns at 15 years were measured using the Weight Concerns scale ²⁷. Dieting risk at 15 years was assessed using the dieting subscale on the Eating Attitudes Test (EAT-26), the summarized version of the EAT-40 ²⁸. A higher dieting risk score indicates increased dieting behaviors and practices, concern about weight, and food avoidance. Binge eating at 15 years was assessed using the Binge Eating Scale ²⁹, designed to assess the behavioral aspects of binge eating episodes as well as the feelings and thoughts associated with this behavior. Good internal consistency was observed for all eating and weight-related characteristics (all $\alpha \geq 0.74$). Dieting frequency was assessed at 15 years by a one-item measure, “During the past year, how often did you diet (by diet, we mean changing the way you eat to control your weight)?” Response options were: never, less than once a month, 1 to 3 a month, 2 to 6 times per week, and every day.

Dietary intake

All dietary intake data was collected when girls were 15 years old. Girls’ self-reported intakes were measured using three 24-h recalls, 2 weekdays and 1 weekend day, randomly selected over a 2-wk period. Interviews were conducted by trained staff using computer-assisted Nutrition Data System for research (NDS-R, Nutrition Coordinating

Center, University of Minnesota, Minneapolis, MN). Nutrient data were averaged across three days to obtain an estimate of energy and nutrient intakes and are based on food only. Physiologically plausible reports of energy intake were determined by comparing reported energy intake with predicted energy requirements using procedures outlined by Huang et al.³⁰ A detailed description of this procedure is described elsewhere³⁰. Briefly, sex- and age-specific standard deviation (SD) cutoffs were created for reported energy intake as a percent of predicted energy requirement³¹. A reporter was considered plausible if reported energy intake as a percent of predicted energy requirements was within the ± 1 SD cutoff (at 15y). Those with values exceeding the upper bounds were categorized as “over-reporters,” and those with values below the lower cutoff value were categorized as “under-reporters.”

Weighed intake was measured in the laboratory for both a standardized lunch and the Eating in the Absence of Hunger (EAH) protocol. For lunch, each girl was given a 12 inch (580 kcal) Subway sandwich (choice of turkey, ham, or cheese), a Subway mustard packet, a Subway mayonnaise packet (35 kcal), a 12 oz can of Minute Maid Lemonade (150 kcal), a Rice Krispies Treat (90 kcal), and 1.5 oz. (160 kcal) bag of Snyder’s of Hanover pretzels, for a total of 1,015 kcal. The EAH protocol was developed to measure children’s snack food consumption in the presence of palatable foods while in the absence of hunger³².

Approximately 70 min after lunch, each girl was given a preload of a Dannon Frusion yogurt smoothie (260 kcal). Approximately 20 min following the preload, girls were presented with generous portions of 5 snack foods: 75g (375 kcal) of Frito Lay Nacho Cheese Doritos, 84g (480 kcal) of Pringles potato chips, 112g (520 kcal) of Nabisco Nutter Butter Sandwich Cookies, 96g (495 kcal) of Keebler Fudge Shoppe Stripe Cookies, and 65g (365 kcal) of

Hershey's Milk Chocolate Nuggets, and were asked to rate their preference and liking of each food. Each girl was offered a total of 2,235 kcal.

Statistical analyses

All data analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC). Descriptive statistics were computed for all predictor and all dietary variables. Chi-square was used to examine differences in weight status and plausibility of reporting by weight control group. Statistical significance was defined as $p \leq 0.05$.

Latent class analysis (LCA) is a person-centered measurement method used to identify an underlying latent grouping variable that is not observed but can be inferred from a set of measured indicators, individual weight control behaviors assessed at age 15 in this case. A detailed description of this procedure is described elsewhere³³. Parameters estimated in LCA include class membership probabilities, defined as the proportion of a population expected to belong to each latent class and sum to one, and item-response probabilities, defined as the probability of endorsing each item given class membership³³. Probabilities of items close to one indicate that the item is characteristic of membership in that latent class and that those in that latent class are likely to have tried it as a weight control behavior. Probabilities of items close to zero indicate that individuals in that latent class are not likely to have tried the behavior. In order to reduce sparseness in the observed data contingency table, which is particularly important with a sample of this small size, the following items were combined into superordinate factors: i) eliminating snacking, sweets, and junk food; ii) reducing the amount of food consumed and calories eaten; iii) use of an unhealthy behavior (laxatives/enemas, diuretics, diet pills, or appetite suppressants, smoking cigarettes, or vomiting). Items that did not discriminate among groups (e.g. eat a low carbohydrate diet,

join diet centers, join weight loss groups) were not included in the final models. Thus, from the original set of 20 weight control behaviors, a final set of 9 weight control behaviors was selected for use in the latent class models.

The final latent class model was identified by comparing latent class models with one to five latent classes to select the model with the optimal fit and best model interpretation using criterion specified by Lanza et al.³³ Based on the Akaike's Information Criterion (660 for the model with one class, 245 for two, 219 for three, 204 for four, and 212 for five), the Bayesian Information Criterion (688 for the model with one class, 304 with two, 309 with three, 325 with four, and 365 with five), entropy (1.00 for the model with one class, 0.93 for two, 0.83 for three, 0.86 for four, and 0.82 for five), and the G^2 fit statistic (642 for the model with one class, 207 with two, 161 with three, 126 with four, and 114 with five), the four-class model was identified as the best fitting model. The average posterior probabilities for the four classes were: 0.98, 0.88, 0.93, and 0.91.

After the four-class model was identified, the next step was to explore differences between the four weight control groups on a number of individual concurrent (e.g. BMI at 15) and antecedent (e.g. BMI at 5) characteristics. This was first done directly in the LCA model to help maximize power. Each variable was included separately in the latent class model to examine the estimation of odds ratios that describe the increase in odds of membership in a particular latent class relative to a reference class corresponding to a one-unit change in the variable. In order to aid with the interpretability of the data, differences among weight control behavior groups on individual variables were also tested using ANOVA with Tukey's honestly significant difference post hoc tests. In order to examine this outside the LCA model, each girl was assigned to the latent weight control group

corresponding to her maximum posterior probability of membership using the classify-analyze approach described by Bray et al.³⁴. Self-reported and lunch intake data were adjusted for girls' estimated energy requirement (EER) to adjust for differences in energy needs based on height and weight.

Results

Four class model of weight control behaviors

As shown in **Table 3.1**, twenty-six percent of the sample was predicted to belong in latent class 1. This group was named the “Non-dieters” group as it is characterized by a low probability of endorsing all of the 9 weight control behaviors. Three “dieting” weight control groups were identified, and varied in the number and type of weight control behaviors they endorsed. Sixteen percent of the sample was predicted to belong to latent class 2, and is named the “Lifestyle” group since it is characterized by a high probability of reporting increasing exercise and eating more fruits and vegetables for weight control, both health-promoting lifestyle changes. Forty-three percent of the sample was predicted to belong to latent class 3, named the “Dieters” group since it is characterized by a high probability of reporting increasing exercise, increasing fruits and vegetables, eating less fat, eliminate snacks, sweets, and junk, reducing calories and amount of food, and eating low calorie food; behaviors that are all consistent with dieting. Fifteen percent of the sample was predicted to belong to latent class 4. This group is named the “Extreme Dieters” group, and is characterized by a high probability of having used all 9 weight control strategies, including over 50% of the class expected to report using at least one unhealthy strategy. **Figure 3.1** depicts the item-response probabilities for each of the weight control groups.

For comparison, 21% of the Non-dieters responded “yes” to having ever dieted. Of

the Lifestyle group, 65% responded “yes” to having ever dieted. Of the Dieters, 86% responded “yes” to having ever dieted. Of the Extreme Dieters, 95% responded “yes” to having ever dieted.

Antecedent characteristics predicting latent class membership

As shown in **Table 3.2**, BMI at 5y, fear of fat at 9y, and pubertal development at 11y were all significant predictors of weight control behavior group membership at 15y, and inhibitory control at 7y was a marginally significant predictor of group membership at 15y. To provide additional information to help with interpretation of the weight control groups, mean values for the antecedent predictor variables are shown by weight control group in **Table 3.3**.

Girls in the Extreme Dieters group had higher BMI percentiles at 5y and lower levels of inhibitory control at 7y than girls in the other three groups, and had higher fear of fat at 9y than girls in the Lifestyle or Non-dieters groups. With every one-point decrease in inhibitory control, girls were twice as likely to be in the Extreme Dieters group than to be in the Non-dieters group, and girls in the Extreme Dieters group had significantly lower inhibitory control at 7y than girls in the other three groups. Similarly, with every one-point increase in BMI at 5y, girls were 1.5 times more likely to be in the Extreme Dieters group than to be in the Non-dieters group, and girls in the Extreme Dieters group had significantly higher BMIs at 5y than girls in the other three groups. The proportion of girls classified as normal weight vs. overweight at 5y differed by group membership ($p < .05$). At 5y, 12% of Non-dieters were overweight or obese, 8 % of the Lifestyle group were overweight or obese, 20 % of Dieters were overweight or obese, and 38 % of Extreme Dieters were overweight or obese.

Concurrent characteristics predicting latent class membership

As shown in **Table 3.4**, all concurrent covariates, measured at 15y, were significant predictors of weight control group membership. Percent body fat, restraint, weight concerns, self-esteem, depression, binge eating, and dieting frequency independently predicted membership in all three dieting groups (Lifestyle, Dieters, Extreme Dieters) relative to the Non-dieters group. Using percent body fat as an example, with every one-point unit increase in percent body fat, girls were 1.09 times more likely to be in the Lifestyle group, 1.12 times more likely to be in the Dieters group, and 1.24 times more likely to be in the Extreme Dieters group than to be in the Non-dieters.

To provide additional information to aid in interpretation of the weight control groups, mean values for the concurrent predictor variables are shown by weight control group in Table 5. Levels of restraint, weight concerns, and self-reported dieting frequency increased on an ordinal scale across groups, from Non-dieters to Extreme Dieters. As shown in **Table 3.5**, girls in the Extreme Dieters group had significantly higher values for all of the measured covariates (with the exception of self-esteem which was significantly lower) than girls in the other 3 groups; girls in the Dieters group had higher values than girls in Lifestyle or Non-dieters on disinhibition, depression, dieting risk, and had lower self-esteem.

The proportion of girls classified as normal weight vs. overweight/obese at 15y differed by group membership ($p < .001$); 17% of Non-dieters were overweight/obese, 8 % of the Lifestyle group were overweight/obese, 16 % of Dieters were overweight/obese, and 56 % of Extreme Dieters were overweight/obese.

Concurrent weight control group differences in dietary intake

Mean self-reported intake is shown by weight control group in **Figure 3.2a**. Self-

reported intake based on 3 24h recalls differed by weight control group ($p < 0.0001$). Girls in the Extreme group reported that they consumed significantly fewer calories than girls in the other weight control groups ($p < .05$); these girls reported an average of 1263 ± 405 calories per day, compared to 1668 ± 395 , 1789 ± 325 , and 1553 ± 401 calories by girls in the Non-dieters, Lifestyle, and Dieters groups, respectively. The plausibility of reporting of self-reported intake also differed by group membership ($p < .05$). In the Non-dieters group, 60% were identified as under-reporters, 38% as plausible reporters, and 2% as over-reporters. In the Lifestyle group, 58% were identified as under-reporters, 38% as plausible reporters, and 4% as over-reporters. In the Dieters group, 75% were identified as under-reporters, 22% as plausible reporters, and 3% as over-reporters. In the Extreme Dieters group, 96% were identified as under-reporters and 4% as plausible reporters.

In contrast, as shown in **Figure 3.2b**, the weighed intake data obtained at the standardized lunch consumed in the laboratory revealed a very different pattern of findings. Overall, the groups differed in their lunch intake ($p < 0.01$); girls in the Non-dieters, Lifestyle, Dieters, and Extreme Dieters groups consumed 603 ± 186 , 661 ± 148 , 606 ± 140 , and 721 ± 171 calories, respectively. Girls in the Extreme Dieters group consumed significantly more calories than girls in the Non-dieters and Dieters groups ($p < .05$). A similar pattern emerged in the EAH protocol ($p < 0.05$); girls in the Non-dieters, Lifestyle, Dieters, and Extreme Dieters groups consumed 247 ± 86 , 269 ± 86 , 291 ± 109 , and 335 ± 164 calories, respectively. Girls in the Extreme Dieters group consumed more calories in EAH than girls in Non-dieters or Lifestyle groups ($p < 0.05$), and marginally significantly more than girls in the Dieters ($p < .10$). When total weighed intake in the laboratory was examined as a combination of lunch and EAH, girls in the Extreme Dieters group consumed significantly

more (1049 ± 306) calories than girls in the other three groups (850 ± 230 , 909 ± 179 and 908 ± 211 for girls in the Non-dieters, Lifestyle, and Dieters, respectively).

DISCUSSION

These findings underscore the view that dieting is not a singular behavior; but is an umbrella term for a wide range of both healthy and unhealthy weight control behaviors. The results revealed four groups using distinct patterns of weight control behaviors in the current sample of adolescent girls: Non-dieters, and three groups of self-reported dieters, Lifestyle, Dieters, and Extreme Dieters. The dieting groups increase in the number and severity of reported weight control behaviors from Lifestyle to Extreme Dieters. These groups were also qualitatively different on a number of psychosocial and weight characteristics, with levels of dietary restraint, weight concerns, and self-reported dieting frequency increasing across groups, from non-dieters to Extreme Dieters. Results from the current study expand on the literature using LCA to identify patterns of weight control behaviors in women^{13,14} to a sample of adolescent females. These findings are similar to those obtained with the women, with appropriate differences noted due to the discrepancy in developmental stage, such as the absence of use of decreased alcohol as a weight control behavior. Risk factors for membership in the Extreme Dieters group were noted as early as 5y; with every one-point decrease in inhibitory control, girls were twice as likely to be in the Extreme Dieters group than to be in the Non-dieters group, and with every one-point increase in BMI, girls were 1.5 times more likely to be in the Extreme Dieters group than to be in the Non-dieters group. Girls in the Extreme Dieters group were more likely to be under-reporters, and had lowest self-reported intake, but ate significantly more in the laboratory.

