

Correlates of weight loss and muscle-gaining behavior in 10- to 14-year-old males and females

Gail McVey, Ph.D.,* Stacey Tweed, B.Sc., and Elizabeth Blackmore, M.A.

Community Health Systems Resource Group, The Hospital for Sick Children, Toronto, Ontario, Canada M5G 1X8

Available online 10 June 2004

Abstract

Background. This study examined the influence of appearance and social acceptance esteem, awareness and internalization of media stereotypes, body size acceptance, and teasing on the weight loss and muscle-gaining behaviors of 10- to 14-year-old boys and girls.

Methods. Male ($n = 670$) and female ($n = 788$) students were drawn from one of four public senior middle schools (grades 6–8) in Southern Ontario as part of a longitudinal outcome-based study. Students' baseline self-report questionnaires, measuring the above variables, were analyzed for the purposes of this study.

Results. A higher percentage of girls reported engaging in weight loss behaviors, whereas a higher percentage of boys admitted to muscle gaining and the use of specific weight control methods such as laxative use and vomiting. Regression analyses revealed that internalization of media messages and body size acceptance were equally predictive of boys' weight loss and muscle-gaining behaviors, while teasing was found to also predict their muscle-gaining behavior. Among the girls, appearance esteem, internalization of media stereotypes, and body size acceptance were predictive of weight loss behaviors. None of the study variables were predictive of girls' muscle-gaining behavior.

Conclusions. Weight loss and muscle-gaining behaviors appear to have their onset in children as young as 10 years. The findings support the need for prevention programs that focus on media literacy and ways to decrease weight-based teasing in the school setting.

© 2004 The Institute For Cancer Prevention and Elsevier Inc. All rights reserved.

Keywords: Dieting; Muscle gain; Teasing; Self-esteem; Males

Introduction

A recent Canadian survey revealed that by grade 6, 1 in 4 girls and 1 in 10 boys have been on a diet [1]. Similarly, another study found that 61% of an Ontario sample of 400 girls in grades 7 and 8 reported dieting to lose weight, despite being within a healthy weight range [2]. Restrictive dieting in children can interfere with physical growth patterns [3], lead to overeating and weight gain [4], or set the stage for the development of disordered eating and eating disorders [5,6].

It is well documented that the identification of determinants for risky behaviors is essential for the development of effective prevention and health promotion strategies [7]. In fact, the risk literature recommends that risk (and protective) factors be identified for specific life transitions. The early

adolescent transition has been identified as a period of high risk for the development of body image concerns and disordered eating among females [8]. For example, research examining eating problems from a developmental perspective [9] has shown that the normative challenges associated with early adolescence can trigger the onset of body image concerns and unhealthy dieting for girls (e.g., natural increases in body weight and fat associated with puberty, peer pressure to diet, onset of romantic relationships, increases in academic expectations). In addition to normative factors, peer likeability, peer modeling, and weight-based teasing have also been linked to dieting behavior in adolescent girls [10–15]. Other research has identified protective influences against disordered eating during the early adolescence transition. For example, one study found that the negative influence of low physical appearance competence on disordered eating was attenuated for middle school girls who placed low, as compared to high, levels of importance on physical appearance [2]. Likewise, paternal support was found to have a protective function against

* Corresponding author. Community Health Systems Resource Group, The Hospital for Sick Children, 555 University Avenue, Toronto, Ontario, Canada M5G 1X8. Fax: +1-416-813-6011.

E-mail address: gail.mcvvey@sickkids.ca (G. McVey).

disordered eating for those girls who experienced high, as compared to low, levels of school-related negative events. Findings from the aforementioned risk and protective research have assisted in the development of effective prevention programs aimed at reducing eating problems among girls of this age group [16,17].

With the exception of studies demonstrating a link between high BMI and disordered eating among males [18,19], little is known about what other factors might play a role in the development of disordered eating, or other body-change strategies, among young males. Adolescent, rather than younger, males have been the main focus of research in this area. For example, one study found that anxiety, ineffectiveness, self-esteem, and perfectionism all predicted male disordered eating [20]. Other studies conducted with adolescent males (grades 7–10) found that negative affect had a unique influence on their body-change strategies [21], and that a drive for muscularity was linked to their perceived popularity with peers [22], low self-esteem and depression [23], and to feedback received from a best male friend (e.g., encouragement to increase muscle tone) [21]. Furthermore, research has linked appearance-based teasing with body image dissatisfaction among adolescent males (grades 7–10) [24]. Longitudinal research has shown that the adoption of normative body-change strategies (such as muscle-gaining techniques) among males in early adolescence is associated with the use of more extreme body-change strategies (steroid use, performance-enhancing supplements) in adolescence [18,23]. As such, the importance of identifying factors that contribute towards the onset of normative body-change strategies among young males is crucial for the development of effective prevention.

Among young females, there is a dearth of research examining the factors that predict the onset of muscle-gaining behaviors. Most of the risk research conducted with early adolescent girls has focused almost exclusively on dieting or disordered eating as an outcome measure. One exception was a study which examined predictors of weight loss and muscle gain in younger male and female children (8–11 years) [19]. However, the outcome measures in that study included children's intentions to engage in body-change strategies (not their actual behaviors). Still, the findings of that study revealed that negative affect was found to be predictive of male and females' intentions to lose weight and gain muscle [19]. Positive affect appeared to play a protective function towards the development of those body-change strategies.

