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Dieting and unhealthy weight control behaviors during adolescence: Associations with 10-year changes in body mass index

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Abstract

Background—Dieting and unhealthy weight control behaviors are common among adolescents and questions exist regarding their long-term effect on weight status.

Objective—To examine 10-year longitudinal associations between dieting and unhealthy weight control behaviors and changes in body mass index (BMI) from adolescence to young adulthood.

Methods and Procedures—A diverse population-based sample of middle school and high school adolescents was followed for 10 years. Participants (N=1,902) completed surveys in 1998–99 (Project EAT-I), 2003–04 (Project EAT-II), and 2008–09 (Project EAT-III). Dieting and unhealthy weight control behaviors at Time 1 and Time 2 were used to predict 10-year changes in BMI at Time 3, adjusting for sociodemographic characteristics and Time 1 BMI.

Results—Dieting and unhealthy weight control behaviors at both Time 1 and Time 2 predicted greater BMI increases at Time 3 in males and females, as compared to no use of these behaviors. For example, females using unhealthy weight control behaviors at both Time 1 and Time 2 increased their BMI by 4.63 units as compared to 2.29 units in females not using these behaviors ($p < .001$). Associations were found in both overweight and non-overweight respondents. Specific weight control behaviors at Time 1 that predicted larger BMI increases at Time 3 included skipping meals and reporting eating very little (females and males), use of food substitutes (males), and diet pill use (females).

Conclusions—Findings clearly indicate that dieting and unhealthy weight control behaviors, as reported by adolescents, predict significant weight gain over time.

Keywords

Dieting; disordered eating; eating behaviors; weight status; weight

The high prevalence of obesity among adolescents and young adults and its health consequences have made obesity prevention efforts a public health priority [1–3].

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Furthermore, many young people are concerned about their body shape and size due to social pressures to conform to a thin body ideal [4–8]. The media is replete with messages on the latest diets and quick fixes for weight loss. As a consequence, many young people cycle on and off diets and engage in unhealthy weight control behaviors [9].

An important question regards the long-term impact of dieting and use of unhealthy weight control behaviors on weight status. Longitudinal research has shown that these behaviors are predictive of weight gain over time in most [10–19], but not all [20] studies. However, we are aware of only one such study that followed adolescents through adulthood. Viner and Cole followed respondents from age 16 to 30 and found that dieting predicted increases in BMI, but did not examine specific weight control behaviors [17].

Explanations for these associations remain unclear. Some researchers have suggested that the association between dieting and weight gain is, at least partially, of a causal nature, in that dieting may be used instead of more lifelong healthful eating and physical activity patterns, and also may be interspersed with binge eating episodes, thus leading to weight gain [11, 21, 22]. Others have argued that dieting is a proxy marker for a tendency to overeat, and without dieting individuals would gain even more weight [23]. If the association between dieting and unhealthy weight control behaviors and weight gain is causal, then we would expect the consistent use of these behaviors to predict larger weight gains over time. In contrast, if the use of dieting and unhealthy weight control behaviors is a proxy for overeating and is playing a protective role for weight gain, then we would expect to see the greatest weight gains among individuals who stop using these behaviors.

It is of interest to examine whether the effects of dieting and unhealthy weight control behaviors differ by the initial weight status of young people as associations may differ for overweight and non-overweight youth. We are unaware of other population-based samples that have examined long-term longitudinal associations between weight control practices and weight change by weight status. It is also of interest to examine longitudinal associations between specific types of weight control typically classified as unhealthy and weight changes over time. Data regarding the effectiveness, or lack thereof, of specific behaviors can help in guiding young people interested in weight management.

This study addresses the following research questions: 1) Do dieting and unhealthy weight control behaviors in adolescence predict changes in body mass index (BMI) over a 10-year period?; 2) How do associations differ when these behaviors are persistently reported as compared to when they are discontinued or initiated at five-year follow-up?; 3) Do associations differ by baseline weight status of young people?; and 4) What specific behaviors predict changes in BMI? We hypothesized that persistent dieting and unhealthy weight control behaviors would predict BMI increases in both overweight and non-overweight respondents.