Predictors of dieting group membership were apparent as early as age 5. This is

consistent with previous work indicating that early overweight status is a risk factor for later weight concerns and eating pathology. It was shown in prior work in this sample that the girls who were overweight at 5y had higher levels of disinhibited eating, dietary restraint, weight concern, body dissatisfaction³⁵, and dieting at 9y⁷, which puts them at risk for continued overweight and dieting attempts, as seen in the current study. The current findings add to the literature that weight status at 5y also predicts an increased frequency of self-reported dieting and use of unhealthy weight control behaviors at 15y. While inhibitory control increases from middle childhood to adolescence³⁶, rank-order differences in inhibitory control are relatively stable over time³⁷. Inhibitory control is an important factor in dieting success³⁸ and in early weight gain³⁹. Thus, it is possible that initial attempts to control weight might not be successful for girls with low inhibitory control and thus they turn to the more unhealthy weight control behaviors in their later attempts. While the results from the current study indicate this as possibility, future work is needed to confirm this finding. These findings suggest opportunities for early intervention in the areas of self-regulation and weight management to prevent the later use of unhealthy weight control behaviors.

All of the concurrent descriptive variables were significant predictors of group membership, with self-reported dieting frequency, restraint, and weight concerns increasing on an ordinal scale across groups, from non-dieters to Extreme Dieters. The relationship between weight concerns and group membership is consistent with past findings that weight concerns are one of the strongest correlates of dieting and weight control practices among adolescents and adults^{27,40}. The current study adds that greater weight concerns are related to the use of an increased number of and more unhealthy weight control behaviors. The increase in percent overweight and body fat at 15y across the groups is consistent with previous

research that adolescents who are overweight and obese more likely to diet ⁶ and use unhealthy weight control behaviors ⁴⁰. Girls in the Extreme Dieters group have the lowest inhibitory control and greatest disinhibition, which may make it harder for these girls to sustain both healthy and unhealthy weight control behaviors, and may lead to loss of control and subsequent weight gain ⁴¹.

Psychological well-being, examined in the current study as both decreased self-esteem and increased depression, decreased on an ordinal scale across the three dieting groups, from Lifestyle to Extreme Dieters. This is consistent with previous findings that both self-esteem ⁴² and depression ⁸ are associated with dieting, disordered eating and the use of unhealthy weight control behaviors ⁴³ in children and adolescents, and suggests that successful weight control interventions might include treatment for depression. Dieting and disordered eating persists and increase ⁴⁴ into young adulthood, suggesting that the girls in the study who are using unhealthy weight control behaviors at 15y will continue to do so. This is a problem because the use of unhealthy weight control behaviors increases the risk for disordered eating and clinical eating disorders ³, could inhibit proper growth and development ⁴⁵, and many of the unhealthy weight control behaviors, such as smoking, increase health risks in other domains ⁴⁶.

Examining associations between dieting and measures of food intake such as self-reported intake and the EAH protocol provides an opportunity to look at possible consequences of dieting on food intake. Weight control group differences for self-reported intake and weighed intake measures show strikingly different patterns. Previous associations between reported dieting and nutrient intake have been mixed, likely due to differences in dietary assessment (e.g., food frequency questionnaires vs. dietary recall) and inconsistent

categorization (e.g., yes/no dieting vs. specific weight control behaviors) of dieting and weight control behaviors^{10,11}. A comparison of self-reported intake from dietary recalls across groups shows that girls in the Extreme Dieters group are, on average, consuming the fewest calories, which is consistent with their greatest frequency of dieting attempts. However, weighed intake in the laboratory indicates that girls in the Extreme Dieters group are actually eating significantly more. This suggests that the group differences in self-reported intake may reflect differences in the extent to which girls are underreporting, which is reflected in differences of plausible reporters, and might not accurately reflect differences in actual intake.

Extreme Dieters had the highest average BMI percentile, the greatest levels of restraint, and most were classified as under-reporters. This is consistent with previous research, given that increased weight status is one of the strongest predictors of underreporting in children⁴⁷, and research indicates that those high in restraint are more likely to underreport their intake⁴⁸. Dietary restraint reflects a cognitive desire and intent to restrict intake⁴⁹. Thus, particularly in those who are overweight and high in restraint, self-reported intake might reflect intended, but not actual, intake. Girls in the Extreme Dieters group might have a greater tendency to underreport their intake given their higher levels of restraint and increased weight status, but have greater reactivity and actually consume the most calories when presented with food. To the extent that their intakes in the laboratory are more indicative of their daily intakes than their self-reports are, it is not surprising that girls in the Extreme Dieters group have higher BMIs and a higher body fat percentage than girls in the other three groups.

The current study is not without limitations. The current sample was homogenous – white adolescent females from middle-class families, and thus the results may not generalize to other populations. Additionally, much of the data, including the use of specific weight control practices, is self-reported data, which might have resulted in reporting and social desirability bias. However, this is a limitation of the field as a whole, and future research should focus on developing tools that assess weight control behavior, etc. that do not rely on self-report. Another limitation is that due to the exploratory nature of this paper, weight control behavior was assessed at only one time point. Future work should assess weight control behavior at repeated time points to capture the dynamic nature of weight control behavior.

In conclusion, findings from the current study advance our understanding of what weight control behaviors adolescent girls use when they diet. The current study found that there were three combinations of self-reported “dieting” in 15y girls, increasing in the number of reported weight control behaviors used and distinct in antecedent and concurrent descriptive characteristics, the majority of which increased pursuant to the dieting groups. Early weight status and inhibitory control were identified as early risk factors for membership in the Extreme Dieters group at 15y. Analysis of the dietary data supports the theory that under reporting in those high in restraint reflects intended restriction, not actual restricted intake ⁴⁹.

Future work should focus on using this information to help target interventions for girls who have early risk factors for membership in the Extreme Dieters group to help reduce the later use of unhealthy weight control behaviors. For adolescent girls who would benefit from weight reduction or maintenance, physicians should emphasize the use of health-

promoting weight control behaviors, such as increasing fruit and vegetable consumption and decreasing high energy-dense food, which have been shown to moderate weight gain overtime in adults ¹⁴, and may also help moderate weight gain in adolescents.

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Table 3.1 Probability of girls reporting using each weight-control behavior given latent class membership

	Latent class			
	Non-dieters (26%)	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
<u>Weight control behavior</u>				
Increase exercise (72%) ¹	0.26	0.69	0.98	0.84
Eat more fruits and vegetables (67%)	0.03	0.94	0.85	1.00
Eat less fat (60%)	0.02	0.34	0.90	1.00
Eliminate snacking, sweets, and junk (63%)	0.01	0.47	0.93	0.99
Reduce calories and amount of food (57%)	0.09	0.15	0.87	0.97
Eat low calorie food (42%)	0.02	0.11	0.62	0.83
Eat less meat (19%)	0.05	0.00	0.08	0.90
Skip meals (42%)	0.12	0.03	0.54	0.94
Unhealthy behavior (14%)	0.02	0.00	0.11	0.54

Unhealthy behavior refers to use of laxatives/enemas, diuretics, diet pills, or appetite suppressants, smoking cigarettes, or vomiting

¹ Percent of total sample reporting use of each weight control behavior

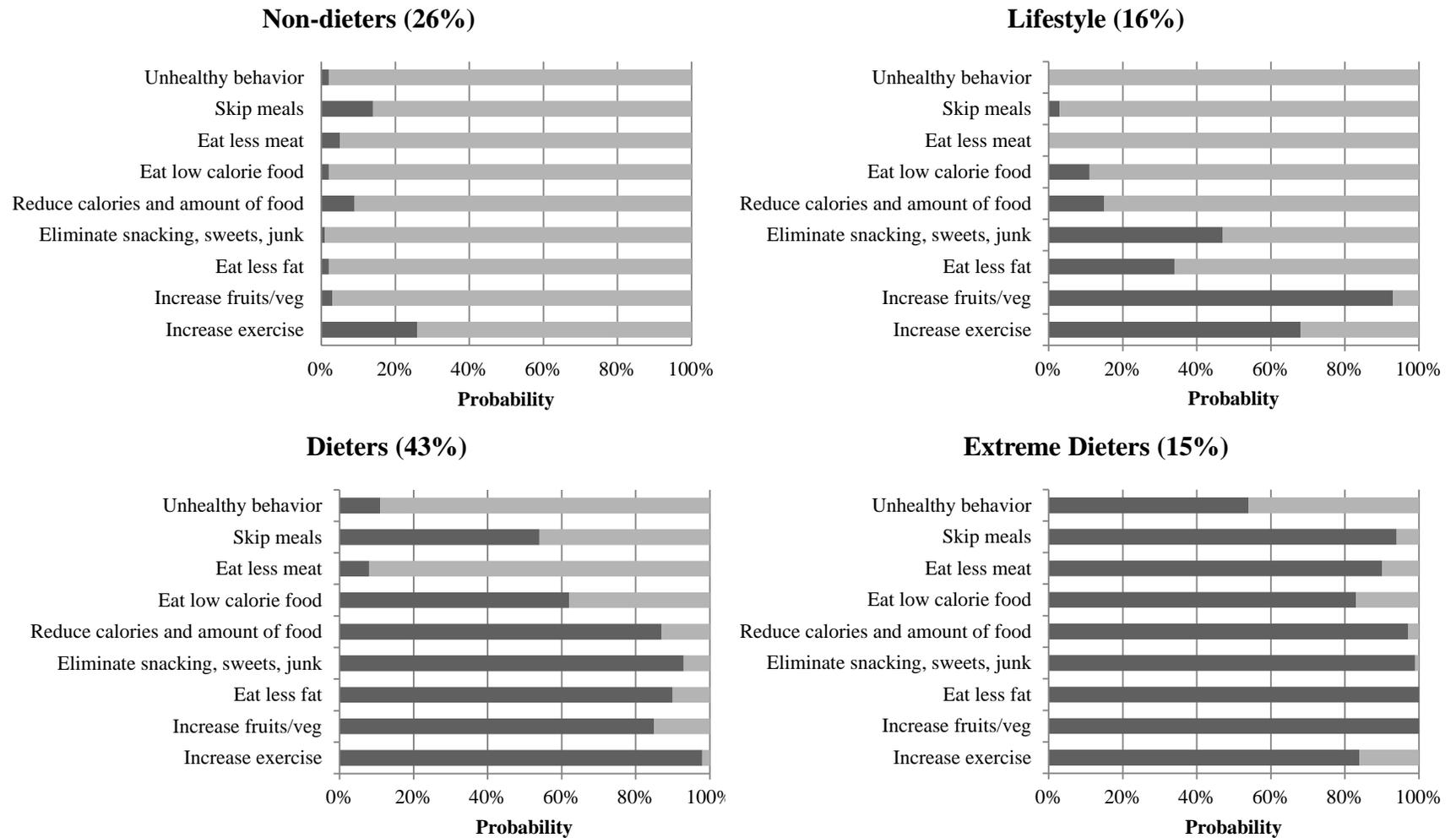


Figure 3.1 Probability of reporting each weight-control behavior, conditional on membership in weight control group (N=166)

Table 3.2 Odds ratios for individual effects of antecedent predictors of membership in the 3 dieting groups relative to the Non-dieters group

	P value	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
BMI (5y)	***	1.05 (0.81, 1.36)	1.12 (0.92, 1.37)	1.51 (1.20, 1.90)
Self-competence (5y) ¹	NS	0.89 (0.54, 1.47)	1.09 (0.73, 1.63)	0.71 (0.45, 1.12)
Body satisfaction (5y) ²	NS	1.24 (0.36, 4.23)	0.86 (0.37, 2.01)	0.47 (0.17, 1.30)
Inhibitory control (7y) ³	*	1.21 (0.67, 2.21)	1.19 (0.76, 1.86)	0.53 (0.31, 0.91)
Fear of fat (9y) ⁴	***	1.57 (0.60, 4.08)	3.60 (1.72, 7.52)	4.66 (2.10, 10.35)
Pubertal status (11y) ⁵	**	1.81 (0.82, 3.98)	2.12 (0.99, 3.85)	3.26 (1.49, 7.13)

Non-dieters group was used as reference class. Predictors entered in separate logit models. Reference latent class has odds of ratio 1.0. Increase in log-odds of membership in latent class relative to membership in reference class corresponding to one-unit change in predictor.

*P < 0.10, **P < 0.05, ***P < 0.01, ****P < .0001

¹Measured using The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children

²Measured using an amended Body Satisfaction Scale

³Measured using mothers' reports on CBQ

⁴Measured using Fear of Fat Scale

⁵Measured using tanner staging of breast development at 11y

Table 3.3 Descriptive characteristics for antecedent covariates for the weight control behavior groups

	Latent Class			
	Non-dieters (26%)	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
BMI percentile (5y) ¹	55.2 (24.3) ^a	56.4 (22.1) ^a	58.5 (29.4) ^a	74.3 (22.6) ^b
Self-competence (5y) ²	7.0 (0.7) ^{ab}	6.9 (1.0) ^{ab}	7.1 (0.7) ^a	6.7 (1.3) ^b
Body satisfaction (5y) ³	2.7 (0.5) ^a	2.7 (0.3) ^a	2.6 (0.5) ^a	2.5 (0.4) ^a
Inhibitory control (7y) ⁴	5.0 (0.9) ^a	5.2 (0.6) ^a	5.1 (0.7) ^a	4.6 (0.8) ^b
Fear of fat (9y) ⁵	1.3 (0.5) ^a	1.4 (0.5) ^a	1.8 (0.7) ^b	2.0 (1.0) ^b
Pubertal status (11y) ⁶	1.9 (0.6) ^a	2.3 (0.8) ^b	2.3 (0.8) ^b	2.6 (0.8) ^b

Means sharing the same superscript are not significantly different from each other (P<0.05).

¹While BMI was included as a covariate, data are shown here as BMI percentiles to aid in interpretation.