The present study is one of few to examine the combined effects of individual and sociocultural factors within a single research design. It is also one of the few to examine the influence of those variables on 10- to 14-year-old girls and boys and their strategies to gain muscle or to lose weight. The first goal of the study was to examine whether weight loss and muscle-gaining behaviors have their onset in children as young as 10–14 years of age; and to explore gender and grade difference in those

behaviors. A second goal was to examine the differential influence of the following variables on weight loss and muscle-gaining behavior: competence and importance ratings in physical appearance and social acceptance by peers, global self-worth, awareness and internalization of media stereotypes, knowledge of the negative influences of the media on body image, body size acceptance, and teasing.

Methodology

Study sample

Participants were 1458 male ($n = 670$) and female ($n = 788$) students in grades 6–8 (mean age = 11.74 years, SD = 0.93). The number of participants varied for each self-report measure, as some students did not complete all questions within the survey. No data was available on students who did not participate in the study. Participants represent those who completed the baseline questionnaire of a larger longitudinal study examining the effectiveness of a school-based comprehensive intervention program. Of those who reported, the majority of participants were Canadian born (66%), reported English as their first language (61%), and were living with two parents (78%). Approximately 38% were Caucasian, 26% were South Asian, 17% were Asian, 13% were African Canadian, and the remaining 14% identified themselves in the other category.

Additional information was collected as a means of better describing the profile of the sample. Self-reports of heights and weights were collected and a mean body mass index (BMI) score and percentile value was calculated for all participants. All students were within 10% of their ideal body weight for height and age (mean = 18.77, SD = 3.80) [25]. With respect to the female participants' perception of weight, 52% responded that they felt 'just right,' 17% felt they were 'underweight/somewhat underweight,' and 31% felt they were 'overweight/somewhat overweight.' Among the males, 56% felt they were 'just right,' 19% felt they were 'underweight/somewhat overweight,' and 25% felt they were 'overweight/somewhat overweight.' As a measure of pubertal status, 49% of females answered *yes* to the question "Have you had your first menstrual period?" No measure of puberty for males was included.

Sampling design

Once permission to conduct the study was granted from the participating school board, four schools within Southern Ontario were randomly selected and matched on size, geographic location, and cultural make-up. A letter was then sent home to parents of all students (grades 6–8) explaining the study's purpose and requesting written permission for their child's participation. Verbal assent

was also obtained from all of the student participants. The overall response rate was approximately 53%. Parents and students were informed that the purpose of the research was to evaluate children's attitudes and behaviors concerning self-acceptance, healthy eating, active living, and body image. Parents were given the opportunity to contact the researchers by telephone or attend parent information sessions. All students participating in the study were asked to complete the questionnaires in their regular classrooms. Verbal instructions for completing the questionnaires were given by one of the study authors with time to completion of the surveys being approximately 50 min.

Measures

Outcome variables

Weight loss and muscle-gaining behavior. Using a yes/no response format, participants were asked to answer the questions "Are you currently doing anything to lose weight?" and "Are you currently doing anything to gain muscle?" Those questions were evaluated as percentages of students endorsing the items. Other items were also used to measure which negative weight loss or muscle-gaining behaviors had been endorsed over the past month [e.g., exercising more to lose weight/gain muscle, lifting weights to gain muscle, skipping meals to lose weight, attending diet group/program, taking food supplements (including the use of steroids), etc.] [26].

Predictor variables

Competence in physical appearance and social acceptance by peers. The Self-Perception Profile For Children [27] was used to measure ratings of competence and importance in the domains of physical appearance and social acceptance by peers. An example of a competency item includes, "Some kids find it *hard* to make friends **BUT** other kids find it's pretty easy to make friends." An example of an importance item is "Some kids think it's important to be good looking in order to feel good about themselves **BUT** other kids don't think that's very important at all." For each item, participants were asked to choose which of the two statements most resembled them and then indicate whether that statement was "really true" or "sort of true." Each item was scored on a four point scale with 1 = *really negative*, 2 = *sort of negative*, 3 = *sort of positive*, 4 = *really positive*. Participants were compared on mean scores of each subscale. The scale has established validity as reported by the test authors [27] and reliability coefficients for all of the subscales ranged from 0.71 to 0.86.

Global self-worth. The Self-Perception Profile for Children [27] was also used to measure global self-worth. An example of a global self-worth item includes "Some kids

are happy with themselves as a person **BUT** other kids are often *not* happy with themselves." Items were scored as above and the scale demonstrated acceptable reliability ($\alpha = 0.78$).

Awareness and internalization of media stereotypes. Two subscales of the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ), awareness (six items) and internalization (eight items) of sociocultural stereotypes, were used in the present study [28]. *Awareness subscale:* Scores ranged from 6 to 30, with higher scores representing a greater awareness of media ideals and their social stereotypes ($\alpha = 0.78$). *Internalization subscale:* Scores ranged from 8 to 40 with higher scores representing a greater internalization of the media depicted images of the thin ideal ($\alpha = 0.89$). Previously in males, the awareness subscale has been further divided into two subtypes: *awareness of stereotypes* and *awareness of male muscle stereotypes* [28]; however, given the lower reliability of the muscle subscale in our sample ($\alpha = 0.51$), the total awareness subscale was used. Participants responded with how well they agreed with statements such as "I would like to look like the models in the magazines" and "Most people believe the thinner you are, the better you look," on a five-point scale ranging from 1 = *completely disagree*, 3 = *neither agree nor disagree*, to 5 = *completely agree*. Items were phrased to reflect influences relevant to male and female adolescents. This scale has established validity with adults [28], as well as with male and female adolescents [29].

Knowledge of the negative influence of media on body image. Knowledge of the negative influences of media on body satisfaction, dieting, and muscle gaining was measured with a four-item scale adapted from the SATAQ [29]. Participants responded with their level of agreement to statements such as "Pictures of thin girls and women make me wish that I were thin" (for females) or "Pictures of muscular men make me wish I were more muscular" (for males). Scores ranged from 4 to 16 with greater scores identifying those with greater knowledge of media influences. The reliability coefficient in this sample was 0.75.