METHODS

Study Design and Population

This study includes data from three waves of Project EAT (Eating and Activity in Teens and Young Adults), a 10-year longitudinal study examining dietary intake, physical activity, and weight-related variables in young people. In Project EAT-I (1998–1999), middle school and high school students from the Minneapolis/St. Paul metropolitan area of Minnesota completed surveys and anthropometric measures [24, 25]. Five years later (2003–2004; Project EAT-II), original participants were mailed follow-up surveys to examine changes as they progressed through adolescence [18, 26]. Project EAT-III followed participants again in 2008–2009, using online surveys with a paper survey option, as they progressed from

adolescence to young adulthood [27, 28]. The University of Minnesota's Institutional Review Board Human Subjects Committee approved all protocols.

There were 1,902 young adults who responded at all three time points (819 males and 1,083 females). At baseline, one third of these participants were in early adolescence (mean age = 12.8 ± 0.7 years); at 10-year follow-up their mean age was 23.2 ± 1.0 years. Two thirds of participants began the study during middle adolescence (mean age = 15.9 ± 0.8 years); at 10-year follow-up their mean age was 26.2 ± 0.9 years.

Survey Development and Measures

The Project EAT-I survey was developed based upon focus groups with adolescents [29], literature reviews, content reviews by multi-disciplinary experts and adolescents, and pilot tests. To allow for longitudinal comparisons, key items from earlier study waves (Projects EAT-I and EAT-II) were retained on the Project EAT-III survey, while some revisions were made to capture new areas of interest. The Project EAT-III survey was pre-tested by 27 young adults in focus groups and examined for test-retest reliability over a 1–3 week period with 66 young adults [27]. Measures used in the current analysis are described below.

Dieting was assessed with the question “How often have you gone on a diet during the last year? By ‘diet’ we mean changing the way you eat so you can lose weight.” Responses included : never, one to four times, five to 10 times, more than 10 times, and I am always dieting. As in previous analyses [18], responses were dichotomized into nondieters (never) and dieters (other responses) (Test-retest agreement = 97%).

Unhealthy weight control behaviors included specific behaviors that are not typically recommended for weight management and were assessed with the question: “Have you done any of the following things in order to lose weight or keep from gaining weight during the past year?” Behaviors included: 1) fasted, 2) ate very little food, 3) used a food substitute (powder or a special drink), 4) skipped meals, 5) smoked more cigarettes, 6) took diet pills, 7) made myself vomit, 8) used laxatives, and 9) used diuretics. (yes/no for each method; test-retest agreement=83%).

Body mass index (BMI) and change in BMI were assessed using self-reported height and weight, from which BMI (kg/m^2) was calculated. Change in BMI was calculated as the difference between the Time 3 and Time 1 BMI measurements. At Time 3, self-report of height and weight were validated in a systematically stratified subsample of 63 male and 62 female participants for whom height and weight measurements were completed by trained research staff. Although self-reported BMI values were approximately one unit lower than measured values, results showed very high correlations between self-reported BMI and measured BMI in males ($r=0.95$) and females ($r=0.98$). Similarly, at Time 1 where measured heights and weights were conducted on all participants there was good agreement between self-reported and measured BMI [30]. Because we are focused on changes in BMI, for comparability we used self-reported measures from both time points in the analysis, hence the correlation is what is important, rather than the absolute numbers.

Gender, race/ethnicity, socioeconomic status (SES), and age/cohort were based on self-report at Time 1 [24].