²Measured using The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children; range 1(low) to 8(high)

³Measured using an amended Body Satisfaction Scale; range 1(low) to 3(high)

⁴Measured using mothers' reports on CBQ; range 1(low) to 7 (high)

⁵Measured using Fear of Fat Scale; range 1(low) to 4(high)

⁶Measured using tanner staging of breast development at 11y; range 1(low) to 5(high)

Table 3.4 Odds ratios for individual effects of concurrent predictors on membership in the 3 dieting groups relative to the Non-dieters group

	P value	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
BMI	****	0.97 (.86, 1.10)	1.09 (1.01, 1.18)	1.27 (1.14, 1.39)
Body fat % ¹	****	1.09 (1.01, 1.17)	1.12 (1.06, 1.19)	1.24 (1.14, 1.34)
Restraint ²	****	4.53 (1.47, 13.95)	27.22 (9.39, 78.88)	129.87 (35.41, 476.28)
Disinhibition ³	****	0.67 (0.30, 1.50)	2.41 (1.37, 4.26)	4.59 (2.35, 8.97)
Weight concerns ⁴	****	6.37 (1.89, 21.44)	23.55 (6.85, 80.88)	156.91 (34.61, 711.28)
Dieting risk ⁵	****	1.05 (0.62, 1.79)	1.68 (1.17, 2.40)	2.73 (1.84, 4.06)
Self-esteem ⁶	****	0.89 (0.77, 1.01)	0.79 (0.70, 0.88)	0.68 (0.59, 0.78)
Depression ⁷	****	1.08 (1.01, 1.16)	1.13 (1.06, 1.20)	1.21 (1.13, 1.30)
Binge eating ⁸	****	1.09 (0.97, 1.21)	1.18 (1.08, 1.29)	1.36 (1.23, 1.51)
Dieting frequency ⁹	****	5.00 (1.45, 17.26)	8.62 (2.68, 27.72)	12.64 (3.78, 42.40)

Non-dieters as reference class. Reference latent class has odds of ratio 1.0. Predictors entered in separate logit models. *P < 0.10, **P < 0.05, ***P < 0.01, ****P < .0001

¹Body fat percentage was measured using Dual-energy X-Ray absorptiometry (DXA).

²Measured using the restraint subscale from the DEBQ

³Measured using the disinhibition subscale from the DEBQ)

⁴Measured using the Weight Concerns Scale

⁵Measured using the Dieting subscale on the EAT

⁶Measured using the Rosenberg Self-Esteem Scale

⁷Measured using the CES-D

⁸Measured using the Binge Eating Scale

⁹Dieting frequency is self-reported, measured as the frequency of dieting during the past year.

Table 3.5 Descriptive characteristics and concurrent (15y) covariates for the weight control behavior groups

	Latent Class			
	Non-dieters (26%)	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
BMI percentile ¹	55.5 (28.2) ^a	52.1 (21.9) ^a	63.1 (22.4) ^b	81.2 (17.9) ^c
Body fat % ²	24.6 (6.0) ^a	26.9 (5.0) ^{ab}	28.4 (5.0) ^b	32.5 (6.2) ^c
Restraint ³	1.3 (0.4) ^a	1.7 (0.5) ^b	2.6 (0.6) ^c	3.4 (0.7) ^d
Disinhibition ⁴	2.1 (0.6) ^a	1.9 (0.5) ^a	2.5 (0.6) ^b	2.8 (0.7) ^c
Weight concerns ⁵	0.4 (0.5) ^a	1.0 (0.4) ^b	1.5 (0.7) ^c	2.5 (0.7) ^d
Dieting risk ⁶	0.3 (0.8) ^a	0.2 (0.7) ^a	1.3 (1.8) ^b	6.1 (3.9) ^c
Self-esteem ⁷	36.8 (3.5) ^c	34.9 (3.5) ^c	32.2 (4.9) ^b	26.8 (6.0) ^a
Depression ⁸	6.5 (5.9) ^a	9.8 (6.5) ^a	14.1 (8.1) ^b	22.2 (12.9) ^c
Binge eating ⁹	4.4 (3.8) ^a	6.3 (4.4) ^{ab}	8.3 (5.4) ^b	18.8 (8.9) ^c
Dieting frequency ¹⁰	1.1(0.3) ^a	1.6 (1.1) ^b	2.1 (1.1) ^c	2.6 (1.2) ^d

Means sharing the same superscript are not significantly different from each other ($P < 0.05$).

¹While BMI was included as a covariate, data are shown here as BMI percentiles to aid in interpretation.

²Body fat percentage was measured using Dual-energy X-Ray absorptiometry (DXA).

³Measured using the restraint subscale from the DEBQ; range 1(low) to 5(high)

⁴Measured using the disinhibition subscale from the DEBQ; range 1(low) to 5(high)

⁵Measured using the Weight Concerns Scale; range 0(low) to 5(high)

⁶Measured using the Dieting subscale on the EAT; range 0(low) to 27(high)

⁷Measured using the Rosenberg Self-Esteem Scale; range 10(low) to 40 (high)

⁸Measured using the CES-D; range 0 (low) to 60 (high)

⁹Measured using the Binge Eating Scale; range 0(low) to 46 (high)

¹⁰Dieting frequency is self-reported, measured as the frequency of dieting from never (1) to everyday (5) during the past year.

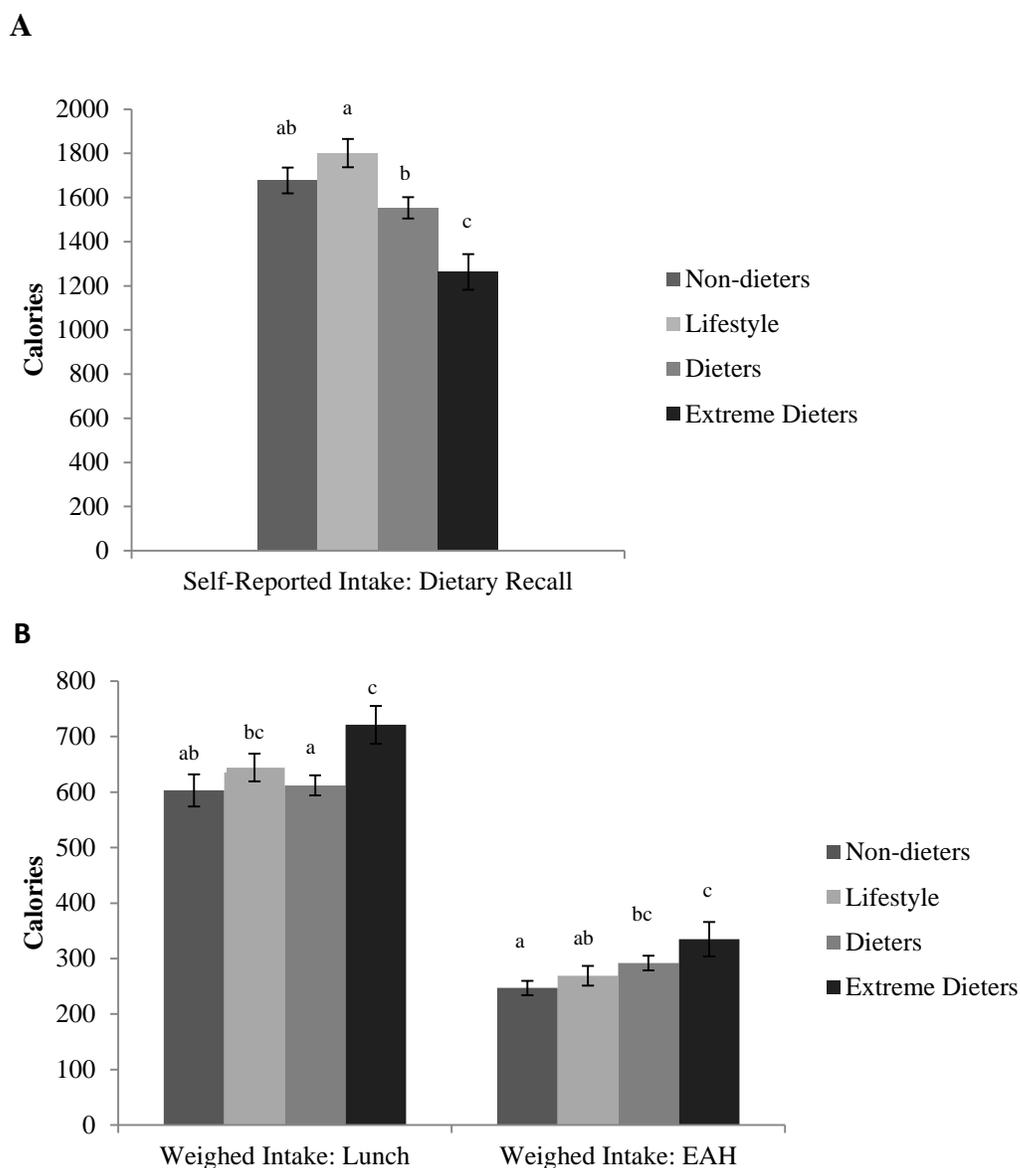


Figure 3.2

Self-reported intake based on 3 24h multiple-pass dietary recalls. Percent underreporting differed by group (61% for Non-dieters, 58% for Lifestyle, 75% for Dieters, and 96% for Extreme Dieters). 1,015 kcal were offered at the lunch, and 2,235 kcal were offered during the Eating in Absence of Hunger (EAH) paradigm. Data are shown as means plus standard error. Self-reported and lunch intakes were adjusted for EER. Means sharing the same superscript are not significantly different from each other ($P < 0.05$).

CHAPTER 4

Family, friend, and media factors predict differences in patterns of weight control behavior
among adolescent girls

ABSTRACT

Purpose: To examine the influence of familial, friends and media factors on weight control group membership at 15y both separately and in a combined model.

Methods: Subjects included 166 15y girls and their mother and father. Latent class analysis identified four patterns of weight control behaviors: Non-dieters, Lifestyle, Dieters, Extreme Dieters. Family (family functioning, priority of the family meals, maternal/paternal weight-teasing, mother's/father's dieting), friend (weight-teasing, dieting), and media variables (media sensitivity, weekly TV time) were included as predictors of weight control group membership.

Results: Family functioning, priority of family meals, and maternal weight-teasing were significant family predictors of weight-control group membership. Friend's dieting and weight-teasing were significant friend predictors of weight-control group membership. Media sensitivity was a significant media predictor of weight-control group membership. In a combined influence model with family, friend, and media factors included, family functioning, friends' dieting, and media sensitivity remained significant predictors of weight control group membership.

Conclusions: Family, friends, and the media are three sources of sociocultural influence that play a role in adolescent girls' use of patterns of weight control behaviors. These findings emphasize the need for multidimensional interventions, addressing risk factors for dieting and use of unhealthy weight control behaviors at the family, peer, and community (e.g. media) levels.

Keywords: Family, friends, media, dieting, weight control

Introduction

Dieting to lose or maintain weight is common among adolescents; recent national data indicate that roughly two-thirds of adolescent girls report trying to lose weight [1]. However, self-reported dieting in adolescents is related to increased sexual activity, increased drug, tobacco, and alcohol use [2], and may increase risk for the development of disordered eating [3], weight gain [4], and depression [5]. A methodological limitation of the dieting literature is that dieting is often assessed as a dichotomous variable, which may obscure qualitative differences in weight control behaviors included in self-reports of dieting [6]. Latent class analysis of data for the endorsement of weight control behaviors [6] have revealed differences among self-reported dieters in the patterns of weight control behaviors they endorsed [7-9]. Among a sample of adolescent girls, LCA results revealed that in addition to a group of non-dieters, who did not report engaging in any weight control behaviors, there were three qualitatively distinct patterns of self-reported dieting: two groups whose behaviors included those consistent with dietary guidance for healthy weight control (e.g. increase fruits and vegetables), with only one of the two groups endorsing reduction behaviors (e.g. reduce snacking, sweets, junk), and a third group who also reported using at least one unhealthy behavior (e.g. laxatives, appetite suppressants) [7]. These three classes of dieters also differed in a number of individual characteristics, including BMI, weight concerns, self-esteem, depression, and disinhibition. However, it is unclear how various sociocultural factors may relate to these different patterns of weight control behavior.

In addition to individual characteristics associated with adolescent dieting behavior [7], Stice et al. [10] have proposed that there are three primary sources of sociocultural influences on adolescent weight concerns and dieting behavior: family, peers, and the media.

The thin ideal is ubiquitous in the mainstream media, reinforcing the normative discontent that many adolescent girls have with their weight. Most experimental research suggests that acute exposure to thin images in both print (e.g. magazine ads) and digital media (e.g. television shows, music videos) increases body dissatisfaction [11]. This association persists, as the frequency of magazine reading by female adolescents has been shown to predict the use of healthy, unhealthy, and extreme weight control behaviors five years later [12].

Prior research indicates that family and friends influence on girls' self-initiated dieting behaviors, through verbal comments such as weight-teasing [13] and encouragement to diet [14], and through the modeling of dieting and disordered eating behaviors [15]. Families can also affect dieting behavior through their influence on the home environment (e.g. family functioning and family meals). Family meals provide the opportunity for social interaction and parent modeling of healthy eating behaviors, and allow parents to monitor children's eating behavior. Increased priority and frequency of family meals have consistently been negatively associated with the use of unhealthy weight control behaviors [16]. Several characteristics of positive family functioning, such as open communication, warmth, and unconditional acceptance, have been associated with lower odds of dieting, use of unhealthy weight control behaviors, and use of extreme weight control behaviors [17]. However, family interactions during family meals that focus on weight-related talk and dieting behavior may moderate the potential protective effects of family meals on disordered eating and dieting behavior [18]. Despite the fact that nearly every day adolescent girls are likely subject to family, friend, and media influence, prior research has tended to focus on examining the influence of one of these three sources in isolation.