Body size acceptance. An adapted four-item scale [29] from the Sociocultural Attitudes Towards Appearance Questionnaire [28] was used to assess students' acceptance of varying body shapes and sizes. Participants responded to items such as "I don't care if my friends are fat or thin" on a four-point scale, ranging from 1 = *strongly disagree* to 4 = *strongly agree*. Scores ranged from 4 to 16, with larger scores representing a greater tendency to accept a wide variety of body shapes and sizes. This scale demonstrated acceptable reliability ($\alpha = 0.63$).

Teasing. Perceptions of physical appearance/weight-based teasing were measured using a revised version of the

Perception of Teasing Scale (POTS) [30,31]. The 13-item self-report questionnaire is scored on a five-point scale with 1 = *never*, 3 = *sometimes*, and 5 = *very often*. Possible scores ranged from 13 to 65, with higher scores representing a greater frequency of perceived weight and shape teasing by others. Examples of items included “Other kids make jokes about you being too heavy” and “Other kids leave you out of things because you are too small or too thin.” The scale has demonstrated acceptable reliability and validity [30] with an alpha equal to 0.92 in the present sample.

Data analysis

Initial *t* tests were conducted to examine any grade or gender differences on the predictor variables. Given the number of significant differences for both gender and grade ($P > 0.05$), regression analyses were conducted separately for each gender and by grade. Chi-square analyses were used to assess the prevalence of weight loss and muscle-gaining behaviors by gender and grade. Following that, direct logistic regression analyses were performed separately for male and female participants by grade to identify correlates of dieting and muscle-gaining behaviors. Full models were tested for statistical reliability and included the following predictor variables: competence and importance ratings in physical appearance and social acceptance by peers, global self-worth, awareness and internalization of media stereotypes, knowledge of the negative influence of media on body image, body size acceptance, and teasing. Goodness of fit for each model was determined via the Hosmer–Lemeshow statistic. Individual correlates of the outcome measures were evaluated via Wald statistics, odds ratio (OR), and confidence intervals. A nonassociation exists between a predictor and dependent variable when the OR is equal to ‘1.’ Confidence intervals including ‘1’ represent nonsignificant relationships [32]. Individuals endorsing currently trying to lose weight or currently trying to gain muscle served as the respective reference groups.

Results

Before all analyses, independent *t* tests were performed on the data to determine if there were any school differences on body mass index, race, age, English as a first language, and menstrual status. All tests were nonsignificant.

Weight loss behaviors

Prevalence

Girls (31.1%) were significantly more likely than boys (24.5%) to be currently trying to lose weight [$\chi^2(1) = 7.64$, $P = 0.006$], with females reporting significant increases in trying to lose weight from grade 6 (29.8%) to grade 7 (32.4%), and from grade 6 to grade 8 (37.8%) [$\chi^2(2) = 6.54$,

$P = 0.038$]. In addition, the percentage of females who reported that they skipped meals to lose weight increased significantly from grade 6 (27.5%) to grade 8 (47.3%) and from grade 7 (25.2%) to grade 8 (47.3%) [$\chi^2(2) = 12.70$, $P = 0.002$]. Table 1 outlines the prevalence rates of weight loss behavior among the male and female participants. Interestingly, overall, boys reported significantly greater use of laxatives/diuretics (4.5%) and vomiting (5.2%) than did girls (1.9% and 1.8%, respectively; $P < 0.01$).

Correlates

Females

Tests of the full regression models against the constant only models were statistically reliable for each of the three grades. This indicated that, as a set, the predictors were able to reliably distinguish between female dieters and nondieters (are you currently trying to lose weight?) [grade 6: $\chi^2(12, N = 285) = 69.23$, $P < 0.001$; grade 7: $\chi^2(12, N = 227) = 51.05$, $P < 0.001$; grade 8: $\chi^2(12, N = 270) = 59.47$, $P < 0.001$] in approximately 80% of the cases. Logistic regression analyses conducted on grade 6, 7, and 8 girls separately found that BMI was positively correlated with weight loss in females across all grade levels ($P < 0.01$). In addition, internalization of sociocultural stereotypes was significantly and positively correlated with weight loss among female participants in grades 7 and 8 ($P = 0.02$), but not those in grade 6. Higher scores on the sociocultural awareness of media messages among girls in grade 6 ($P = 0.05$), low scores on size acceptance in girls in grade 7 ($P = 0.02$), and low physical

Table 1
Prevalence rates of weight loss and muscle-gaining behaviors in the past month

Weight loss	Girls		Boys		P value
	n	%	n	%	
<i>Weight loss behaviors</i>					
<i>Behavior</i>					
Trying to lose weight	238	31.1	156	24.5	0.006*
<i>Methods</i>					
Exercise	136	57.0	87	55.8	0.647
Diet pills	4	1.6	4	2.5	0.227
Vomiting	4	1.8	8	5.2	<0.001*
Diet program	9	3.6	5	3.3	0.778
Skipped meals	79	17.3	20	12.4	0.010*
Laxatives or diuretics	5	1.9	7	4.5	0.006*
<i>Muscle-gaining behaviors</i>					
<i>Behavior</i>					
Trying to gain muscle	273	35.7	266	42.4	0.011*
<i>Methods</i>					
Ate more meat/protein	41	14.9	53	20.1	0.009*
Took food supplements (i.e., vitamins, pills, or steroids)	23	8.3	19	7.1	0.381
Lifted weights	54	19.9	89	33.5	<0.001*
Exercised	191	70.0	182	68.6	0.562

* $P < 0.05$. Participants may have endorsed more than one item measuring method of weight loss and/or muscle-gaining.

appearance competence in girls in grade 8 ($P < 0.05$) were also significantly associated with currently trying to lose weight. Odds ratios and 95% confidence intervals for each of the predictors are presented in Table 2. Cox and Snell R^2 values for the grade 6, 7, and 8 models were 0.40, 0.34, and 0.29, respectively.