Statistical Analysis

For the current analysis, we deleted pregnant women ($n=75$) and respondents who had missing BMI data at one of the three time points or missing data for dieting or unhealthy weight control behaviors at Time 1 or Time 2, for a final analytic sample of 1714 (774 male and 940 female respondents). Individuals were categorized, separately for dieting and

unhealthy weight control behaviors, based on their longitudinal pattern of behaviors from Time 1 to Time 2: 1) not doing the behavior at either time point (no use); 2) not doing the behavior at Time 1 but doing at Time 2 (starters); 3) doing the behavior at Time 1 but not at Time 2 (stoppers); and 4) doing the behavior at both time points (persistent use). Percentages of individuals in each category are presented. The simple unadjusted means and standard deviations for Time 1 BMI and 10-year change in BMI are presented for each weight control pattern category. Multiple linear regressions were used to obtain estimates of 10-year change in BMI for each weight control category adjusted for potential confounders of ethnicity/race, SES, age cohort and Time 1 BMI. We conducted additional multiple linear regression analyses stratified by baseline weight status (non-overweight vs. overweight/obese) to confirm that effects found for persistent versus no use of weight control behaviors on change in BMI were consistent across baseline weight status. These analyses similarly adjusted for sociodemographics and Time 1 BMI. When examining the specific weight control behaviors, only the Time 1 behavior was used as a predictor rather than longitudinal pattern of behaviors from Time 1 to Time 2 because of small cell sizes for some of these behaviors. All analyses were stratified by gender and performed in SAS 9.2 (SAS Institute Inc., Cary, NC).

Weighting and Sample Demographics

Because attrition from the original Time 1 sample (N=4,746) did not occur at random, in all analyses, the data were weighted using the response propensity method [31]. Response propensities (i.e., the probability of responding to the Project EAT-III survey) were estimated using a logistic regression of response at both Time 2 and Time 3 on a large number of predictor variables from the Project EAT-I survey. Weights were additionally calibrated so that the weighted total sample sizes used in analyses for each gender cohort accurately reflect the actual observed sample sizes in those groups. The weighting method resulted in estimates representative of the demographic make-up of the original school-based sample, thereby allowing results to be more fully generalizable to the population of young people in the Minneapolis/St. Paul metropolitan area. Specifically, with regard to ethnicity/race, the weighted sample was 49.7% white, 17.7% African American, 18.7% Asian, 5.5% Hispanic, 3.2% Native American, and 5.3% mixed, other or missing.

RESULTS

Dieting and unhealthy weight control behaviors at Time 1 and Time 2

Dieting and unhealthy weight control behaviors were prevalent, particularly in females (Table 1). Among females, 37.8% reported persistent dieting (use at both Time 1 and Time 2) and 43.7% reported persistent use of unhealthy weight control behaviors. In males, 10.3% reported persistent dieting and 18.7% reported persistent use of unhealthy weight control behaviors.

Changes in BMI by dieting and unhealthy weight control behaviors

Females and males engaging in dieting and unhealthy weight control behaviors at both Time 1 and Time 2 had higher BMI values at the beginning of the study, and had larger BMI increases by Time 3, as compared to those who did not diet or engage in unhealthy weight control behaviors (Tables 2 and 3).

Among females (Table 2), in analyses adjusted for sociodemographic characteristics and baseline BMI, persistent dieters increased their BMI more than non-dieters over the 10-year study period (4.33 vs. 2.38 BMI units; $p < .001$). To a lesser extent, dieting at only one time point also predicted greater weight gain over time than not dieting. Persistent use of unhealthy weight control behaviors predicted larger increases in BMI over 10 years, as

compared to no unhealthy weight control behaviors or use of these behaviors at one time point only. Female persistent users of unhealthy weight control behaviors showed an increase of 4.63 BMI units as compared to an increase of 2.29 BMI units among females who did not engage in unhealthy weight control behaviors ($p<.001$).

Among males (Table 3), in adjusted analyses, persistent dieting was also predictive of the greatest increase in BMI over the 10-year study period. Male persistent dieters showed an increase of 6.96 BMI units as compared to 3.45 BMI units among non-dieters ($p<.001$). Male persistent dieters also had significantly greater gains than those who dieted only at Time 1 or Time 2. Of note, males who stopped dieting (dieted at Time 1 but not Time 2) did not gain any more weight than the non-dieters. In adjusted analyses, persistent use of unhealthy weight control behaviors predicted larger increases in BMI over 10 years, as compared to no use of unhealthy weight control behaviors or use of these behaviors at one time point only. Male persistent users of unhealthy weight control behaviors increased their BMI by 5.42 units as compared to 3.65 units among males who did not use unhealthy weight control behaviors ($p<.001$).