Building on findings that the family, friends, and media all affect aspects of dieting behavior, the current study will expand on the extant literature by exploring the combined relations of these influences with patterns of weight control behavior. The present study has 2 aims: 1) to examine the influence of familial, friends and media factors on weight control group membership at 15y, and 2) to examine the combined influence of multiple family, friend, and media sociocultural factors on weight control group membership at 15y.

Methods

Participants

Participants at study entry included 197 non-Hispanic, white families living in Central Pennsylvania recruited as part of a longitudinal study of the health and development of young girls with one of the primary aims to identify familial predictors of individual differences among girls in behavioral controls of food intake, including dieting. Eligibility criteria for girls' participation at recruitment included living with the biological mother and father, the absence of severe food allergies or chronic medical problems affecting food intake, and the absence of dietary restrictions involving animal products. The sample was not recruited based on weight status. Parents and their 5y old daughter (mean age: 5.4 ± 0.4 y) were recruited for participation into the study using flyers and newspaper advertisements. In addition, families with age-eligible female children within a five-county radius received mailings and follow-up phone calls (Metromail Inc.). Families were assessed at age 5, (N=192) study entry baseline, and then assessed every 2y, when daughters were age 7 (N=192), 9 (N=183), 11 (N=177), 13 (N=168), and 15 (N=167). Attrition was primarily due to family relocation outside of the area. One girl at 15y had missing weight control behavior data, and thus the final sample had 166 girls and their families.

At study entry, the mean family income was \$35,000-\$50,000. Parents were well educated; mothers' mean level of education was 14.5 ± 2.3 years (range: 12-20y), and fathers' mean level of education was 14.7 ± 2.5 years (range: 12-20y). The Pennsylvania State University Institutional Review Board approved all study procedures, and parents provided consent for their family's participation before the study began.

Measures

All measures were collected at 15y.

Anthropometric measures (BMI)

Height and weight were measured by a trained staff member following procedures described by Lohman [19]. Girls were dressed in light clothing and measured without shoes. Height was measured in triplicate to the nearest 0.1 cm using a Shorr Productions stadiometer (Irwin Shorr, Olney MD). Weight was measured in triplicate to the nearest 0.1 kg using a Seca Electronic Scale (Seca Corp, Birmingham, United Kingdom). BMI (weight (kg)/height (m)²) scores were generated based on height and weight measurements.

Family influence

The priority of family meals was assessed using 5 items that were part of the family meal patterns factor from the Project EAT survey [16]. Example items include, "In my family, it is important that the family eat at least one meal a day together," and "In my family, different schedules make it hard to eat meals together on a regular basis." Internal consistency was good ($\alpha = 0.84$) for priority of family meals. Family functioning was assessed using girls' reports on the five-item Family APGAR[20], which is based on the idea that overall perceived family function can be elucidated by a single member's report of satisfaction. Example items include, "I am satisfied with the way my family talks things over

with me and shares problems with me.” Internal consistency was $\alpha = 0.77$. Consistent with other studies [13, 21, 22], mother and father weight-teasing were each assessed by a single item, asking, “Does your mother/father ever criticize (put you down) or tease you about your weight?” Response options include: really no, sort of no, sort of yes, really yes. Consistent with other studies [22, 23], mother’s and father’s dieting were each assessed by a single item, asking, “Has your mother/father ever tried to lose weight?” Response options include: really no, sort of no, sort of yes, really yes.

Friend influence

To get an indicator of peer influence, friends’ weight-teasing and dieting were measured. Consistent with other studies [13, 21, 22], friend weight-teasing were assessed by a single item, asking, “Do your friends ever criticize (put you down) or tease you about your weight?” Response options include: really no, sort of no, sort of yes, really yes. Consistent with other studies [22, 23], friends’ dieting were assessed by a single item, asking, “Have your friends ever tried to lose weight?” Response options include: really no, sort of no, sort of yes, really yes.

Media influence

Media influence was examined as both media exposure and media sensitivity. Media sensitivity was assessed using a revised version of the Multidimensional Multimedia Influence Scale (MMIS) [24]. The revised version contains 14 items (1 = strongly agree, 4 = strongly disagree), and was designed to assess media influence on 4 dimensions: internalization of the thin-ideal, awareness of the thin-ideal, appearance comparison, and use of the media as a source of information about appearance. A factor analysis was conducted with the current sample, and revealed only one factor with an eigenvalue over 1. Thus, a total media

sensitivity score, the mean of all 14 items, was used in the current study. Internal consistency was high ($\alpha = 0.96$). Total weekly TV time was used as a measure of media exposure, and was asked as “How many hours per day do you spend watching television/videos” for both school and non-school days.

Weight control behaviors for LCA

Dieting behavior was examined as specific weight control behaviors, assessed by responses to the question, “Have you ever done any of the follow things to lose weight or to keep from gaining weight?” In the current study, 20 weight control behaviors from the comprehensive list developed by French et al. [6] were selected as potential items to be used in the LCA. Behaviors were coded as healthy or unhealthy using French’s classification of the behaviors [6]. In order to reduce sparseness in the observed data contingency table, which is particularly important with a sample of this small size, similar items (e.g. eliminate snacking and eliminate sweets and junk) were combined if their correlation was high (~ 0.70). Thus, the following items were combined into superordinate factors: i) eliminating snacking, sweets, and junk food; ii) reducing the amount of food consumed and calories eaten. Due to the low prevalence (14%) of using at least one unhealthy behaviors in the current sample, the unhealthy behaviors (use of laxatives/enemas, diuretics, diet pills, or appetite suppressants, smoking cigarettes, or vomiting) were combined into a superordinate factor. Response options for each behavior were: never, rarely, sometimes, often, and always. Dichotomous indicators of each weight-control behavior were created for use in LCA models for this study: coded two (yes) if they engaged in healthy behaviors “sometimes” or more often and in unhealthy behaviors “rarely” or more often.

Statistical analyses

All data analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC). Statistical significance was defined as $p \leq 0.05$.

Latent class analysis (LCA) is a person-centered measurement method used to identify an underlying latent grouping variable that is not observed but can be inferred from a set of measured indicators, weight control behaviors in this case [25]. This method was used to identify 4 classes of weight control behaviors in the current sample, Non-dieters (26%) who did not endorse any weight control behaviors, and three dieting groups. Girls in the Lifestyle group (16%) reported a higher frequency of dieting than Non-dieters, but only reported increasing fruits/vegetables and exercise, both health-promoting weight control behaviors. The Dieters (43%) group was characterized by behaviors commonly associated with dieting (e.g. eliminating sweets and snacking, reducing calories). The Extreme Dieters (16%) group also reported skipping meals, and over half reported use of an unhealthy behavior (e.g. vomiting, use of laxatives). Additional details can be found elsewhere [7]. Membership in the weight control patterns identified for this sample in the prior study is used as the outcome in the present study.

To identify family, friend, and media factors that influence weight control group membership, three models were tested, one for each set of factors (family, friends, media). All potential variables were first tested as independent predictors of weight control group membership to test if their inclusion in the larger models was warranted. The only factor that was not a significant independent predictor was father's dieting, and thus it was excluded from the family model. The family model included two family environment factors (family functioning, priority of family meals), mother's dieting, maternal weight-teasing, and

maternal weight-teasing. The friend model included friends' dieting and friend weight-teasing. The media model included media sensitivity and media exposure (weekly TV time). All models were adjusted for girls' BMI to account for the influence of BMI on weight control membership [7]. Including the variables in the latent class model allows one to examine the extent to which each variable predicts membership in the weight control latent classes, and allows for the estimation of odds ratios that describe the increase in odds of membership in a particular latent class (relative to a specified reference latent class) corresponding to a one-unit change in the variable.

To examine the combined influence of family, friend, and media factors on weight control group membership, a generalized linear model was conducted using PROC GENMOD. Each girl was assigned to the weight control group using the classify-analyze approach [26], identified and described elsewhere [7]. The model was adjusted for girls' BMI. The first step was to include all significant predictors identified from the family, friend, and media models. The variables initially included in what the full model were BMI, family functioning, priority of family meals, maternal weight-teasing, friend weight-teasing, friends' dieting, and media sensitivity. Backwards elimination was used to eliminate the variables one at a time (the variable with highest p value) that were no longer significant. This procedure was repeated until all variables remaining were significant at $p < 0.10$.

Results

Descriptive data for the family, friend, and media factors are presented in **Table 4.1**.

Family influences on weight control group membership

As shown in **Table 4.2**, family functioning, priority of family meals, and maternal weight-teasing were significant predictors of weight control group membership in the family

model. With an increase in family functioning, girls were less likely to be Extreme Dieters than Non-dieters. With an increase in priority in family meals, girls were less likely to be Extreme Dieters than Non-dieters group. With an increase in maternal weight-teasing, girls were more likely to be Dieters and Extreme Dieters than Non-dieters. Neither mother's dieting nor paternal weight-teasing were significant predictors of weight control group membership.

Friend influences on weight control group membership

As shown in **Table 4.3**, both friends' dieting and weight-teasing were significant predictors of weight control group membership in the weight-teasing model. With an increase in friend weight-teasing, girls were more likely to be Dieters or Extreme Dieters than Non-dieters. Girls who reported that their friends have dieted were more likely to be Dieters and Extreme Dieters compared to Non-dieters.

Media influences on weight control group membership

As shown in **Table 4.4**, media sensitivity was a significant predictor of weight control in the media influence model. With an increase in media sensitivity, girls were more likely to be in the Lifestyle, Dieters, and Extreme Dieters groups than to be in Non-dieters. Media exposure, measured as weekly TV time, was not a significant predictor of weight control group membership.

Combined influence model including family, friend, media factors

In the combined influence model, friend's dieting (parameter estimate: -0.38, SE: 0.17, $p < .05$), family functioning (parameter estimate: 0.99, SE: 0.32, $p < .01$), and media sensitivity (parameter estimate: -1.30, SE: 0.24, $p < .001$) all remained significant predictors of weight control group membership. Family functioning was a protective factor for

membership in the Non-dieters group over the three dieting groups, whereas friends' dieting and media sensitivity were all risk factors for membership in one of the three dieting groups. While priority of family meals, maternal weight-teasing, and friend weight-teasing were all significant predictors in the smaller models, they were no longer significant in the context of the combined model.

Discussion

Results confirmed that several family, friend, and media influences were associated with differences in girls' patterns of weight control behavior during adolescence. Family functioning, priority of family meals, and maternal weight-teasing were identified as significant family factors, friends' dieting and weight-teasing were identified as significant friend factors, and media sensitivity was identified as a significant media factor. In the model examining family, friend, and media influences together, friends' dieting, family functioning, and media sensitivity all remained significant predictors of membership in a dieting group relative to the Non-dieters.

Family and family-level characteristics predicting weight-control group membership included maternal weight-teasing. Girls who reported that their mother teased them about their weight were more likely to be Dieters and Extreme Dieters, the latter of whom reported using unhealthy weight control behaviors. This is consistent with prior findings that family weight-teasing is related to dieting behavior and the use of unhealthy weight control behaviors [13, 22, 27]. However, given that these studies only included a measure of general family weight-teasing [13, 22, 27], the current study clarifies that it is maternal, but not paternal, weight-teasing that is related to adolescent dieting behavior. While mothers may be engaging in weight-teasing because they are concerned about their daughter's weight,

increased weight-teasing can have intended mental health consequences, as it is related to increased depressive symptomatology and decreased emotional health [21, 28]. Other evidence suggests that mothers who are worried about daughter's weight should engage in conversations about healthy eating and physical activity rather than focus on having weight-related conversations. Findings by Berge et al. [29] indicate that especially for overweight adolescents, having a mother who engaged in conversations about healthful eating and physical activity was protective against adolescent dieting and disordered eating, whereas having a mother who engaged in weight-related conversations increased likelihood of adolescent dieting. Current findings that mothers' dieting was not associated with weight control group membership is consistent with some (e.g. [30, 31], but not all (e.g. [22, 32]), studies, and follows qualitative reports from adolescents that mother's dieting is not an important cause of dieting behavior for adolescents [33]. The lack of significant findings for paternal influences on adolescent daughters' weight control behavior is consistent with most (e.g. [22, 30]) but not all (e.g. [34]) previous findings, with other findings indicating that fathers might be influential in pre-adolescents only [14]. More work is needed to explore the role that fathers play in the development of daughter's dieting behavior.

In the present study, two family environment factors, family functioning and priority of family meals, were associated with weight control group membership. Girls who reported having lower family functioning were more likely to be Extreme Dieters, reporting more frequent dieting and use of unhealthy weight control behaviors. This is consistent with prior findings that indicators of more positive family functioning were associated with lower levels of disordered eating, consistent with previous findings [17, 35]. Increased priority of family meals was protective against membership in the Extreme Dieters groups, which is consistent

with past findings that family meals protective against dieting behavior and use of unhealthy weight-control behaviors [16, 18]. There are several potential mechanisms for why priority of family meals might be protective against membership in a dieting group. Eating meals together as a family provides opportunities for parents to continue to provide adolescents with a variety of nutrient-dense foods despite adolescent's increasing autonomy. Higher family meal frequency in adolescence has also been associated with higher diet quality both concurrently [36, 37] and later in adulthood [38]. Additionally, the family meal may provide the family with opportunities to monitor their children and interact in a positive way and allow time for family communication [39]. For these reasons, frequent family meals and an increased priority on family meals should be recommended to all families.

Both friends' dieting and weight-teasing predicted patterns of weight control behavior, indicating that both friends' comments (e.g. weight-teasing) and modeling of dieting behavior are aspects of friends' influence. This is consistent with qualitative reports that friends' dieting is an important cause of dieting behavior for adolescents [33]. Social norms dictate that if enough people within a group participate in a given attitude or behavior, the attitude or behavior is more likely to be accepted as a social norm [40], and girls may be using certain weight control behaviors to try to fit in [41]. To this point, Paxton and colleagues found that friendship cliques shared similar levels of body image, dietary restraint, and use of extreme weight control behaviors [41]. However, it is important to keep in mind that self-selection into such friend groups might also play a role; girls might choose friend groups who endorse similar weight-control attitudes and behaviors. Consistent with past research [13], friend weight-teasing was related the use of unhealthy weight control behaviors. Given the high-prevalence of peer weight-teasing and the relationship between

weight-teasing and low body dissatisfaction, low self-esteem, high depressive symptoms, and suicidal ideations and attempts [21], there is a need for school-based weight-teasing interventions (i.e. replicating the pilot program developed by Haines et al. [42]) for adolescents.