Males

As with the females, all three full model grade analyses reliably distinguished male dieters from nondieters [$\chi^2(11, N = 242) = 58.48, P < 0.001$; $\chi^2(12, N = 229) = 32.73, P = 0.001$; $\chi^2(12, N = 186) = 45.63, P < 0.001$, by respective grade] 80% of the time. Separate grade level analyses found that BMI was correlated with weight loss attempts in males across all grades ($P < 0.002$). Specifically, the greater the reported BMI, the greater the likelihood that males reported dieting (i.e., currently trying to lose weight). Additional concurrent predictor variables unique to those in grade 6 were competence in physical appearance ($P = 0.006$) and internalization of media ideals ($P = 0.05$), while body size acceptance ($P = 0.02$) and importance of physical appearance ($P = 0.04$) were unique to those in grade 8. Knowledge of media influences on body image predicted significantly in both grade 7 and 8 male students ($P < 0.03$) (see Table 3 for odds ratios and 95% confidence intervals). In younger males, it appears that low competence in physical appearance and high internalization of sociocultural stereotypes were correlated with a greater incidence of weight loss attempts. In older males, high importance of physical appearance, high knowledge of media influences on body image, and low body size acceptance predicted weight loss attempts. These accounted for 36%, 22%, and 29% of the variance in males' weight loss status by grade, respectively.

Muscle-gaining behaviors

Prevalence

Males (42.4%) were significantly more likely than females (35.7%) to be engaging in muscle-gaining behaviors [$\chi^2(1) = 6.50, P = 0.011$]. Males also reported significant increases in their attempts to gain muscle from grade 6 (26.4%) to grade 7 (37.5%) and from grade 6 to grade 8 (36.0%) [$\chi^2(2) = 20.1, P < 0.001$]. Likewise, the percentage of males who reported that they were lifting weights to gain muscle increased significantly from grade 6 (26.5%) to grade 7 (37.6%) and from grade 6 (26.5%) to grade 8 (36.0%) [$\chi^2(2) = 13.8, P = 0.001$] (refer to Table 1 for the differences in prevalence rates of muscle-gaining behavior among male and female participants).

Correlates

Males

When the individual full model grade analyses were compared to their constant only models, only the grade 7 model was able to reliably distinguish males who were trying to gain muscle from those that were not (in 71% of cases). The binary logistic regression analysis conducted separately on grade 7 boys found that high internalization ($P < 0.001$), low body size acceptance ($P = 0.05$), and high teasing ($P < 0.03$) scores significantly accounted for 23% of the variance in their reporting muscle-gaining behaviors [$\chi^2(11, N = 229) = 34.82, P < 0.001$]. There were no significant correlates of muscle-gaining behavior for males in grade 6 or 8. Odds ratios and 95% confidence intervals are presented in Table 4.

Table 2

Females correlates of currently trying to lose weight: odds ratios (OR) and 95% confidence intervals (CI)

Trying to lose weight	Grade 6 (n = 285)		Grade 7 (n = 227)		Grade 8 (n = 270)	
	OR	CI	OR	CI	OR	CI
BMI	1.22**	1.04, 1.43	1.17**	1.03, 1.32	1.42***	1.20, 1.68
Menstrual status	0.41	0.09, 1.74	1.94	0.72, 5.21	0.63	0.22, 1.74
Physical appearance competence	0.43	0.18, 1.05	0.76	0.29, 2.00	0.47*	0.22, 0.99
Social acceptance competence	0.83	0.31, 2.22	1.05	0.53, 2.10	0.94	0.46, 1.91
Physical appearance importance	1.04	0.43, 2.49	1.38	0.69, 2.78	0.92	0.52, 1.63
Social acceptance importance	0.71	0.32, 1.58	1.35	0.69, 2.63	1.20	0.66, 2.18
Global self-esteem	0.83	0.26, 2.70	0.68	0.23, 2.03	0.87	0.35, 2.14
Media knowledge	1.17	0.93, 1.48	0.97	0.78, 1.21	1.02	0.86, 1.21
Awareness of media stereotypes	1.15*	1.00, 1.32	1.05	0.93, 1.19	0.96	0.87, 1.04
Internalization of media stereotypes	1.07	0.98, 1.17	1.10*	1.02, 1.20	1.07*	1.01, 1.14
Size acceptance	0.81	0.57, 1.16	1.48*	1.06, 2.07	0.91	0.81, 1.27
Teasing	1.02	0.92, 1.13	1.04	0.97, 1.13	0.93	0.85, 1.02
Grade 6, Goodness of fit χ^2 (Hosmer–Lemeshow) = 6.06, $df = 8, P = 0.64$						
Grade 7, Goodness of fit χ^2 (Hosmer–Lemeshow) = 4.81, $df = 8, P = 0.78$						
Grade 8, Goodness of fit χ^2 (Hosmer–Lemeshow) = 11.52, $df = 8, P = 0.17$						

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

Table 3

Males correlates of *currently trying to lose weight*: odds ratios (OR) and 95% confidence intervals (CI)

