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Original quantitative research

Weight control intentions and mental health among Canadian adolescents: a gender-based analysis of students in the COMPASS study

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Abstract

Introduction: Little is known about gender differences in associations between weight control intentions and mental health in adolescents. Our objective was to examine these associations in a large sample of adolescent girls and boys.

Methods: Using data from Year 6 (2017–18) of the COMPASS study (n = 57 324), we performed a series of multivariable linear regressions to examine whether weight control intentions (gain, lose, stay the same, no intention) were associated with depression, anxiety and self-concept, while adjusting for relevant covariates including body mass index. Models were stratified by self-reported gender.

Results: Compared to those with no intentions, girls who intended to lose weight reported higher symptoms of depression ($\beta = 0.52$, $p < 0.001$) and anxiety ($\beta = 0.41$, $p < 0.001$) and poorer self-concept ($\beta = 2.06$, $p < 0.001$). Girls who intended to gain weight also reported higher symptoms of depression ($\beta = 0.54$, $p < 0.001$), anxiety ($\beta = 0.50$, $p < 0.001$) and self-concept ($\beta = 1.25$, $p < 0.001$). Boys who intended to lose weight reported greater symptoms of depression ($\beta = 0.26$, $p < 0.001$) and anxiety ($\beta = 0.33$, $p < 0.001$) and poor self-concept ($\beta = 1.10$, $p < 0.001$). In boys, weight-gain intentions were associated with greater symptoms of anxiety ($\beta = 0.17$, $p < 0.05$), but not depression or self-concept.

Conclusion: Intentions to gain or lose weight were associated with symptoms of mental disorder and poor self-concept in our large sample of adolescents, and these relationships differed in boys and girls. These findings have important implications for school-based programs promoting healthy weight and body image.

Keywords: *gender, weight control, mental health, depression, anxiety, self-concept, girls, boys*

Highlights

- This research examined the relationship between mental health and weight control intentions in adolescent girls and boys using data from the COMPASS system—the largest school-based study of its kind.
- Compared to adolescents who did not intend to change their weight, those who intended to lose weight had poorer mental health, independent of body mass index.
- Girls who intended to gain weight reported higher anxiety and depression symptoms and lower self-concept, but intentions to gain weight were associated only with higher anxiety in boys.
- These findings support the importance of incorporating weight-neutral approaches in health promotion efforts, especially in school-based settings.

Introduction

Adolescence (i.e. ages approximately 12 to 18 years[1]) represents an important stage of maturation, characterized by substantial developmental and social changes. During this time, adolescents become increasingly aware of changes to their body weight and sociocultural body ideals.[1] This can contribute to the rise of negative body image—a person's confidence in their appearance—and weight dissatisfaction.[1-4]

An unhealthy body image, characterized by skewed and negative perceptions, may play a role in the development of adverse behaviours and psychological harm.[5] This is especially true during adolescence, a critical time for the onset of depression, anxiety and eating disturbances.[4-8]

Body image is influenced by exposure to messages about body ideals, through interacting with family and friends and observing portrayals in the media.[3,8-10] Some may feel pressured to conform to socially prescribed body ideals that often represent unrealistic and unattainable body weights and shapes.[10,11] Internalizing normative body

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ideals demonstrates an important psychological process underpinning unhealthy body image and body dissatisfaction.[12]

Some adolescents with body dissatisfaction intend to lose or gain weight.[13,14] Those who do may be at greater risk for developing unhealthy and extreme weight-control behaviours.[15] Others may have emotional problems as a consequence of poor body image. For example, research demonstrates that the psychological sequelae of overweight and obesity correlate more strongly with perceived weight than actual body mass index (BMI).[16-18] Poor body image, body dissatisfaction and distorted weight perceptions can contribute to the etiology of significant psychological concerns[19,20], including mental disorder and subclinical symptoms of social anxiety[21,22] and depression[23-26] as well as poor self-concept and esteem.[27,28] Self-concept refers to conscious beliefs an individual has about themselves.[29] This multidimensional construct includes self-perceived academic and physical competencies, physical appearance, honesty, relationships and self-esteem.[30] High levels of daily conflict[31], mental disorder and body dissatisfaction have been linked to poor self-concept.[32,33]

It is important to consider how social identities, such as gender, may influence body dissatisfaction and weight control intentions. For example, girls tend to overestimate their weight[34] and report feeling pressured to lose weight[35], while boys report feeling pressured to gain muscularity and size while staying lean.[36-38] These pressures and perceptions may contribute to profound mental health impacts in both males and females.[39] However, existing research on weight control intentions and mental health is limited, and measures largely focus on female-oriented characterizations of body ideals and weight-related behaviours. Thus, our understanding of the mental health implications that boys experience may be inadequate.