Associations across weight status

Persistent dieting and use of unhealthy weight control predicted greater increases in BMI in respondents who were overweight and those who were not overweight at Time 1 (Table 4). Of particular concern, were the large increases in BMI found among respondents who were overweight at Time 1 and who reported dieting or unhealthy weight control behaviors. For example, among overweight adolescent females, those who used unhealthy weight control behaviors at both Time 1 and Time 2 increased their BMI by 5.19 units over the 10-year study period as compared to an increase of only 0.15 BMI units among overweight adolescent girls who did not use any unhealthy weight control behaviors.

Changes in BMI by specific unhealthy weight control behaviors

Associations between specific weight control behaviors at Time 1 and changes in BMI over the 10-year study period were examined (Table 5). Findings indicate that these behaviors are not effective in long-term weight management. Eating very little and skipping meals were by far the most commonly reported behaviors, and both behaviors predicted statistically significant larger increases in BMI in females and males. Additionally, use of food substitutes predicted increases in BMI in males and diet pill use predicted increases in BMI in females. The only behavior found to significantly predict lower amounts of weight gain was diuretic use in males, but the small number of males using diuretics ($n=7$) limits the interpretability of this finding.

DISCUSSION

Findings from the current study raise concerns about the high prevalence of dieting and unhealthy weight control behaviors in adolescents, particularly females, and the implications of these behaviors for weight gain over time. Persistent use of dieting and unhealthy weight control behaviors longitudinally predicted greater increases in BMI from adolescence to young adulthood in both overweight and non-overweight respondents. Of concern, was the large magnitude of the BMI increases associated with the use of these behaviors. Specific weight control behaviors used during adolescence that predicted large increases in BMI at ten-year follow-up included skipping meals and reporting eating very little (females and males), use of food substitutes (males), and diet pill use (females). It is crucial to find ways to steer young people away from these ineffective and potentially harmful weight control behaviors, and provide support for the adoption of healthful eating and physical activity behaviors that can be implemented on a long-term basis.

An important question raised in the literature is why we see associations between dieting and weight gain [19, 21, 23, 32, 33]. “Dieting” or “going on a diet” are somewhat ambiguous terms, and lend themselves to different interpretations by adolescents and researchers. In a qualitative study involving 25 focus groups, adolescents were asked: “What does the term diet mean to you? What do you and your friends do when you diet?” Responses indicated a variety of interpretations; dieting was described in terms of healthy behaviors (e.g., eating more fruit) and unhealthy behaviors (e.g., starvation, not eating), but also in non-behavioral terms (e.g., interested in losing weight, planning for behavioral change) [34]. Along these same lines, Larsen and colleagues have reported that it may be important to distinguish between intentions to restrict food intake and actual restrictive behaviors [35], both of which may get reported by adolescents as “dieting”. It may be that the vast majority of youth who indicate that they have dieted, have engaged in “unsuccessful” dieting or failed attempts at restricting their dietary intakes over extended periods of time. Finally, researchers have proposed that dieting may be a proxy or marker for a tendency towards overeating and/or weight gain and that if dieters stopped their behaviors, they would gain more weight over time [23, 36]. We were able to partially address this question in that we examined and compared weight gain trajectories among young people who reported that they stopped dieting halfway throughout the study and those who reported that they persisted in their dieting behaviors. In no cases did we find that “stopping dieting” was associated with greater weight gains over time than persistent efforts to diet. In fact, males who dieted at Time 1 but not at Time 2 (i.e., stoppers) had much lower weight gains than the persistent dieters and similar weight gains to the non-dieters. Thus, our findings do not lend support to the idea that dieting is a proxy for a tendency to overeat and that if one stops trying to diet, one will overeat and gain weight.