Trying to lose weight	Grade 6 (n = 242)		Grade 7 (n = 229)		Grade 8 (n = 186)	
	OR	CI	OR	CI	OR	CI
BMI	1.42***	1.18, 1.72	1.23***	1.12, 1.43	1.27**	1.09, 1.48
Physical appearance competence	0.21**	0.07, 0.64	1.04	0.42, 2.57	0.65	0.23, 1.84
Social acceptance competence	0.40	0.14, 1.14	0.70	0.32, 1.52	1.23	0.42, 3.64
Physical appearance importance	1.07	0.47, 2.41	1.06	0.57, 1.99	0.41*	0.18, 0.96
Social acceptance importance	1.11	0.50, 2.43	1.65	0.77, 3.53	1.13	0.48, 2.67
Global self-esteem	1.86	0.50, 6.85	0.54	0.19, 1.57	0.40	0.12, 1.39
Media knowledge	1.20	0.99, 1.45	1.32*	1.03, 1.70	1.56**	1.14, 2.14
Awareness of media stereotypes	1.07	0.86, 1.33	0.93	0.78, 1.10	1.00	0.81, 1.24
Internalization of media stereotypes	1.10*	1.01, 1.22	0.98	0.91, 1.05	0.99	0.90, 1.09
Size Acceptance	1.10	0.84, 1.43	0.86	0.70, 1.06	0.71*	0.53, 0.95
Teasing	0.98	0.89, 1.08	1.03	0.98, 1.08	1.05	0.96, 1.15
Grade 6, Goodness of fit χ^2 (Hosmer–Lemeshow) = 7.89, <i>df</i> = 8, <i>P</i> = 0.45						
Grade 7, Goodness of fit χ^2 (Hosmer–Lemeshow) = 7.79, <i>df</i> = 8, <i>P</i> = 0.45						
Grade 8, Goodness of fit χ^2 (Hosmer–Lemeshow) = 15.33, <i>df</i> = 8, <i>P</i> = 0.06						

* *P* < 0.05.** *P* < 0.01.*** *P* < 0.001.

Females

Regression analyses revealed that no significant correlates of muscle-gaining behaviors for female participants were found. Table 5 presents the odds ratios and 95% confidence intervals.

Discussion

The findings of the present study demonstrated that weight loss and muscle-gaining behaviors are reported in children as young as 10–14 years (grades 6–8). In addition, there were significant gender differences in both the prevalence and correlates of weight loss and muscle-gaining behaviors. In comparison to males, females were more

likely to engage in weight loss attempts, most notably through the skipping of meals. Males were more likely than females to report engaging in muscle-gaining behavior, of which the most commonly reported methods included eating more meat/protein or lifting weights. A small percentage admitted to using food supplements (i.e., vitamins, pills, or steroids) as a means to increase muscle. Similar gender differences in weight loss and muscle-gaining behaviors have been reported elsewhere [19,22]. Although the prevalence was low, boys in our sample engaged significantly more often than girls in the use of laxatives/diuretics and vomiting as a method of weight loss. These extreme weight loss behaviors are becoming more common among boys who want to be thinner [23]. One study found that 3.1% of males in grades 7, 9, and 11 engaged in the use of diuretics/

Table 4

Males correlates of *currently trying to gain muscle*: odds ratios (OR) and 95% confidence intervals (CI)

Trying to gain muscle	Grade 6 (n = 242)		Grade 7 (n = 229)		Grade 8 (n = 186)	
	OR	CI	OR	CI	OR	CI
BMI	1.04	0.92, 1.18	0.97	0.88, 1.07	1.00	0.89, 1.13
Physical appearance competence	1.04	0.45, 2.41	0.60	0.27, 1.34	1.01	0.51, 2.0
Social acceptance competence	1.49	0.70, 3.18	1.19	0.59, 2.39	0.91	0.44, 1.88
Physical appearance importance	1.23	0.69, 2.19	0.83	0.45, 1.52	0.97	0.55, 1.72
Social acceptance importance	1.04	0.59, 1.85	1.49	0.75, 2.95	1.21	0.64, 2.31
Global self-esteem	1.23	0.45, 3.39	0.59	0.25, 1.41	1.32	0.55, 3.15
Media knowledge	1.09	0.96, 1.24	0.94	0.78, 1.15	1.07	0.91, 1.26
Awareness of media stereotypes	1.15	0.99, 1.35	1.00	0.86, 1.17	0.91	0.79, 1.06
Internalization of media stereotypes	1.02	0.95, 1.09	1.14***	1.06, 1.23	1.10	1.03, 1.18
Size acceptance	0.93	0.77, 1.13	1.23*	1.01, 1.49	1.01	0.82, 1.23
Teasing	1.01	0.94, 1.08	0.94*	0.90, 0.99	0.95	0.89, 1.01
Grade 6, Goodness of fit χ^2 (Hosmer–Lemeshow) = 6.69, <i>df</i> = 8, <i>P</i> = 0.57						
Grade 7, Goodness of fit χ^2 (Hosmer–Lemeshow) = 2.81, <i>df</i> = 8, <i>P</i> = 0.95						
Grade 8, Goodness of fit χ^2 (Hosmer–Lemeshow) = 13.21, <i>df</i> = 8, <i>P</i> = 0.11						

* *P* < 0.05.*** *P* < 0.001.