The objective of this study was to examine the gendered associations between weight control intentions and symptoms of depression, anxiety and self-concept in a large sample of adolescent boys and girls in Canada.

Methods

COMPASS study design

We used student-level cross-sectional data from Year 6 (2017–18) of the COMPASS (Cannabis, Obesity, Mental health, Physical activity, Alcohol, Smoking, Sedentary behaviour) study, a large, 9-year (2012–2021) prospective study that collects health behaviour data once a year from a rolling cohort of Canadian secondary school students.[40]

Active-information passive-permission consent protocols are used to recruit full school samples of students to complete the COMPASS student questionnaire during class time. The University of Waterloo Office of Research Ethics (ORE #30118) and participating school boards approved all the procedures. Additional details about COMPASS study procedures are available in print[40] and online (www.compass.uwaterloo.ca). The current study represents a secondary analysis of existing COMPASS data.

Study sample

A total of 57 324 Grade 9 to 12 students from across 122 schools in Alberta, British Columbia, Ontario and Quebec participated in COMPASS Year 6. We excluded participants with missing data for all covariates other than BMI (n = 1816; 3.2%). Our complete-case analytic sample included 45 019 participants, after removal of cases with missing data in the dependant (i.e. depression, anxiety, self-concept) and independent (i.e. weight control intentions) categories (n = 10 489; 18.9%).

Measures

Weight control intentions

A measure of students' weight control intentions served as the dependent variable of interest. In response to the question "Which of the following are you trying to do about your weight?" the students could choose one of these options: "lose weight," "gain weight," "stay the same weight" or "I am not trying to do anything about my weight." We operationalized students' weight control intentions as none (the reference category [*ref.*]), maintain, lose or gain.

Depression, anxiety and self-concept

To assess the mental health of students in our present study, we chose measures of depression, anxiety and self-concept that have demonstrated strong psychometric properties for use in general adolescent populations.[41,42]

To assess self-reported symptoms of depression, the COMPASS student questionnaire included the Centre for Epidemiological Studies Depression Scale (Revised)-10 (CESD-R-10).[43] Using a 4-point Likert scale (where 1 corresponds to "none or less than 1 day" and 4 to "5 to 7 days"), students indicated the frequency with which they experienced somatic, affective and anhedonia symptoms during the past 7 days. Examples of symptoms included feeling sad, hopeless, unmotivated and lonely. Possible sum scores ranged from 0 to 30, with higher scores indicating more severe symptoms. The internal consistency of the CESD-R-10 was acceptable (Cronbach $\alpha = 0.77$).

To capture self-reported symptoms of anxiety, the COMPASS student questionnaire included the Generalized Anxiety Disorder 7-item Scale (GAD-7).[44] Students reported how often in the past 2 weeks symptoms (e.g. uncontrollable worrying, restlessness) bothered them. They recorded the frequency using a 4-point Likert scale (where 1 corresponds to "not at all" and 4 to "nearly every day"). Higher sum scores (from 0 to 21) indicated a greater presence of generalized anxiety symptoms. Internal consistency of the GAD-7 was high ($\alpha = 0.91$).

Self-concept was assessed using items from the *SDQ II Manual: Self Description Questionnaire II*.[45] On a 5-point Likert scale (where 1 corresponds to "true" and 5 to "false"), students indicated the answer that best describing themselves in response to five items: "in general, I like the way I am"; "overall, I have a lot to be proud of"; "a lot of things about me are good"; "when I do something, I do it well"; and "I like the way I look." These responses were summed to represent a global measure of self-concept (from 0 to 25). Higher scores indicated poorer self-concept; internal consistency was high ($\alpha = 0.90$).