Media sensitivity was identified as significant predictor of weight control group membership, with girls reported higher levels of media sensitivity more likely to be in all three dieting groups relative to the Non-dieters. This is consistent with past findings that media exposure plays a role in the development of dieting behavior and eating pathology [11, 12]. The images that adolescents are exposed to showcase ideals that are unattainable to majority of them [43]. While it could be that those more susceptible to media influence self-select for increased media exposure, findings from the current study indicate that it is not media exposure, but rather media sensitivity, that predicts weight control group membership. Stice et al. [44] noted that the adverse effects of media exposure to thin-ideal images may only have lasting effects on those who were initially vulnerable and had lower social support, elevated body dissatisfaction, and perceived pressure to be thin from family, friends, and dating partners. Thus, for the current sample, current findings in combination with previous findings [11] indicate that girls in the Extreme group will be the most susceptible to long-lasting effects from exposure to the thin-ideal in the media.

Examining several family, friend, and media factors in the same model revealed that a factor from each sector of influence (family functioning, friends' dieting, and media sensitivity, respectively) remained a significant predictor in combined influence model, consistent with Stice's contention that family, peers, and the media are all important sociocultural factors of dieting behavior [10]. In the combined model, a friend influence (e.g.

friends' dieting) remained significant while the maternal influence (e.g. maternal weight-teasing) did not, a pattern consistent with the increasing susceptibility to peer influence and decreasing susceptibility to parental influence that occurs as children become adolescents [45]. The importance of peer social modeling of dieting behavior seen in the current study, combined with work indicating that peer dieting behavior during adolescence is a risk factor for use of extreme weight control behavior in adulthood[3], supports the need for school-based interventions to target large groups of adolescents at once, such as the pilot program developed by Haines et al. [42]. The current findings that media influence remains a significant predictor of dieting behavior in the context of family and friend factors is consistent with the association between the internalization of the thin-ideal in the media and dieting behavior seen in other studies [11]. In fact, prior work has shown that media literacy interventions can decrease both body dissatisfaction and levels of internalization of the thin-ideal in the media [46, 47], and the current findings support that this is an avenue worth exploring. General family functioning was the only family influence that remained significant in the context of the other family, peer, and media influences. This is not surprising given the relationship between general family functioning and the physical, social, and emotional well-being of children [48-50]. Given that the priority of family meals was no longer significant in the presence of general family functioning, the current findings support the idea that the family meal is both a proxy and a vehicle for more positive family functioning [39].

The current study supports Stice 's [10] contention that family, peers, and the media are three sources of sociocultural influence that play a role in adolescent girls' use of patterns of weight control behaviors. Specifically, in the context of several friends, family, and media

factors, friends' dieting, general family functioning, and media influence remained significant predictors of weight control group membership. Given that similar factors associated with both the initiation and persistence of use of unhealthy weight control behaviors, [51] these findings emphasize the need for a multidimensional prevention and interventions, addressing risk factors for dieting and use of unhealthy and extreme weight control behaviors at the family, peer, and community (e.g. media) levels.

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Table 4.1 Descriptive information for the family, friend, and media factors

	Non-dieters (26%)	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
Family functioning ¹	1.73 (0.41)	1.75 (0.24)	1.50 (0.54)	1.21 (0.71)
Priority of family meals ²	2.78 (0.71)	2.80 (0.77)	2.52 (0.72)	2.19 (0.77)
Mother's dieting ³	2.88 (1.15)	3.19 (0.98)	3.22 (0.91)	3.56 (0.65)
Maternal weight-teasing ⁴	1.10 (0.37)	1.35 (0.80)	1.47 (0.67)	1.68 (0.99)
Paternal weight-teasing ⁴	1.10 (0.37)	1.20 (0.71)	1.23 (0.59)	1.52 (0.87)
Friend's dieting ³	2.35 (1.08)	2.69 (0.93)	3.00 (0.90)	3.20 (0.96)
Friend's weight-teasing ⁴	1.07 (0.34)	1.23 (0.71)	1.42 (0.74)	1.52 (0.82)
Media sensitivity ⁵	1.55 (0.59)	1.89 (0.60)	2.46 (0.66)	2.65 (0.92)
Media exposure (hr/wk) ⁶	13.63 (7.79)	9.73 (5.16)	13.18 (7.39)	14.16 (8.09)

Data are presented as mean (SD).

¹ Assessed using Family APGAR; Range: 0 (Hardly ever) – 2(Almost always)

² Assessed using Priority of Family Meals; Range: 1 (Strongly disagree) – 4(Strongly agree)

³ Assessed with, “Has (have) your mother/father/friends ever tried to lose weight?; Range: 1 (Really no) – 4(Really yes)

⁴ Assessed with, “Does (do) your mother/father/friends ever criticize or tease you about your weight?; Range: 1 (Really no) – 4(Really yes)

⁵ Assessed with the MMIS; Range: 1 (Strongly disagree) – 4(Strongly agree)

⁶ Total average hours of TV per week

Table 4.2 Odds ratios for the family model, adjusting for daughter BMI, on membership in the 3 dieting groups relative to the Non-dieters group

	P value	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
BMI	***	1.00 (0.89, 1.13)	1.07 (0.98, 1.17)	1.21 (1.09, 1.35)
Family functioning	*	0.97 (0.34, 2.76)	0.59 (0.30, 1.17)	0.29 (0.13, 0.68)
Priority of Family Meals	**	0.95 (0.56, 1.62)	0.71 (0.48, 1.05)	0.42 (0.23, 0.78)
Maternal weight-teasing	**	1.51 (0.54, 4.16)	2.69 (1.29, 5.61)	2.70 (1.17, 6.26)
Paternal weight-teasing	NS	1.41 (0.52, 3.84)	0.68 (0.31, 1.52)	1.15 (0.48, 2.75)
Mother's dieting	NS	1.43 (0.90, 2.29)	1.32 (.99, 1.75)	1.85 (1.12, 3.04)

Non-dieters as reference class. *P < 0.10, **P < 0.05, ***P < .01, ****P < .0001

Table 4.3 Odds ratios for the friend model, adjusting for daughter BMI, on membership in the 3 dieting groups relative to the Non-dieters group

	P value	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
BMI	****	1.00 (0.88, 1.13)	1.11 (1.02, 1.22)	1.29 (1.17, 1.44)
Friend's weight-teasing	**	1.33 (0.59, 3.03)	2.25 (1.23, 4.11)	2.78 (1.38, 5.60)
Friends' dieting	***	1.31 (0.87, 1.95)	1.66 (1.24, 2.22)	2.29 (1.46, 3.57)

Non-dieters as reference class. *P < 0.10, **P < 0.05, ***P < .01, ****P < .0001

Table 4.4 Odds ratios for media model, adjusting for daughter BMI, on membership in the 3 dieting groups relative to the Non-dieters group

	P value	Lifestyle (16%)	Dieters (43%)	Extreme Dieters (15%)
BMI	****	1.00 (0.89, 1.13)	1.07 (0.99, 1.16)	1.26 (1.14, 1.38)
Weekly TV	NS	0.92 (0.87, 0.98)	0.97 (0.93, 1.01)	0.98 (0.92, 1.04)
Media Influence	****	1.93 (1.09, 3.44)	4.31 (2.72, 6.82)	6.62 (3.55, 12.33)

Non-dieters as reference class. *P < 0.10, **P < 0.05, ***P < .01, ****P < .0001

Chapter 5

OVERALL DISCUSSION

The overall goal of this dissertation was to study predictors of girls' self-initiated dieting behavior in childhood and adolescence using a longitudinal sample of girls and their parents followed from 5-15y. Dieting is implicated as a causal factor for a number of disorders, including obesity, eating disorders, and depression [1, 2], thus understanding the etiology of the emergence of dieting early in life is needed. In the three papers of this dissertation, findings were presented identifying patterns of weight-control behaviors among adolescent girls, as it is novel and necessary to study weight-control behaviors in the context of each other rather than studying dieting as a singular behavior. Each paper also focused on examining the role of individual and contextual factors on dieting behavior, including parental encouragement to diet and other familial factors, friend influences, and the thin-ideal in the media.

The first aim of Study 1 was to examine the influence of parental encouragement to diet on the emergence of early dieting (by 11y) and adolescent dieting (between 11y and 15y). Both mother and fathers' encouragement to diet consistently predicted the emergence of early dieting, but did not predict the emergence of adolescent dieting. Specifically, with each time point that mothers reported encouraging her daughter to diet, girls were 2 times more likely to report early dieting. A similar finding was observed for fathers' reported encouragement to diet. However, when both maternal and paternal encouragement to diet was examined as a combined influence, girls who were encouraged by both parents were 8 times more likely than girls who were encouraged by neither parent to report early dieting. In contrast, neither maternal nor parental encouragement to diet, examined both independently

and combined, had an influence on the emergence of dieting in adolescence. Taken together, these findings support the hypothesis that girls are more susceptible to their parents' influence during childhood than during adolescence, when girls become more susceptible to peer influence [3]. The second aim of Study 1 was to look at the influence of encouragement to diet on changes in BMI percentile from 9y-15y. Parental encouragement to diet predicted increases in girls' BMI percentiles between the ages of 9 and 15, but only among girls who reported dieting early or during adolescence.

Due to our limited knowledge of what weight control behaviors adolescents are using when they report dieting, the primary aim of Study 2 was to use latent class analysis to identify patterns of weight control behaviors, obtained from French's comprehensive list of behaviors [4], among a sample of 15y girls. Four patterns were identified, Non-dieters, and three dieting groups: Lifestyle, Dieters, and Extreme Dieters. The Non-dieters did not endorse using any weight control behaviors, and the three dieting groups increased in the number and severity of their reported weight control behaviors. The Lifestyle group only reported increasing exercise and fruit and vegetable intake weight control behaviors, the Dieters reported using a number of behaviors recommended as part of dietary guidance for weight management (e.g. reduce overall intake, reduce snacking), and the Extreme Dieters who reported using all the weight control behaviors, with over half reporting the use of at least one unhealthy behavior (e.g. laxatives, smoke cigarettes). Differences between the groups were observed as early as 5y; girls in the Extreme group had the highest BMI percentiles at 5y and the lowest inhibitory control at 7y and girls in both the Dieters and Extreme Dieters groups had the highest fear of becoming fat at 9y. The three dieting groups were also qualitatively distinct on several individual characteristics measured at 15y,

including BMI, dietary restraint, weight concerns, self-esteem, and depression. When dietary intake was compared across groups, girls in the Extreme Dieters group had the lowest self-reported intake, and were more likely to be classified as under-reporters, and but ate significantly more in the laboratory.

Using the groups of weight control behaviors identified in Study 2, the aim of Study 3 was to examine the association between these groups and family, friend, and media factors. Among the familial factors, with increased family functioning and priority of family meals, girls were less likely to be Extreme Dieters than to be Non-dieters. With increased maternal weight-teasing, girls were more likely to be Dieters and Extreme Dieters than to be Non-dieters. Among the friend factors, with increases in both friend dieting and weight-teasing, girls were more likely to be Dieters and Extreme Dieters than to be Non-dieters. And lastly, among the media factors, media sensitivity, but not media exposure, was significantly associated with group membership. With increases in media sensitivity, girls were more likely to be in all three dieting groups than the Non-dieters. When the family, friend, and media factors were examined in the same model, only family functioning, friends' dieting, and media sensitivity remained statistically significant. These findings support Stice's contention that family, peers, and the media are all important sociocultural factors of dieting behavior [5], and extend the current evidence base to suggest that many of these sociocultural factors differentiate between different patterns of weight control behaviors.

HIGHLIGHTED FINDINGS

Overall, the three studies were designed to gain insight into child and adolescent dieting behavior. Several major findings emerged. First, while it was shown in Study 1 that the parents may have more influence on the emergence of dieting behavior in childhood than

adolescence, results from Study 3 clarify that parents still have a role in dieting behavior in adolescence, specifically in how they shape the family environment. Second, the findings underscore the view that adolescent dieting is not a singular behavior, but is an umbrella term representing a wide range of both healthy and unhealthy weight control behaviors. In fact, girls did not respond the same way to, “Have you ever dieted?” as they did to, “Have you ever done any of the following things to lose weight or to keep from gaining weight?” Third, while all three dieting groups reported use of at least two weight control behaviors and had an average dieting frequency higher than the Non-Dieters, they differed from each other not only in the number and types of weight control behaviors they endorsed, but were qualitatively different on a number of individual characteristics and family, friend, and media factors. Thus, it is necessary to not just assess “dieting,” but also any weight control behaviors used.

Building on the current expert report by the Energy Balance Measurement Working Group [6], who state that, “inaccurate scientific methods will lead to inaccurate conclusions,” the current findings suggest that it may be futile to try to examine self-reported intake in adolescent dieters, particularly among those who use unhealthy weight control behaviors (i.e. Extreme Dieters). Based on their self-reported intake, the Extreme Dieters consumed, on average, roughly 1300 calories/day. Using this criterion alone, one might draw the conclusion that the Extreme Dieters are successful in their attempts to restrict their intake. However, while the Extreme Dieters reported consuming the fewest calories, they had the highest weighed food intake in the laboratory. Thus, given that the Extreme Dieters were on average overweight and had the greatest levels of restraint, this supports the theory that under-reporting in those girls with higher levels of restraint likely reflects intended

restriction, not actual restricted intake [7]. Thus, especially in overweight dieters who might be actively trying to lose weight, but are not successful in their attempts to do so, self-reported intake might simply reflect intended intake, and thus we may be unable to examine associations between dieting and intake.