Previous research has suggested that dietary restraint may lead to increased disinhibition and overeating in the presence of large portion sizes [37, 38], which may, in turn, lead to weight gain over time. In working toward reducing obesity within a society in which a certain amount of dietary restraint is needed, given the ready accessibility to foods high in calories, the question then becomes how can we encourage restraint that will be helpful rather than harmful. Findings from the current study indicate that skipping meals, trying to eat very little, using food substitutes, and diet pills are not helpful and should be discouraged. In a previous analysis using our five-year follow-up data from Project EAT-II, we distinguished between adolescents reporting dieting without the use of specific unhealthy weight control behaviors (i.e., healthy dieting) and those using unhealthy weight control behaviors [18]. Among adolescent girls both healthy dieting and unhealthy weight control behaviors increased risk for weight gain over time, whereas in boys the picture was less clear-cut. Given that dieting or attempts to “undereat” are not sustainable over the long-term for most individuals, Herman and colleagues have suggested a shift toward decreasing overeating tendencies, as an alternative to dietary restraint [39]. For example, clinicians can focus on identifying individuals at risk for external or emotional overeating and intervening to help reduce these overeating tendencies through some type of behavioral therapy. In a four-year longitudinal study, Field and colleagues [40] found that limiting portion sizes, in conjunction with frequent physical activity, was the most successful strategy for weight gain prevention. Additional strategies that may be effective include the consumption of foods that have higher nutrient density and foods that lead to a greater feeling of satiety, but have lower caloric values. Efforts to encourage the consumption of appropriate portion sizes and healthier food options through educational efforts with youth and changes in the food and restaurant industries may be effective vehicles for reducing the need for unhealthy restraint, and for promoting healthy weight management.

Strengths of the current study, study limitations, and strategies for addressing these limitations, should be taken into account in interpreting the findings. Important study

strengths include the ten-year follow-up period that captured a critical transitional period between adolescence and young adulthood, a diverse study population, and the assessment of different types of weight control behaviors. Although respondents reporting dieting and unhealthy weight control behaviors at both Time 1 and Time 2 are called persistent dieters or users, we only have data at five-year intervals, thus we cannot be sure about the persistency of the use of these behaviors between assessments. For example, individuals may have stopped and started weight control behaviors in between the assessments, and these patterns may not have been detected. However, had we been able to better measure persistency of behaviors, with more data points and more questions on frequency and duration of use of behaviors, we would expect to have seen less diluted, and thus stronger associations. The use of self-reported height and weight data at follow-up is a study limitation and it would have been preferable to have measured heights and weights. However, as previously described, our substudy at Time 3 showed high correlations between measured and self-reported BMI ($r=.95-.98$). Finally, although the population-based nature of the sample allows for more generalization than is possible from clinical samples, the population was drawn from one urban area and there was attrition from the sample over time. The sample was weighted to allow for generalization back to the original sample and no differences were found between the full original sample and the final weighted sample of responders in terms of mean baseline BMI (p-values =.63 and .81 for females and males, respectively); percentage of unhealthy weight control behaviors at baseline (p-values=.97 and .61 for females and males, respectively) and baseline dieting (p-values=.87 and .60 for females and males, respectively). Thus, our weighting procedures were successful, minimizing concerns about any impact of attrition on the results of this analysis.

Implications for research and practice

Study findings strongly suggest the futility and counter-productivity of dieting attempts and unhealthy weight control practices for long-term weight management for the majority of adolescents. Research is needed to further explore why for some adolescents dieting and unhealthy weight control behaviors lead to excessive weight loss and eating disorders, while for most adolescents these behaviors lead to weight gain over time. Intervention research is needed to assess whether helping adolescents substitute dieting and unhealthy weight control behaviors with healthier behavioral patterns results in long-term improvements in weight status. Research should also explore what young people mean when they say that they are dieting, and whether this has changed since the aforementioned study [34], given that over the past decade there has been greater discussion about weight-related topics. Likewise, within practice settings, health care providers working with adolescents who report that they are dieting should try to determine what exactly is meant by this behavior, and intervene accordingly. We suspect that many reports of dieting are actually unsuccessful and short-term efforts at food restrictions. Given the high prevalence of unhealthy weight control behaviors (e.g., skipping meals), and the associations between these practices and long-term weight gain, it is important to discourage these practices. Health care practitioners can play an important role in directing adolescents away from these ineffective, and potentially harmful, weight control practices.