Table 5
Females correlates of currently trying to gain muscle: odds ratios (OR) and 95% confidence intervals (CI)

Trying to gain muscle	Grade 6 (n = 285)		Grade 7 (n = 227)		Grade 8 (n = 270)	
	OR	CI	OR	CI	OR	CI
BMI	0.95	0.86, 1.07	1.09	0.98, 1.21	1.02	0.92, 1.14
Menstrual status	0.40	0.14, 1.15	1.37	0.58, 3.20	0.68	0.31, 1.49
Physical appearance competence	1.10	0.53, 1.96	0.41	0.18, 0.94	0.75	0.42, 1.36
Social acceptance competence	0.61	0.31, 1.19	1.01	0.54, 1.87	1.42	0.79, 2.55
Physical appearance importance	1.25	0.71, 2.21	1.53	0.83, 2.82	0.99	0.63, 1.54
Social acceptance importance	1.14	0.64, 2.10	1.40	0.76, 2.59	0.90	0.56, 1.44
Global self-esteem	1.58	0.64, 3.89	2.34	0.88, 6.21	1.47	0.70, 3.09
Media knowledge	1.10	0.95, 1.27	0.88	0.74, 1.05	1.05	0.91, 1.21
Awareness	0.92	0.83, 1.02	1.09	0.97, 1.22	1.00	0.93, 1.07
Internalization	1.06	0.99, 1.14	0.93	0.86, 1.01	1.02	0.97, 1.07
Size acceptance	1.02	0.81, 1.28	1.12	0.90, 1.40	1.04	0.87, 1.23
Teasing	0.99	0.92, 1.08	1.00	0.93, 1.06	0.99	0.93, 1.05

Grade 6, Goodness of fit χ^2 (Hosmer–Lemeshow) = 14.31, *df* = 8, *P* = 0.07
Grade 7, Goodness of fit χ^2 (Hosmer–Lemeshow) = 13.32, *df* = 8, *P* = 0.10
Grade 8, Goodness of fit χ^2 (Hosmer–Lemeshow) = 5.80, *df* = 8, *P* = 0.67

laxatives and vomiting as a means to lose weight [33]. Still, other studies have found that in high school males, the prevalence ranges from 5% to 15% [34,35].

With respect to grade differences, the percentage of females in the present study who engaged in weight loss behaviors increased significantly from grade 6 to grade 7, and remained high thereafter. Skipping meals increased in prevalence from grade 6 to grade 8 among the girls also. The percentage of boys who admitted to muscle-gaining behaviors, including the use of food supplements (i.e., steroids), increased significantly between grade 6 and grade 7, and remained significantly higher in grade 8. Developmentally, it would appear that the adoption of body-change strategies, in one form or another, increased significantly between grade 6 and grade 7 for girls and boys in the present study.

With respect to correlates, it was perhaps not surprising that the participants with a higher body mass index (BMI) (regardless of their gender or grade level) were more likely to report weight loss behaviors. This association has been reported elsewhere among female [24] and male [18] youth, and more recently among girls and boys as young as 8–11 years of age [19].

However, in the present study, variables other than BMI appeared to have an influence on the adoption of body-change strategies. Among the girls, awareness (grade 6) and internalization (grades 7 and 8) of media stereotypes, appearance esteem (grade 8), and body size acceptance (grade 7) were predictive of weight loss behaviors. Among males, competence in physical appearance (grade 6), internalization of media stereotypes (grade 6), knowledge of the influence of media influences on body image (grades 7 and 8), body size acceptance (grade 8), and importance of physical appearance (grade 8) were predictive of boys' weight loss behaviors.

With respect to muscle-gaining behaviors, no significant correlates were found among the female participants.

Although more prevalent among boys, muscle-gaining behavior was reported by a significant proportion of girls; in fact, its prevalence exceeded that of reported weight loss. Previous research has identified significant predictors of girls' strategies to increase muscle tone, namely, sociocultural pressures to increase either weight (e.g., "Do you think that the media give you the idea you should be more muscular?") [21]. However, the age group of girls examined in that study was older than that used in the present study. Among the male participants in this present study, internalization of media messages, size acceptance and teasing were found to be significantly correlated with muscle-gaining behaviors, but only for those in grade 7. Previous studies have shown negative influences of internalization of media stereotypes [21,29] and teasing [24] on body-change strategies [21,29] among male adolescents. The findings of the present study suggest that the impact of those variables on body-change strategies might have their onset in boys as young as in grade 7. The fact that muscle-gaining behaviors (and the use of food supplements including steroids) increased in prevalence between grade 6 and grade 7 is problematic. First, boys at that age are going through a period of rapid physical growth and some research has suggested that males' attempts to become more muscular can have a negative impact on their health [36]. Second, as previously mentioned, the adoption of muscle-gaining behaviors by boys in early adolescence could set the stage for unhealthy body-change strategies such as steroid use throughout adolescence [18].

Of equal concern was the finding that weight loss behaviors increased in prevalence for girls between grade 6 and grade 7. In addition to the potential negative health consequences associated with restrictive dieting, particularly during a period of rapid growth, dieting has also been linked to the adoption of extreme weight control and unhealthy behaviors among females [37]. Moreover, restrictive dieting

has recently been linked to weight gain, putting those girls at risk of being overweight [4].

The association found between the internalization of media stereotypes and body-change strategies in both males and females argues for the continued inclusion of media literacy as a component of preventive interventions [38–40]. In addition to media literacy training, the findings of the present study suggest that prevention programs may need to incorporate strategies to help reduce weight and shape teasing, given its potential negative influence on male and females' body-change strategies. In addition to helping children understand and respect individual differences in body size and shape [8,41,42], prevention programs may need to institute school-wide policies to help reduce or eliminate harassment and weight and shape teasing. Addressing the negative impact of harassment and weight-based teasing with boys in single-sex sessions and helping them develop more equitable life skills is an initiative which warrants further investigation. This type of peer support group program has been successful in helping females of this age group cope with pressures such as teasing, media, and peer pressures [17,43,44].