IMPLICATIONS

More work is needed to identify ways that parents who are concerned about their child's weight status can help their child to maintain and reach a healthy weight. While parents may be using strategies such as encouragement to diet and weight-teasing out of concern for their daughter's weight status, the current findings highlight that these strategies do not work and may even backfire. Specifically, girls who were encouraged to diet by a parent and reported dieting had increases in BMI percentile from 9y to 15y. Similarly, maternal weight-teasing was associated with membership in Dieters and Extreme Dieters, the latter of whom report using unhealthy weight control behaviors. Weight-teasing has other negative effects; studies have shown that weight-teasing is associated with increased depressive symptomatology and decreased emotional health [8, 9]. Recent research suggests that instead of using controlling feeding practices, parents who are concerned about their child's weight status should focus on modeling healthy behaviors [10, 11], provide limits and structure for their child by focusing on what the child should eat instead of what they should not eat, and by giving them access to a variety of healthy food choices [12, 13], which has been shown to increase weight loss relative to decreasing energy-dense foods [14]. Other evidence suggests that mothers who are worried about their daughter's weight should engage in conversations about healthy eating and physical activity rather than focus on having weight-related conversations. Findings by Berge et al. [15] indicate that engaging in

conversations about healthful eating and physical activity, rather than focusing on weight, was protective against adolescent dieting and disordered eating. Future work should focus on creating resources and tools to help parents learn how to do this.

The current findings have implications for intervention development. These findings emphasize the need for multidimensional preventions and interventions, addressing risk factors for dieting and use of unhealthy and extreme weight control behaviors at the individual, family, friend, and community (e.g. media) levels. Given that one-third of the current sample reported dieting by 11y, and that risk factors for later membership in both Dieters and Extreme Dieters were present as early as 5y, there is a need to start preventions and interventions early, in childhood. Two risk factors for membership in the Extreme Dieters group were elevated BMI at 5y and decreased inhibitory control at 7y. These findings suggest opportunities for early intervention in the domains of early weight management and self-regulation to help prevent the development of early dieting and unhealthy weight control behaviors. Girls in the Extreme group were the heaviest at 5y and remained the heaviest at 15y. Thus early weight management may help prevent later weight gain, which may help decrease early attempts at dieting and later use of unhealthy weight control behaviors. Inhibitory control is an important factor in dieting success [16] and in early weight gain [17]. Thus, initial attempts to control weight might not be successful for girls with low inhibitory control, as the low levels of inhibitory control will make it harder for these girls to sustain all weight control behaviors, and given that these girls are also heavier and have higher levels of disinhibition, may lead to loss of control and subsequent weight gain. Therefore, early interventions that help increase inhibitory control may help mitigate later dieting behavior. Limited work in adults shows that inhibitory control training through repeated exposure to

inhibitory control tasks (e.g. Stroop task, Go/No-Go task) can improve level of inhibitory control, and also has been linked to positive changes in health outcomes such as BMI [18]. Future work should focus on using inhibitory control training in children to investigate whether this could be an effective intervention component to help decrease later dieting behavior in children. While there is little work in this arena, parents can help their children increase their inhibitory control and self-regulation around food by teaching them mindful eating techniques such as slowing down and savoring every bite. Additionally, previous interventions have found that school-based self-esteem interventions have successfully decreased Eating Disorder Inventory (EDI) scores [19], and given the relationship between self-esteem and weight control in the current study, suggest that self-esteem in childhood would be another necessary component to target.

The current findings also offer multiple potential avenues for future weight control interventions. Given the observed importance of friend influences on weight control behavior, school-based programs present good opportunities for reaching several young girls and their peers at once. There are several directions that these programs can go in, but would benefit from including components that address healthy body image, healthy eating and active cooking classes, and the importance of physical activity, both for a healthy body image and for overall health. Results from Studies 1 and 3 highlight the importance of parental influences on dieting behavior during childhood. Thus, interventions should include components that address and integrate parental involvement into the program, including teaching parents ways that they can successfully help their child manage her weight (e.g. talking about and modeling healthy eating and physical activity). For example, for programs that are primarily based in a school setting, there could be a component that could include

both the girl and her parent(s), such as participating in a fitness class together or participating in a cooking class together.

Girls in the Extreme Dieters group were on average overweight and over half reported use of at least one unhealthy weight control behavior. This is consistent with past research that girls who are overweight are more likely report dieting and use of unhealthy weight control behaviors [20]. Taken together, this suggests that for those who would likely benefit from weight reduction or maintenance, these interventions could include elements that emphasize the importance of using of health-promoting weight control behaviors, such as increasing fruit and vegetable consumption and decreasing high energy-dense food. It is imperative to develop interventions to help adolescents who use unhealthy and extreme weight control behaviors stop using these weight control behaviors. Disordered eating persists and increases into young adulthood [21], which suggests that girls who are using unhealthy weight control behaviors in adolescence are at risk of continuing to do so. This warrants attention, as the use of unhealthy weight control behaviors increases the risk for disordered eating and clinical eating disorders [1] and could inhibit proper growth and development [22]. Thus, it will be worthwhile to develop resources to help them stop. Also, given the observed relationship between the use of unhealthy weight control behaviors and aspects of health included lower psychological well-being, increased weight status, and uncontrolled eating behaviors, physicians and other health professionals should start screening for the use of unhealthy weight control behaviors. This could be included as a quick checklist at the beginning of an annual physical exam; the nurse could ask whether or not they use or have used each specific unhealthy weight control behavior (e.g. “Have you ever used laxatives to help control your weight?”). Including this as a regular screening in

well-child visits could help identify girls who might be at an elevated risk of developing a later eating disorder.

These findings underscore the view that adolescent dieting is not a singular behavior, and instead is an umbrella term representing a wide range of both healthy and unhealthy weight control behaviors. Thus, it is necessary to not just assess “dieting,” as there are significant discrepancies around this term, but also any weight control behaviors used, and this is something that needs to be conveyed to researchers working in this area. Given that that dieting is implicated as a causal factor for a number of disorders (e.g. obesity and weight gain, eating disorders, depression), in order to identify etiological factors it is necessary to distinguish between patterns of weight control behaviors. There are self-reported dieters who only use health-promoting behavior modifications without any distress (i.e. the Lifestyle group), and there are self-reported dieters who use potentially dangerous unhealthy weight control behaviors (i.e. the Extreme Dieters). Thus, we need to move beyond just the use of the term “dieting,” and work towards developing a measure that incorporates both the behavioral and psychological aspects of dieting. Obesity researchers often support dieting for healthy weight loss, whereas many eating disorder researchers consider dieting as a casual factor in the development of eating disorders. This will hopefully provide clarity for both obesity and eating disorder researchers, and will allow both to make appropriate recommendations for different populations.

FUTURE WORK

While the current studies address gaps in the literature, there are several limitations that need to be kept in mind. The sample used in the current studies was homogenous – non-Hispanic white, and middle- to upper-class families from Central Pennsylvania, and thus the

results are not necessarily generalizable to other populations. While many of the current findings are consistent with prior research, those previous samples have also been primarily white, middle- to upper-class and female. Thus, the current findings should be replicated in a more gender, racially, and socioeconomically diverse sample. It might be that other cultural groups are more likely to use different weight control behaviors, and thus might not fit the patterns described in the current studies. Nonetheless, these findings fill a significant gap in the literature and should encourage future research on this topic.

Another limitation that spans the length of the dissertation is the reliance on self-report measures. This is not only a limitation of the current study, but a limitation of the field as whole. Currently, there are no better tools to capture dieting attitudes (e.g. restraint) and behaviors other than self-report. Future work should focus on the development of other tools to help us collect data on dieting and weight control behavior without relying on self-report. New technologies such as photo-imaging of food or cameras that monitor everything that someone does (or does not) eat might help collect data on specific weight control behaviors. However, given that a “diet” is typically thought of as a change from some previous state or norm, this would still require the individual to report on how these behaviors differ from what they used to do.

In conclusion, findings from the current dissertation address several gaps in the literature by taking advantage of a longitudinal data set to examine the development of dieting behavior from childhood to adolescence. The findings further our understanding of what weight control behaviors adolescent girls are using when they report dieting, and provide several compelling reasons for studying weight control behaviors rather than studying dieting as a singular behavior. As a field, we also need to work towards being

consistent in our use of this term, and should be cautious when making comparisons between studies “dieting” is not clearly defined and there is no information about specific weight control behaviors. In future research on this topic, dieting should be defined as, “the active use of weight control behaviors to lose or maintain weight,” and information should be obtained on the specific weight control behaviors used and on any psychological distress accompanying the dieting.

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APPENDIX

Appendix A: Parental Encouragement to Diet (CCOR)**Please answer all questions. For example, for question 3 answer questions 3, 3a and 3b.**

	definitely not	not really	a little	a lot/ definitely
1. Are you concerned that your daughter is overweight?	1	2	3	4
2. Have you expressed concern to your daughter about her being overweight?	1	2	3	4
3. Have you encouraged your daughter to lose weight?	1	2	3	4
a. Have you encouraged your daughter to go on a weight loss diet?	1	2	3	4
b. Have you encouraged your daughter to exercise more in order to help her lose weight?	1	2	3	4
4. Have you talked to your daughter about the things she could do to lose weight?	1	2	3	4
a. Have you talked to your daughter about how to diet?	1	2	3	4
b. Have you talked to your daughter about how to exercise to lose weight?	1	2	3	4
5. Do you try to use your own behavior to show your daughter how to lose weight?	1	2	3	4
a. Do you try to use your own eating to show your daughter how to diet?	1	2	3	4
b. Do you try to use your own exercise patterns to show your daughter how she can lose weight by exercising?	1	2	3	4
6. Have you ever helped your daughter try to lose weight?	1	2	3	4
a. Have you ever put your daughter on a weight loss diet?	1	2	3	4
(1) Have you ever restricted your daughter's food intake to help her lose weight?	1	2	3	4
(2) Have you ever restricted your daughter's intake of particular types of foods to help her lose weight?	1	2	3	4
(3) Have you ever encouraged your daughter to eat more of certain types of foods to help her lose weight?	1	2	3	4
b. Have you ever put your daughter on an exercise program to lose weight?	1	2	3	4
7. Is your daughter currently on a weight loss program?	1	2	3	4
a. Is your daughter on a weight loss diet?	1	2	3	4
b. Is your daughter on an exercise program to lose weight?	1	2	3	4

Appendix B: French Weight Loss Scale (French et al., 1995)

Have you ever done any of the following things to **LOSE WEIGHT** or to **KEEP FROM GAINING WEIGHT**?

Please read each strategy listed and indicate how often you have used the strategy to lose weight or to keep from gaining weight. If you have NEVER used a certain strategy, circle the number for NEVER next to the strategy.

Weight Loss Strategy	Never	Rarely	Sometimes	Often	Always
1. Increase Exercise	1	2	3	4	5
2. Eat more fruit and vegetables	1	2	3	4	5
3. Eat less fat	1	2	3	4	5
4. Eliminate Snacking	1	2	3	4	5
5. Eliminate sweets and junk	1	2	3	4	5
6. Reduce Calories	1	2	3	4	5
7. Reduce amount of food	1	2	3	4	5
8. Eat low-calorie food	1	2	3	4	5
9. Skip meals	1	2	3	4	5
10. Eat less meat	1	2	3	4	5
11. Use diet pills	1	2	3	4	5
12. Vomit after eating	1	2	3	4	5
13. Eat a low-carbohydrate diet	1	2	3	4	5
14. Use appetite suppressants	1	2	3	4	5
15. Use liquid diets	1	2	3	4	5
16. Smoke cigarettes	1	2	3	4	5
17. Use laxatives or enemas	1	2	3	4	5
18. Join diet centers that provide food/meals	1	2	3	4	5
19. Join weight loss groups	1	2	3	4	5
20. Use diuretics	1	2	3	4	5

Appendix C: Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter and Pike, 1984)

Example:

This girl is usually kind of happy, but this girl is usually kind of sad. Which girl are you like?

Are you:

4. Always happy
3. Usually happy

Are you:

2. Usually sad
1. Always sad

1. This girl is pretty good at puzzles, but this girl isn't very good at puzzles. Which girl are you like?

Are you:

4. Really good at puzzles
3. Pretty good at puzzles

Are you:

2. Sort of good at puzzles
1. Not very good at puzzles

2. This girl has lots of friends to play with, but this girl doesn't have very many friends to play with. Which girl are you like?

Do you have:

4. A whole lot of friends
3. Pretty many friends

Do you have:

2. A few friends
1. Hardly any friends

3. This girl isn't very good at swinging by herself, but this girl is pretty good at swinging by herself. Which girl are you like?

Are you:

4. Really good at swinging by yourself
3. Pretty good at swinging by yourself

Are you:

2. Sort of good at swinging by yourself
1. Not too good at swinging by yourself

4. This girl's mom doesn't smile at her very much, but this girl's mom smiles at her a lot. Which girl are you like?

Does your mom:

4. Smile at you a whole lot
3. Smile at you pretty much

Does your mom:

3. Smile at you sometimes
1. Smile at you hardly ever

5. This girl usually gets stars on her papers, but this girl usually doesn't get stars on her papers. Which girl are you like?

Do you:

4. Always get stars on your papers.
3. Most of the time get stars on your papers

Do you:

2. Sometimes get stars on your papers
1. Never get stars on your papers

6. This girl doesn't stay overnight at her friends' houses very often, but this girl stays overnight at her friends' houses. Which girl are you like?

Do you:

4. Stay over a whole lot
3. Stay over pretty much

Do you:

2. Stay over hardly ever
1. Never stay over

7. This girl is pretty good at climbing, but this girl isn't very good at climbing. Which girl are you like?

Are you:

4. Really good at climbing
3. Pretty good at climbing

Are you:

2. Sort of good at climbing
1. Not very good at climbing

8. This girl's mom takes her to a lot of places she likes to go, but this girl's mom doesn't take her to very many places she likes to go. Which girl are you like?

Does your mom take you to:

4. A whole lot of places you like to go
3. Pretty many places you like to go

Does your mom take you to:

2. A few places you like to go
1. Not very many places you like to go

9. This girl doesn't know the names of very many colors, but this girl knows the names of pretty many colors. Which girl are you like?