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Table 1Dieting and unhealthy weight control behaviors (WCB) at Time 1 and Time 2.^{1,2}

	Females N=940		Males N=774	
	N	%	N	%
Dieting				
No	253	27.1	461	59.7
Starter	163	17.4	118	15.3
Stopper	166	17.7	113	14.7
Persistent dieter	354	37.8	80	10.3
Unhealthy WCB				
None	215	22.9	411	53.2
Starter	184	19.6	113	14.6
Stopper	130	13.8	104	13.5
Persistent user	411	43.7	145	18.7

¹Weighted numbers and percentages – respondents were included only if they had complete data for the behavior at Time 1 and Time 2 and BMI at Time 1 and Time 3.

²Respondents are categorized as follows:

No/None: did not report behavior at Time 1 or Time 2

Starter: reported behavior at Time 2 but not at Time 1

Stopper: reported behavior at Time 1 but not at Time 2

Persistent user: reported behavior at Time 1 and Time 2

Table 2

Females: BMI and 10-year changes in BMI by dieting and unhealthy weight control behaviors¹

	N	Unadjusted Time 1 BMI Mean (SD)	Unadjusted 10-year increase in BMI Mean (SD)	Adjusted 10-year increase in BMI Mean (SE) ^{2,3}	p-value ⁴
Dieting					
No	253	20.8 (3.7)	2.78 (3.79)	2.38 (0.32) ^a	-
Starter	163	21.7 (3.8)	3.68 (4.69)	3.49 (0.37) ^b	.022
Stopper	166	22.5 (5.1)	3.86 (5.28)	3.78 (0.37) ^b	.004
Persistent dieter	354	24.0 (5.2)	4.03 (5.21)	4.33 (0.26) ^b	<.001
Unhealthy weight control behaviors					
None	215	20.5 (3.6)	2.78 (3.79)	2.29 (0.33) ^a	-
Starter	184	21.9 (3.6)	3.68 (4.69)	3.49 (0.35) ^b	.011
Stopper	130	22.3 (4.9)	3.86 (5.28)	2.62 (0.42) ^{ab}	.526
Persistent user	411	23.9 (5.3)	4.03 (5.21)	4.63 (0.25) ^c	<.001

¹ Respondents are categorized as follows:

No/None: did not report behavior at Time 1 or Time 2

Starter: reported behavior at Time 2 but not at Time 1

Stopper: reported behavior at Time 1 but not at Time 2

Persistent user: reported behavior at Time 1 and Time 2

² Adjusted for ethnicity/race, SES, age cohort, and Time 1 BMI

³ Different superscripts indicate statistically significant differences (p<.05) between groups

⁴ p-values are for comparisons with no dieting or unhealthy WCB for adjusted 10-year increases in BMI

Table 3

Males: BMI and 10-year changes in BMI by dieting and unhealthy weight control behaviors¹

	N	Unadjusted Time 1 BMI Mean (SD)	Unadjusted 10-year increase in BMI Mean (SD)	Adjusted 10-year increase in BMI Mean (SE) ^{2,3}	p-value ⁴
Dieting					
No	461	21.1 (3.2)	3.82 (3.01)	3.45 (0.18) ^a	-
Starter	118	23.0 (4.0)	4.91 (3.35)	4.88 (0.32) ^b	<.001
Stopper	113	24.5 (5.6)	2.73 (5.37)	3.24 (0.34) ^a	.592
Persistent dieter	80	26.8 (5.6)	5.79 (5.15)	6.96 (0.41) ^c	<.001
Unhealthy weight control behaviors					
None	411	21.2 (3.1)	3.85 (2.99)	3.65 (0.18) ^a	-
Starter	113	24.0 (4.5)	3.77 (3.80)	4.04 (0.34) ^a	.311
Stopper	104	22.4 (4.5)	3.89 (3.78)	3.79 (0.35) ^a	.713
Persistent user	145	25.2 (6.3)	4.89 (5.94)	5.42 (0.33) ^b	<.001

¹ Respondents are categorized as follows:

No/None: did not report behavior at Time 1 or Time 2

Starter: reported behavior at Time 2 but not at Time 1

Stopper: reported behavior at Time 1 but not at Time 2

Persistent user: reported behavior at Time 1 and Time 2

² Adjusted for ethnicity/race, SES, age cohort, and Time 1 BMI

³ Different superscripts indicate statistically significant differences (p<.05) between groups

⁴ p-values are for comparisons with no dieting or unhealthy WCB for adjusted 10-year increases in BMI

Table 4

Changes in BMI by dieting and unhealthy weight control behaviors (WCB)¹ in non-overweight and overweight respondents

	Not overweight at Time 1 (BMI < 85 th percentile)			Overweight at Time 1 (BMI ≥ 85 th percentile)		
	N	Adjusted 10-year increase in BMI ² M (SE)	p-value	N	Adjusted 10-year increase in BMI ² M (SE)	p-value
<u>Females:</u>						
Dieting						
No	218	2.64 (0.26)	<.001	35	1.64 (1.15)	.024
Persistent dieter	216	4.06 (0.25)		138	4.47 (0.59)	
Unhealthy WCB						
No	192	2.86 (0.27)	<.001	23	0.15 (1.40)	<.001
Persistent user	265	4.25 (0.23)		146	5.19 (0.60)	
<u>Males:</u>						
Dieting						
No	402	3.97 (0.14)	<.001	59	2.16 (0.69)	.002
Persistent dieter	24	7.35 (0.57)		56	5.22 (0.66)	
Unhealthy WCB						
No	357	4.08 (0.15)	.002	54	2.48 (0.67)	.014
Persistent user	67	5.28 (0.36)		78	4.64 (0.61)	

¹ Respondents are categorized as follows:

No/none: did not report behavior at Time 1 or Time 2

Persistent user: reported behavior at Time 1 and Time 2

² Adjusted for ethnicity/race, socio-economic status, age cohort, and Time 1 BMI

Table 5
Adjusted 10-year changes in BMI by specific weight control behaviors at Time 1

	Females			Males		
	N	Adjusted 10-year increase in BMI ^a M (SE)	P-value	N	Adjusted 10-year increase in BMI ^a M (SE)	P-value
Less extreme behaviors						
Eat very little			.006			<.001
No	505	3.19 (0.22)		632	3.72 (0.15)	
Yes	435	4.07 (0.24)		141	5.47 (0.32)	
Skip meals			.002			.007
No	512	3.12 (0.22)		649	3.85 (0.15)	
Yes	422	4.14 (0.24)		123	4.83 (0.33)	
Fast			.409			.055
No	746	3.51 (0.18)		688	3.91 (0.14)	
Yes	180	3.84 (0.37)		85	4.73 (0.41)	
Food substitutes			.533			.003
No	841	3.54 (0.17)		732	3.90 (0.14)	
Yes	99	3.86 (0.49)		41	5.65 (0.56)	
Smoke cigarettes			.093			.480
No	850	3.49 (0.17)		737	3.98 (0.14)	
Yes	89	4.39 (0.51)		34	4.43 (0.62)	
More extreme behaviors						
Vomit			.876			.139
No	886	3.58 (0.17)		762	3.97 (0.14)	
Yes	54	3.48 (0.65)		12	5.55 (1.05)	
Diet pills			.011			.611
No	887	3.48 (0.17)		766	3.99 (0.14)	
Yes	53	5.20 (0.66)		8	4.63 (1.25)	
Laxatives			.380			.254
No	925	3.59 (0.17)		769	4.01 (0.14)	
Yes	13	2.41 (1.34)		5	2.18 (1.60)	
Diuretics			.803			.002

	Females			Males		
	N	Adjusted 10-year increase in BMI ¹ M (SE)	p-value	N	Adjusted 10-year increase in BMI ¹ M (SE)	p-value
No	931	3.58 (0.17)		766	4.03 (0.14)	
Yes	8	3.16 (1.67)		7	-0.28 (1.41)	

¹ Adjusted for ethnicity/race, socio-economic status, age cohort, and Time 1 BMI