Covariates

We included weight-related variables in all models to adjust for potentially confounding effects. Students reported the number of hours per day they usually spent engaging in moderate-to-vigorous physical activity (MVPA), recreational screen time (5 items: television, video games, surfing the internet, talking on the phone, texting/messaging) and sleep. Behaviours were dichotomized according to whether they met the daily recommendations of the Canadian Society for Exercise Physiology (CSEP) 24-Hour Movement Guidelines

(≥1 hour MVPA, ≤2 hours recreational screen time, 8–10 hours of sleep).[46] Students also indicated whether they ate breakfast daily. Skipping breakfast and meeting the movement guidelines were treated as binary (i.e. yes vs. no [*ref.*]).

Students indicated their grade (9 [*ref.*], 10, 11, 12), race/ethnicity (categorized as racialized [Black, Indigenous, Asian, Latin American/Hispanic, Other, Mixed], non-racialized [White] [*ref.*]), height and weight. Consistent with the World Health Organization Child Growth Standards, we calculated and categorized students' age- and sex-adjusted BMI into underweight, healthy weight, overweight and obesity.[47] Given the prevalence of missing responses, which may not be random, we categorized missing responses to height, weight, age and sex (used to compute BMI) as "not reported."[48,49] Measures used to assess MVPA[50], screen time[51] and BMI[52] have been validated in this age group.

Analyses

All analyses were conducted using statistical package SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).[53] We compared adolescents in weight-control intention and gender categories using (1) chi-square tests for demographics, movement, breakfast skipping and BMI category; and (2) ANOVA or *t*-tests for depression, anxiety and self-concept. We estimated three sets of models using multivariable linear regression to examine associations between weight control intentions and self-reported symptoms of depression, anxiety and self-concept scores. We tested the multiplicative interaction term of gender by weight control intentions (deemed statistically significant at $p < 0.05$) to determine whether stratification of our models by gender was appropriate. Sociodemographic (grade, race/ethnicity) and weight-related variables (MVPA, screen time, sleep, breakfast skipping, BMI) were included in each model to adjust for their potentially confounding effects on the associations between students' weight control intentions and mental health. To account for comorbidity between depression and anxiety, models for CESD-R-10 were further adjusted for GAD-7 scores, and vice versa. Unadjusted and adjusted standardized beta estimates (β) were reported alongside 95% confidence limits.

We calculated the intraclass correlation coefficient (ICC) describing the extent of school-level variability between weight control intention and each of CESD-R-10, GAD-7 and self-concept. Roughly 1% of within-school variation was detected for each dependent variable ($ICC_{GAD-7} = 0.014$; $ICC_{CESD-R-10} = 0.018$; $ICC_{Self-concept} = 0.011$), so we did not adjust for clustering for computational efficiency.

Results

Comparing students with missing and complete data

We estimated the odds of missing responses across dependant and independent variables using a series of multivariable linear regression models (see Table 1 for missing data analysis results). Compared to boys, girls had lower odds of omitted responses for all measures of depression, anxiety, self-concept and weight control intentions. In general, the odds of missingness for any of the dependant or independent variables were lower for students in higher grades than for those in grade 9. The students had higher odds of missing depression, anxiety and self-concept scores if they reported being racialized or underweight. Students who did not report their height or weight were approximately 1.5 to 2 times more likely to also have missing scores for depression, anxiety and self-concept and more likely to not have reported any weight control intentions.

Sample characteristics

Over one-third (36%) of the students reported currently trying to lose weight, while 16% reported trying to gain weight and 20% reported trying to maintain their weight. Mean (SD) scores for CESD-R-10, GAD-7 and self-concept were 8.9 (6.1), 6.5 (5.7) and 10.9 (4.6), respectively. Nearly half met the guidelines for MVPA (42%) and sleep (41%), while 5% met guidelines for screen time. Over half (55%) reported skipping breakfast.

About one-quarter of the students (27%) were in grade 9, 28% in grade 10, 27% in grade 11 and 18% in grade 12. Half (51%) identified as girls and 28% with a racialized ethnic identity.

Table 2 shows differences in self-reported weight control intention categories by sample characteristics and mental health measures. Table 3 shows differences in self-reported sociodemographic characteristics, weight control intention categories and mental health measures between boys and girls.