Do you know the names of:

4. A whole lot of colors
3. Pretty many colors

Do you know the names of:

2. A few colors
1. Hardly any colors

10. This girl has pretty many friends to play games with, but this girl doesn't have a lot of friends to play games with. Which girl are you like?

Do you have:

4. A lot of friends to play games with
3. Pretty many friends to play games with

Do you have:

2. A few friends to play games with
1. Hardly any friends to play games with

11. This girl isn't very good at tying her shoes, but this girl is pretty good at tying her shoes. Which girl are you like?

Are you:

4. Really good at tying your shoes
3. Pretty good at tying your shoes

Are you:

2. Not too good at tying your shoes
1. Not at all good at tying your shoes

12. This girl's mom cooks a lot of the food she likes, but this girl's mom only cooks a few of the foods she likes. Which girl are you like?

Does your mom:

4. Always cook the foods you like
3. Most of the time cook the foods you like

Does your mom:

2. Sometimes cook the foods you like
1. Hardly ever cook the foods you like

13. This girl isn't very good at counting, but this girl is pretty good at counting. Which girl are you like?

Are you:

4. Really good at counting
3. Pretty good at counting

Are you:

2. Sort of good at counting
1. Not too good at counting

14. This girl doesn't have very many friends to play with on the playground, but this girl has lots of friends to play with on the playground. Which girl are you like?

Do you have:

4. A whole lot of friends
3. Pretty many

Do you have:

2. A few friends
1. Hardly any friends

15. This girl is pretty good at skipping, but this girl isn't very good at skipping. Which girl are you like?

Are you:

4. Really good at skipping
3. Pretty good at skipping

Are you:

2. Sort of good at skipping
1. Not too good at skipping

16. This girl's mom reads to her a little, but this girl's mom reads to her a lot. Which girl are you like?

Does your mom:

4. Read to you a whole lot
3. Read to you pretty much

Does your mom:

2. Read to you sometimes
1. Never read to you

17. This girl isn't very good at saying the alphabet, but this girl is pretty good at saying the alphabet. Which girl are you like?

Are you:

4. Really good at saying the alphabet
3. Pretty good at saying the alphabet

Are you:

2. Sort of good at saying the alphabet
1. Not too good at saying the alphabet

18. This girl usually gets asked to play with the other kids, but this girl gets lonely sometimes because the other kids don't ask her to play. Which girl are you like?

Do you:

4. Always get asked to play
3. Usually get asked to play

Do you:

2. Sometimes get asked to play
1. Hardly ever get asked to play

19. This girl can't run very fast, but this girl can run pretty fast. Which girl are you like?

Do you:

4. Run really fast
3. Run pretty fast

Do you:

2. Run sort of fast
1. Not run very fast

20. This girl's mom plays with her a lot, but this girl's mom plays with her a little. Which girl are you like?

Does your mom:

4. Play with you a whole lot
3. Play with you pretty much

Does your mom:

2. Sometimes play with you
1. Hardly ever play with you

21. This girl knows the first letter of her name, but this girl has trouble remembering the first letter of her name. Which girl are you like?

Do you know the first letter of your name:

4. Really well
3. Pretty well

Do you know the first letter of your name:

2. Not very well
1. Not at all

22. This girl usually doesn't get to eat dinner at friends' houses, but this girl usually gets to eat dinner at friends' houses. Which girl are you like?

Do you:

4. Get to eat at friends' houses a whole lot
3. Get to eat at friends' houses pretty much

Do you:

2. Sometimes get to eat at friends' houses
1. Never get to eat over at friends' houses

23. This girl is pretty good at hopping on one foot, but this girl has trouble hopping on one foot. Which girl are you like?

Are you:

4. Really good at hopping on one foot
3. Pretty good at hopping on one foot

Are you:

2. Not too good at hopping on one foot
1. Not at all good at hopping on one foot

24. This girl's mom talks with her a little, but this girl's mom talks with her a lot. Which girl are you like?

Does your mom:

4. Talk with you a whole lot
3. Talk with you pretty much

Does your mom:

2. Sometimes talk with you
1. Hardly ever talk with you

Appendix D: Rosenberg Self-Esteem Scale (Rosenberg, 1965)

The next questions are about how you think and feel about yourself. Please circle the number indicating how much you agree or disagree with each of the following statements.

		Strongly Disagree	Mostly Disagree	Mostly Agree	Strongly Agree
1.	I feel that I am a person of worth, at least on an equal plane with others.	1	2	3	4
2.	I feel that I have a number of good qualities.	1	2	3	4
3.	All in all, I am inclined to feel that I am a failure.	1	2	3	4
4.	I am able to do things as well as most people.	1	2	3	4
5.	I feel I do not have much to be proud of.	1	2	3	4
6.	I take a positive attitude toward myself.	1	2	3	4
7.	On the whole, I am satisfied with myself.	1	2	3	4
8.	I wish I could have more respect for myself.	1	2	3	4
9.	I certainly feel useless at times.	1	2	3	4
10.	At times, I think I am no good at all.	1	2	3	4

Appendix E: Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977)

Using the following scale, please indicate how often you have felt or behaved this way
DURING THE PAST WEEK.

<i>During the Past Week</i>		None of the time	Some of the time	Moderate amount of time	Most of the time
1.	I was bothered by things that usually don't bother me.	1	2	3	4
2.	I did not feel like eating; my appetite was poor.	1	2	3	4
3.	I felt that I could not shake off the blues even with help from my family or friends.	1	2	3	4
4.	I felt that I was just as good as other people.	1	2	3	4
5.	I had trouble keeping my mind on what I was doing.	1	2	3	4
6.	I felt depressed.	1	2	3	4
7.	I felt that everything I did was an effort.	1	2	3	4
8.	I felt hopeful about the future.	1	2	3	4
9.	I thought my life had been a failure.	1	2	3	4
10.	I felt fearful.	1	2	3	4
11.	My sleep was restless.	1	2	3	4
12.	I was happy.	1	2	3	4
13.	I talked less than usual.	1	2	3	4
14.	I felt lonely.	1	2	3	4
15.	People were unfriendly.	1	2	3	4
16.	I enjoyed life.	1	2	3	4
17.	I had crying spells.	1	2	3	4
18.	I felt sad.	1	2	3	4
19.	I felt that people disliked me.	1	2	3	4
20.	I could not "get going."	1	2	3	4
		Very Unusual	Fairly Unusual	Somewhat Unusual	Not at all Unusual
21.	How unusual was this week compared to others?	1	2	3	4

Appendix F: Children's Behavior Questionnaire (CBQ; Rothbart et al., 2001)

	extremely untrue	quite untrue	slightly untrue	neither true nor untrue	slightly true	quite true	extremely true	NA
1. Seems always in a big hurry to get from one place to another.	1	2	3	4	5	6	7	NA
2. Can lower his/her voice when asked to do so.	1	2	3	4	5	6	7	NA
3. Gets so worked up before an exciting event that s/he has trouble sitting still.	1	2	3	4	5	6	7	NA
4. Is good at games like "Simon Says," "Mother, May I?" and "Red Light, Green Light."	1	2	3	4	5	6	7	NA
5. When s/he wants a toy s/he wants, gets very excited about getting it.	1	2	3	4	5	6	7	NA
6. Tends to run rather than walk from room to room.	1	2	3	4	5	6	7	NA
7. Has a hard time following instructions.	1	2	3	4	5	6	7	NA
8. When s/he wants to do something, s/he talks about little else.	1	2	3	4	5	6	7	NA
9. When outside, often sits quietly.	1	2	3	4	5	6	7	NA
10. Moves about actively (runs, climbs, jumps) when playing in the house.	1	2	3	4	5	6	7	NA
11. Prepares for trips and outings by planning things s/he will need.	1	2	3	4	5	6	7	NA
12. Has strong desired for certain kinds of foods.	1	2	3	4	5	6	7	NA
13. Can wait before entering into new activities is s/he is asked to.	1	2	3	4	5	6	7	NA
14. Looks forward strongly to the visit of loved relatives.	1	2	3	4	5	6	7	NA

	extremely untrue	quite untrue	slightly untrue	neither true nor untrue	slightly true	quite true	extremely true	NA
15. Sometimes sits quietly for long periods in the house.	1	2	3	4	5	6	7	NA
16. Has difficulty waiting in line for something.	1	2	3	4	5	6	7	NA
17. Becomes very excited when planning for trips.	1	2	3	4	5	6	7	NA
18. Prefers quiet activities to active games.	1	2	3	4	5	6	7	NA
19. Has trouble sitting still when s/he is told to (at movies, church, etc.).	1	2	3	4	5	6	7	NA
20. Is able to resist laughing or smiling when it isn't appropriate.	1	2	3	4	5	6	7	NA
21. Becomes very excited before an outing (e.g., picnic, party).	1	2	3	4	5	6	7	NA
22. Rarely runs or moves quickly in the house.	1	2	3	4	5	6	7	NA
23. Plays games slowly and deliberately.	1	2	3	4	5	6	7	NA
24. Is usually pretty calm before going on an outing (e.g., picnic, party).	1	2	3	4	5	6	7	NA
25. Is good at following instructions.	1	2	3	4	5	6	7	NA
26. Sits quietly in the bath.	1	2	3	4	5	6	7	NA
27. Approaches places s/he has been told are dangerous slowly and cautiously.	1	2	3	4	5	6	7	NA
28. Gets very enthusiastic about the things s/he does.	1	2	3	4	5	6	7	NA
29. Plays actively outdoors with other children.	1	2	3	4	5	6	7	NA
30. Is not very cautious and careful when crossing streets.	1	2	3	4	5	6	7	NA

	extremely untrue	quite untrue	slightly untrue	neither true nor untrue	slightly true	quite true	extremely true	NA
31. Shows great excitement when opening a present.	1	2	3	4	5	6	7	NA
32. Can easily stop an activity when s/he is told "no."	1	2	3	4	5	6	7	NA
33. Is full of energy, even in the evening.	1	2	3	4	5	6	7	NA
34. Doesn't become very excited about upcoming television programs.	1	2	3	4	5	6	7	NA
35. Is usually able to resist temptation when told s/he is not supposed to do something.	1	2	3	4	5	6	7	NA
36. Has difficulty sitting still at dinner.	1	2	3	4	5	6	7	NA
37. Remains pretty calm about upcoming desserts like ice cream.	1	2	3	4	5	6	7	NA
38. Looks forward to family outings, but does not get too excited about them.	1	2	3	4	5	6	7	NA
39. Likes to sit quietly and watch people do things.	1	2	3	4	5	6	7	NA

Appendix G: Body Satisfaction Scale (Slade et al., 1990)

	<u>1</u>	<u>2</u>	<u>3</u>
1. I think that I am:	too short	just right	too tall
2. I think I weigh:	too little	just right	too much
3. I think I have _____ muscle:	too little	just right	too much
4. I think I have ____ fat on my body:	too little	just right	too much
5. I think my arms are:	too little	just right	too big
6. I think my feet are:	too little	just right	too big
7. I think my chest is:	too little	just right	too big
8. I think my hands are:	too little	just right	too big
9. I think my waist is:	too little	just right	too big
10. I think my bottom is:	too little	just right	too big
11. I think my hair is:	too short	just right	too long
12. I think my hips are:	too little	just right	too long
13. I think my hair is:	too light	just right	too dark
14. I think my legs are:	too thin	just right	too heavy
15. I think my legs are:	too short	just right	too long
16. I think my stomach is:	too flat	just right	too big
17. Overall, I _____ how I look.	don't like	sort of like	like
18. Overall, I _____ how much I weigh.	don't like	sort of like	like
19. Overall, I _____ how tall I am.	don't like	sort of like	like
20. Overall, I am ____ with my body shape.	not happy	sort of happy	happy
21. I think my mother is:			
	too thin	a little too thin	just right
		a little too fat	too fat

22. I think my father is:

too thin a little too thin just right a little too fat too fat

23. I think my brother/sister is:

too thin a little too thin just right a little too fat too fat

24. I think that I am:

too thin a little too thin just right a little too fat too fat

25. Would you change anything about your body if you could? No Yes

26. If yes, what would you change?

Appendix H: Fear of Fat Scale (Shapiro et al., 1997)

	NO		YES	
	Really	Sort of	Sort of	Really
1. Fat people have lots of friends	1	2	3	4
2. It is good to be thin	1	2	3	4
3. It is important for men/boys to be thin	1	2	3	4
4. It is important for women/girls to be thin	1	2	3	4
5. It is bad to be fat	1	2	3	4
6. Thin people have lots of friends	1	2	3	4
7. Thin people are happy people	1	2	3	4
8. It is hard for fat people to make friends	1	2	3	4
9. It is hard for thin people to make friends	1	2	3	4
10. It is good to be fat	1	2	3	4
11. Fat people have very few friends	1	2	3	4
12. It is bad to be thin	1	2	3	4
13. Fat people are happy people	1	2	3	4
14. Thin people have very few friends	1	2	3	4
15. Fat people are smart	1	2	3	4
16. Thin people are good looking	1	2	3	4
17. Thin people are smart	1	2	3	4
18. Fat people are good looking	1	2	3	4
19. Thin people are lazy.	1	2	3	4
20. Fat people are lazy.	1	2	3	4
21. I think about the fat on my body	1	2	3	4
22. I wish I were thinner	1	2	3	4
23. My weight makes me unhappy	1	2	3	4
24. I think about being thin	1	2	3	4
25. I am scared about <u>being</u> fat	1	2	3	4

Appendix I: Dutch Eating Behavior Questionnaire (DEBQ; Van Strien et al., 1986)

These questions are also about eating. You can answer Never, Seldom/Rarely, Sometimes, Often, or Very Often. If one of the questions is about something you have never felt or done, please circle “not relevant”, meaning that it doesn’t apply to you.