The absence of muscle-gaining predictors for females in the present study also highlights the need for future research in this area. One possible explanation could be that the female participants viewed muscle-gaining and weight loss strategies as common goals towards achieving a thin/lean body shape. As such, the variables which were found to predict dieting may not have appeared to significantly contribute to the variance in the muscle-gaining outcome measure. As with children's interpretation of the word dieting [45], qualitative research (involving face-to-face discussions with girls) might be necessary to identify how, and in which ways, young girls interpret questions related to muscle-gaining behaviors. The availability of a newly developed scale that measures muscle-gaining behaviors in a more comprehensive manner [23] might help to clarify this issue. Longitudinal research is also required to determine whether the adoption of muscle-gaining strategies among girls in early adolescence leads to more dangerous behaviors, such as steroid use, in adolescence. Future research is also needed to identify the mechanisms (e.g., mediating factors) by which factors such as the internalization of media stereotypes and teasing influence body-change strategies in children.

The findings of the present study should be interpreted with caution given the cross-sectional nature of the study design and the large number of predictor variables used in the regression analyses (without the use of Bonferroni corrections). Ideally, prospective research is needed to establish the direction of causality of the variables found to be significantly correlated. Nevertheless, the findings suggest that the involvement of males and females in prevention efforts, particularly those aimed at media liter-

acy and the reduction of appearance-based teasing, might help to reduce the onset of normative body-change strategies (that could lead to dangerous body-change practices). Given that the prevalence of weight loss and muscle-gaining behaviors significantly increased from grade 6 to grade 7, prevention efforts may need to be initiated with children as young as 10 years. Finally, the findings of the present study suggest there may be a need for developmentally tailored prevention programs where the unique needs of students in grades 6, 7, and 8 could be met.

Acknowledgments

This study was supported by a Women's Health Council grant of Ontario (Grant # 000-45) to Gail L. McVey. The Council is fully funded by the Ontario Ministry of Health and Long Term Care. This research does not necessarily reflect endorsement by the Ministry of Health and Long Term Care. The authors thank the adolescents and their families who participated in the study, and the following individuals who assisted with the implementation of the study: Mary Turfryer, Melissa Lieberman, Angus Warner, Margus Heinmaa, Brian Rybak, and Alexandra Ashton.

References

- [1] Nova Scotia Public Health Services, Northern Regional Health Board (2000, February). *Children Speaking Up!* Retrieved September, 2003, from http://www.hpclearinghouse.ca/downloads/Children_Speaking_Up.pdf.
- [2] McVey GL, Pepler D, Davis R, Flett GL, Abdoell M. Risk and protective factors associated with disordered eating during early adolescence. *J Early Adolesc* 2002;22(1):75–95.
- [3] Katzman DK. Prevention of medical complications in children and adolescents with eating disorders. In: Piran N, Levine MP, Steiner-Adair C, editors. *Preventing eating disorders: a handbook of interventions and special challenges*. Philadelphia, Brunner/Mazel, 1999.
- [4] Field AE, Austin SB, Taylor CB. Relation between dieting and weight change among preadolescents and adolescents. *Pediatrics* 2003;112:900–6.
- [5] Hsu LKG. Can dieting cause an eating disorder? *Psychol Med* 1997;27:509–13.
- [6] Edmunds H, Hill AJ. Dieting and the family context of eating in young adolescent children. *Int J Eat Disord* 1999;25:435–40.
- [7] Cicchetti D. A historical perspective on the discipline of developmental psychopathology. In: Rolf J, Masten AS, Cicchetti D, Nuechterlein KH, Weintraub S, editors. *Risk and protective factors in the development of psychopathology*. Cambridge, England, Cambridge Univ. Press, 1990. p. 2–28.
- [8] Smolak L, Levine MP. A two-year follow-up of a primary prevention program for negative body image and unhealthy weight regulation. *Eat Disord* 2001;9:313–25.
- [9] Smolak L, Levine MP. Adolescent transitions and the development of eating problems. In: Smolak L, Levine MP, Striegel-Moore RH, editors. *The developmental psychopathology of eating disorders*. Mahwah, NJ: Lawrence Erlbaum Associates, 1996. p. 207–33.
- [10] Lieberman M, Gauvin L, Bukowski WM, White DR. Interpersonal

- influence and disordered eating behaviors in adolescent girls. The role of peer modeling, social reinforcement, and body-related teasing. *Eat Behav* 2001;2:215–36.
- [11] Fabian LJ, Thompson JK. Body image and eating disturbance in young females. *Int J Eat Disord* 1989;8(1):63–74.
- [12] Lunner K, Werthem EH, Thompson JK, Paxton SJ, McDonald F, Halvarsson K. A cross-cultural examination of weight-related teasing, body image, and eating disturbance in Swedish and Australian samples. *Int J Eat Disord* 2000;28(4):430–5.
- [13] Paxton SJ, Schutz HK, Werthem EH, Muir SL. Friendship clique and peer influences on body image concerns, dietary restraint, extreme weight-loss behaviors, and binge eating in adolescent girls. *J Abnorm Psychology* 1999;10(2):255–66.
- [14] Piran N. The reduction of preoccupation with body weight and shape in schools: a feminist approach. In: Piran N, Levine MP, Steiner-Adair C, editors. *Preventing eating disorders: a handbook of interventions and special challenges*. Philadelphia, PA: Brunner/Mazel, 1999. p. 148–59.
- [15] Thompson JK, Fabian LJ, Moulton DO, Dunn ME, et al. Development and validation of the physical appearance related teasing scale. *J Pers Assess* 1991;56(3):513–21.
- [16] McVey GL, Davis R, Tweed S, Shaw BF. Evaluation of a school-based program designed to improve body image satisfaction, global self-esteem, and eating attitudes and behaviours: a replication study. *Int J Eat Disord* 2004;36:1–11.
- [17] McVey GL, Lieberman M, Voorberg N, Wardrope D, Blackmore E. School-based peer support groups: a new approach to the prevention of disordered eating. *Eat Disord J Treat Prev* 2003;11(8):171–98.
- [18] McCabe MP, Ricciardelli LA. A longitudinal study of body change strategies among adolescent males. *J Youth Adolesc* 2003;32(2):105–13.
- [19] McCabe MP, Ricciardelli LA. Body image and strategies to lose weight and increase muscles among boys and girls. *Health Psychol* 2003;22(1):39–46.
- [20] McCabe MP, Vincent MA. The role of biodevelopmental and psychological factors in disordered eating among adolescent males and females. *Eur Eat Disord Rev* 2003;11(4):315–28.
- [21] McCabe MP, Ricciardelli LA. Sociocultural influences on body image and body changes among adolescent boys and girls. *J Soc Psychol* 2003;143(1):5–26.
- [22] McCabe MP, Ricciardelli LA, Finemore J. The role of puberty, media and popularity with peers on strategies to increase weight, decrease weight and increase muscle tone among adolescent girls and boys. *J Psychosom Res* 2002;52:145–53.
- [23] McCreary DR, Sasse DK. An exploration of the drive for muscularity in adolescent boys and girls. *J Am Coll Health* 2000;48:297–304.
- [24] Barker ET, Galambos NL. Body dissatisfaction of adolescent girls and boys: risk and resource factors. *J Early Adolesc* 2003;23(2):141–65.
- [25] Hammer LD, Kraemer HC, Wilson DM, Ritter PL, Dornbusch SM. Standardized percentile curves of body-mass index for children and adolescents. *Am J Dis Child* 1991;145:259–63.
- [26] Neumark-Sztainer D, Sherwood NE, Collier T, Hannan PJ. Primary prevention of disordered eating among preadolescent girls: feasibility and short-term effect of a community-based intervention. *J Am Diet Assoc* 2000;100(12):1466–73.
- [27] Harter S. *Manual for the self-perception profile for children*. Denver, CO: University of Denver, 1985.
- [28] Heinberg LJ, Thompson JK, Stormer SM. Development and validation of the sociocultural attitudes towards appearance questionnaire. *Int J Eat Disord* 1995;17(1):81–9.
- [29] Smolak L, Levine M, Thompson JK. The use of the sociocultural attitudes towards appearance questionnaire with middle school boys and girls. *Int J Eat Disord* 2001;29:216–23.
- [30] Thompson JK, Cattarin J, Fowler B, Fisher E. The Perception of Teasing Scale (POTS): a revised and extension of the Physical Appearance Related Teasing Scale (PARTS). *J Pers Assess* 1995;65(1):146–57.
- [31] Williams ML. *The association between perceptions of teasing from peers, restrained eating, and body esteem in children and adolescents*. Montreal, Canada: Concordia University, 2001.
- [32] Tabachnick BG, Fidell LS. *Using multivariate statistics*. third ed. New York: Harper Collins College, 1996.
- [33] Neumark-Sztainer D, Story M, Falkner NH, Beuhring T, Resnick MD. Sociodemographic and personal characteristics of adolescents engaged in weight loss and weight/muscle gain behaviors: who is doing what? *Prev Med* 1999;28:40–50.
- [34] Killen JD, Taylor B, Telch MJ, Saylor KE, Maron DJ, Robinson TN. Self-induced vomiting and laxative and diuretic use among teenagers. Precursors of the binge-purge syndrome? *J Am Med Assoc* 1986;255:1447–9.
- [35] Lachenmeyer JR, Muni-Brander P. Eating disorders in a non-clinical adolescent population: implications for treatment. *Adolescence* 1988;23:303–12.
- [36] Edwards S, Launder C. Investigating muscularity concerns in male body image: development of the Swansea Muscularity Attitudes Questionnaire. *Int J Eat Disord* 1999;28:120–4.
- [37] McCreary DR, Sasse DK. Gender differences in high school students' dieting behavior and their correlates. *Int J Ment Health* 2002;1(2):195–213.
- [38] Levine MP, Piran N, Stoddard C. Mission more probable: media literacy, activism, and advocacy as primary prevention. In: Piran N, Levine MP, Steiner-Adair C, editors. *Preventing eating disorders: a handbook of interventions and special challenges*. Philadelphia: Brunner/Mazel, 1999. p. 1–25.
- [39] Steiner-Adair C, Vorenberg AP. Resisting weightism: media literacy for elementary-school children. In: Piran N, Levine MP, Steiner-Adair C, editors. *Preventing eating disorders: a handbook of interventions and special challenges*. Philadelphia: Brunner/Mazel, 1999. p. 26–43.
- [40] McVey GL, Davis R. A program to promote positive body image: a 1-year follow-up evaluation. *J Early Adolesc* 2002;22(1):96–108.
- [41] Irving LM. Promoting size acceptance in elementary school children: the EDPA puppet program. *Eat Disord* 2000;8:221–32.
- [42] Smolak L, Levine MP, Shermer F. A controlled study evaluation of an elementary school primary prevention program for eating problems. *J Psychosom Res* 1998;44(3/4):339–53.
- [43] McVey GL, Lieberman M, Voorberg N, Wardrope D, Blackmore E, Tweed S. Replication of a peer support program designed to prevent disordered eating: is a life skills approach sufficient for all middle school students? *Eat Disord J Treat Prev* 2003;11(8):199–214.
- [44] Piran N. Eating disorders: a trial of prevention in a high-risk school setting. *J Prim Prev* 1999;20(1):75–90.
- [45] Roberts SJ, Maxwell SM, Bagnall G, Bilton R. The incidence of dieting amongst adolescent girls: a question of interpretation? *J Hum Nutr Diet* 2001;14(1):103–9.