	never	seldom/ rarely	some- times	often	very often	not relevant
1. If you have put on weight, do you eat less than you usually do?	1	2	3	4	5	G
2. Do you try to eat less at mealtimes than you would like to eat?	1	2	3	4	5	G
3. How often do you refuse food or drink offered because you are concerned about your weight?	1	2	3	4	5	G
4. Do you watch exactly what you eat?	1	2	3	4	5	G
5. Do you deliberately eat foods that are not fattening?	1	2	3	4	5	G
6. When you have eaten too much, do you eat less than usual the following days?	1	2	3	4	5	G
7. Do you deliberately eat less in order not to become heavier?	1	2	3	4	5	G
8. How often do you try not to eat between meals because you are watching your weight?	1	2	3	4	5	G
9. How often in the evening do you try not to eat because you are watching your weight?	1	2	3	4	5	
10. When you eat, do you take into account what you weigh (or think about your weight when deciding what to eat)?	1	2	3	4	5	
11. Do you have the desire to eat when you are irritated ?	1	2	3	4	5	G
12. Do you have a desire to eat when you have nothing to do ?	1	2	3	4	5	G
13. Do you have a desire to eat when you are depressed or discouraged ?	1	2	3	4	5	G
14. Do you have a desire to eat when you are feeling lonely ?	1	2	3	4	5	G
15. Do you have a desire to eat when somebody lets you down ?	1	2	3	4	5	G
16. Do you have a desire to eat when you are angry ?	1	2	3	4	5	G
17. Do you have a desire to eat when you are expecting something unpleasant to happen ?	1	2	3	4	5	G
18. Do you get the desire to eat when you are anxious, worried or tense ?	1	2	3	4	5	G

19. Do you have a desire to eat when things are going against you, or when things have gone wrong?	1	2	3	4	5	G
20. Do you have a desire to eat when you are frightened?	1	2	3	4	5	G
21. Do you have a desire to eat when you are disappointed?	1	2	3	4	5	G
22. Do you have a desire to eat when you are upset?	1	2	3	4	5	G
23. Do you have a desire to eat when you are bored or restless?	1	2	3	4	5	G
24. If food tastes good to you, do you eat more than usual?	1	2	3	4	5	
25. If food smells and looks good, do you eat more than usual?	1	2	3	4	5	
26. If you see or smell something delicious, do you have a desire to eat it?	1	2	3	4	5	
27. If you have something delicious to eat, do you eat it right away?	1	2	3	4	5	
28. If you walk past a bakery, do you have the desire to buy something delicious?	1	2	3	4	5	
29. If you walk past a snack bar or cafe, do you have the desire to buy something delicious?	1	2	3	4	5	
30. If you see others eating, do you also have the desire to eat?	1	2	3	4	5	
31. Can you resist eating delicious foods?	1	2	3	4	5	
32. Do you eat more than usual when you see others eating?	1	2	3	4	5	

Appendix J: Eating Attitudes Test (EAT; Garner et al., 1979)

These questions ask you about eating and your feelings about eating.

	Never	Rarely	Sometimes	Often	Usually	Always
1. I am terrified about being overweight.	1	2	3	4	5	6
2. I avoid eating when I am hungry.	1	2	3	4	5	6
3. I find myself preoccupied with (thinking a lot about) food.	1	2	3	4	5	6
4. I have gone on eating binges where I feel that I may not be able to stop.	1	2	3	4	5	6
5. I cut my food into small pieces.	1	2	3	4	5	6
6. I am aware of the calorie content of the foods I eat.	1	2	3	4	5	6
7. I particularly avoid food with a high carbohydrate content (breads, potatoes, rice).	1	2	3	4	5	6
8. I feel that others would prefer if I ate more.	1	2	3	4	5	6
9. I vomit after I have eaten.	1	2	3	4	5	6
10. I feel extremely guilty after eating.	1	2	3	4	5	6
11. I am preoccupied with (think a lot about) a desire to be thinner.	1	2	3	4	5	6
12. I think about burning up calories when I exercise.	1	2	3	4	5	6
13. Other people think I'm too thin.	1	2	3	4	5	6
14. I am preoccupied with (think a lot about) the thought of having fat on my body.	1	2	3	4	5	6
15. I take longer than others to eat my meals.	1	2	3	4	5	6
16. I avoid foods with sugar in them.	1	2	3	4	5	6
17. I eat diet foods.	1	2	3	4	5	6
18. I feel that food controls my life.	1	2	3	4	5	6
19. I display (show) self-control around food.	1	2	3	4	5	6
20. I feel that others pressure me to eat.	1	2	3	4	5	6
21. I give too much time and thought to food.	1	2	3	4	5	6
22. I feel uncomfortable after eating sweets.	1	2	3	4	5	6
23. I engage in (participate/do) dieting behavior.	1	2	3	4	5	6
24. I like my stomach to be empty.	1	2	3	4	5	6
25. I have the impulse (urge or desire) to vomit after meals.	1	2	3	4	5	6
26. I enjoy trying new rich foods.	1	2	3	4	5	6

Appendix K: Binge Eating Scale (BES; Gormally et al., 1982)

The following questionnaire is about eating. Please read **ALL** statements for each question. Once you have read each statement, *Circle the answer (letter) that sounds most like you.*

1	a	I don't feel self-conscious about my weight or body size when I'm with others.
	b	I feel concerned about how I look to others, but it normally does not make me feel disappointed with myself.
	c	I get self-conscious about my appearance and weight which makes me feel disappointed in myself.
	d	I feel very self-conscious about my weight and frequently, I feel intense shame and disgust for myself. I try to avoid social contacts because of my self-consciousness.
2	a	I don't have any difficulty eating slowly in the proper manner.
	b	Although I seem to "gobble down" foods, I don't end up feeling stuffed because of eating too much.
	c	At times, I tend to eat quickly and then, I feel uncomfortably full afterwards.
	d	I have the habit of bolting down my food without really chewing it. When this happens I usually feel uncomfortably stuffed because I've eaten too much.
3	a	I feel capable of controlling my eating urges when I want to.
	b	I feel like I have failed to control my eating more than the average person.
	c	I feel utterly helpless when it comes to feeling in control of my eating urges.
	d	Because I feel so helpless about controlling my eating I have become very desperate about trying to get in control.
4	a	I don't have a habit of eating when I'm bored.
	b	I sometimes eat when I'm bored, but often I'm able to 'get busy' and get my mind off food.
	c	I have a regular habit of eating when I'm bored, but occasionally, I can use some other activity to get my mind off eating.
	d	I have a strong habit of eating when I'm bored. Nothing seems to help me break the habit.

- 5** a I'm usually physically hungry when I eat something.
- b Occasionally, I eat something on impulse even though I really am not hungry.
- c I have the regular habit of eating foods, that I might not really enjoy to satisfy a hungry feeling even though physically, I don't need the food.
- d Even though I'm not physically hungry, I get a hungry feeling in my mouth that only seems to be satisfied when I eat a food, like a sandwich, that fills my mouth. Sometimes, when I eat the food to satisfy my mouth hunger, I then spit the food out so I won't gain weight.
-
- 6** a I don't feel any guilt or self-hate after I overeat.
- b After I overeat, occasionally I feel guilt or self-hate.
- c Almost all the time I experience strong guilt or self-hate after I overeat.
-
- 7** N/A – these situations do not apply to me because I do not diet.
- a I don't lose total control of my eating when dieting even after periods when I overeat.
- b Sometimes when I eat a 'forbidden food' on a diet, I feel like I 'blew it' and eat even more.
- c Frequently, I have the habit of saying to myself, 'I've blown it now, why not go all the way' when I overeat on a diet. When that happens I eat even more.
- d I have a regular habit of starting strict diets for myself, but I break the diets by going on an eating binge. My life seems to be either a 'feast' or 'famine'.
-
- 8** a I rarely eat so much food that I feel uncomfortably stuffed afterwards.
- b Usually about once a month, I eat such a quantity of food, I end up feeling very stuffed.
- c I have regular periods during the month when I eat large amounts of food, either at mealtime or at snacks.
- d I eat so much food that I regularly feel quite uncomfortable after eating and sometimes a bit nauseous.
-

-
- 9**
- a My level of calorie intake does not go up very high or go down very low on a regular basis.
 - b Sometimes after I overeat, I will try to reduce my caloric intake to almost nothing to compensate for the excess calories I've eaten.
 - c I have a regular habit of overeating during the night. It seems that my routine is not to be hungry in the morning but overeat in the evening.
 - d I have had week long periods where I practically starve myself. This follows periods when I overeat. It seems I live a life of either 'feast or famine'.
-
- 10**
- a I usually am able to stop eating when I want to. I know when 'enough is enough'.
 - b Every so often, I experience a compulsion to eat which I can't seem to control.
 - c Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.
 - d I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.
-
- 11**
- a I don't have any problem stopping eating when I feel full.
 - b I usually can stop eating when I feel full but occasionally overeat leaving me feeling uncomfortably stuffed.
 - c I have a problem stopping eating once I start and usually I feel uncomfortably stuffed after I eat a meal.
 - d Because I have a problem not being able to stop eating when I want, I sometimes have to induce vomiting to relieve my stuffed feeling.
-
- 12**
- a I seem to eat just as much when I'm with others (family, social gatherings) as when I'm by myself.
 - b Sometimes, when I'm with other persons, I don't eat as much as I want to eat because I'm self-conscious about my eating.
 - c Frequently, I eat only a small amount of food when others are present, because I'm very embarrassed about my eating.
 - d I feel so ashamed about overeating that I pick times to overeat when I know no one will see me. I feel like a 'closet eater'.
-

- 13** a I eat three meals a day with only an occasional between meal snack.
- b I eat 3 meals a day, but I also normally snack between meals.
- c When I am snacking heavily, I get in the habit of skipping regular meals.
- d There are regular periods when I seem to be continually eating, with no planned meals.
- 14** a I don't think much about trying to control unwanted eating urges.
- b At least some of the time, I feel my thoughts are pre-occupied with trying to control my eating urges.
- c I feel that frequently I spend much time thinking about how much I ate or about trying not to eat anymore.
- d It seems to me that most of my waking hours are pre-occupied by thoughts about eating or not eating. I feel like I'm constantly struggling not to eat.
- 15** a I don't think about food a great deal.
- b I have strong cravings for food but they last only for brief periods of time.
- c I have days when I can't seem to think about anything else but food.
- d Most of my days seem to be pre-occupied with thoughts about food. I feel like I live to eat.
- 16** a I usually know whether or not I'm physically hungry. I take the right portion of food to satisfy me.
- b Occasionally, I feel uncertain about knowing whether or not I'm physically hungry. At these times it's hard to know how much food I should take to
- c Even though I might know how many calories I should eat, I don't have any idea what is a 'normal' amount of food for me.

Appendix L: Priority of Family Meals (Project EAT, Neumark-Sztainer et al, 2004)

-
- | | | |
|----|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1. | During the past 7 days, how many times did all, or most of your family living in your house eat a meal together? | 1) Never
2) 1 or 2 times
3) 3 or 4 times
4) 5 or 6 times
5) 7 times
6) More than 7 times |
| 2. | On how many of the past 7 days was at least one of your parents in the room with you when you ate dinner? | 1) Never
2) 1 to 2 days
3) 3 to 4 days
4) 5 to 6 days
5) Everyday |
-

	Strongly Disagree	Disagree	Agree	Strongly Agree
3. In my family, it is important that the family eat at least one meal a day together.	1	2	3	4
4. In my family, we are expected to be home for dinner.	1	2	3	4
5. I am often just too busy to eat dinner with my family.	1	2	3	4
6. In my family, different schedules make it hard to eat meals together on a regular basis.	1	2	3	4
7. In my family, it is often difficult to find a time when family members can sit down to a meal together.	1	2	3	4

Appendix M: Family APGAR (Smilkstein et al., 1982)**INSTRUCTIONS:**

These questions are about your family. Read each sentence and then decide how often you feel that way about your family. You can answer **HARDLY EVER**, **SOME OF THE TIME**, or **ALMOST ALWAYS**. Please circle the number that matches your answer. Use the definitions below for words you don't understand.

Definitions:

Satisfied: when you feel happy with something

Turn to: someone you can ask for help

Troubling: When something is upsetting you or making you unhappy

Expressed: Showed, displayed, or to let you see something

	Hardly ever	Some of the time	Almost always
1. I am satisfied that I can turn to my family for help when something is troubling me.	0	1	2
2. I am satisfied with the way my family talks things over with me and shares problems with me.	0	1	2
3. I am satisfied that my family accepts and supports my wishes to take on new activities or directions.	0	1	2
4. I am satisfied with the way my family expresses affection, and responds to my emotions, such as anger, sorrow, or love.	0	1	2
5. I am satisfied with the quality of time my family and I share together.	0	1	2

Appendix N: Multimedia Influence Scale (MMIS; Cusumano and Thompson, 2001)

This questionnaire is about television, magazines, and movies. You need to decide how much you agree or disagree with the statement. Please circle your response.

	strongly disagree	mostly disagree	mostly agree	strongly agree
1. I learn how to look attractive (pretty) by watching TV.	1	2	3	4
2. When I watch sports on TV, I compare my body to the bodies of the athletes.	1	2	3	4
3. Watching movies makes me feel that attractive people are more successful than unattractive people.	1	2	3	4
4. I would like my body to look like the bodies of people in the movies.	1	2	3	4
5. Watching movies gives me ideas about how to be attractive.	1	2	3	4
6. Looking at magazines makes me want to change the way I look.	1	2	3	4
7. I compare my body to the bodies of athletes that I see in magazines.	1	2	3	4
8. Reading magazines makes me want to lose or gain weight.	1	2	3	4
9. I get hints (ideas) about how to look attractive by reading magazines.	1	2	3	4
10. Watching TV shows makes me believe that thin people are more successful than overweight people.	1	2	3	4
11. Reading magazines makes me want to change my appearance (the way I look).	1	2	3	4
12. I learn how to look attractive by watching movies.	1	2	3	4
13. I would like to look like people in magazines.	1	2	3	4
14. Watching TV gives me ideas about how to improve my appearance.	1	2	3	4

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