Gender-stratified associations between weight control intentions and depression, anxiety and self-concept

We stratified models by gender (girls and boys) because multiplicative interaction effects between gender and weight control intentions were significant ($p < 0.05$, results not shown). Table 4 shows results from multivariable linear regression models estimating the change in CESD-R-10, GAD-7 and self-concept scores at every weight control intention level for girls and boys; adjusted estimates are described below.

Adolescent girls who intended to maintain their weight reported lower symptoms of depression ($\beta = -0.21$, $p < 0.01$) and greater symptoms of anxiety ($\beta = 0.22$, $p < 0.01$) than adolescent girls without weight control intentions. Girls who intended to lose weight reported greater symptoms of depression ($\beta = 0.52$, $p < 0.001$) and anxiety ($\beta = 0.41$, $p < 0.001$) and poorer self-concept ($\beta = 2.06$, $p < 0.001$), while girls who intended to gain weight also reported greater symptoms of depression ($\beta = 0.54$, $p < 0.001$) and anxiety ($\beta = 0.50$, $p < 0.001$) and poorer self-concept ($\beta = 1.25$, $p < 0.001$). Adolescent boys who intended to maintain weight reported fewer symptoms of depression ($\beta = -0.15$, $p < 0.05$), slightly greater anxiety ($\beta = 0.17$, $p < 0.05$) and higher self-concept ($\beta = -0.33$, $p < 0.001$) than boys with no weight control intentions. Like girls, boys who intended to lose weight reported greater symptoms of depression ($\beta = 0.26$, $p < 0.001$) and anxiety ($\beta = 0.33$, $p < 0.001$) and poor self-concept ($\beta = 1.10$, $p < 0.001$). However, weight-gain intentions were not associated with any differences in self-reported depression or self-concept compared to boys without weight control intentions; rather, boys who intended to gain weight had greater symptoms of anxiety ($\beta = 0.17$, $p < 0.05$).

Discussion

The purpose of our present study was to examine the associations between weight control intentions and symptoms of depression, anxiety and self-concept in a large sample of adolescent girls and boys in Canada. More than half of respondents in

TABLE 1
Logistic regression models estimating the odds of missing data for measures of depression, anxiety, self-concept and weight control intentions in adolescent girls and boys

Measure	aOR (95% CI)			
	Model I	Model II	Model III	Model IV
Gender				
Boys (*ref.*)	1.00	1.00	1.00	1.00
Girls	0.85 (0.81–0.89)***	0.85 (0.79–0.91)	0.58 (0.52–0.63)***	0.64 (0.54–0.76)***
Grade				
9 (*ref.*)	1.00	1.00	1.00	1.00
10	0.86 (0.81–0.92)***	0.95 (0.87–1.03)	0.82 (0.73–0.92)**	0.87 (0.70–1.07)
11	0.77 (0.72–0.82)***	0.88 (0.80–0.96)**	0.79 (0.70–0.89)**	0.77 (0.62–0.97)*
12	0.77 (0.72–0.83)***	0.91 (0.82–1.00)	0.85 (0.74–0.97)*	0.67 (0.52–0.88)**
Race/ethnicity				
Non-racialized (*ref.*)	1.00	1.00	1.00	1.00
Racialized	1.37 (1.30–1.44)***	1.46 (1.36–1.57)***	1.57 (1.43–1.72)***	1.05 (0.88–1.25)
BMI category				
Underweight	1.21 (1.01–1.45)*	1.31 (1.03–1.66)*	1.52 (1.10–2.07)**	1.41 (0.77–2.60)
Normal (*ref.*)	1.00	1.00	1.00	1.00
Overweight	1.06 (0.98–1.15)	0.91 (0.82–1.02)	1.07 (0.92–1.24)	0.95 (0.71–1.28)
Obesity	1.00 (0.90–1.15)	1.06 (0.91–1.22)	1.22 (1.00–1.48)*	1.23 (0.86–1.76)
Not reported	1.43 (1.35–1.52)***	1.60 (1.48–1.72)***	1.89 (1.71–2.10)***	2.13 (1.77–2.56)***

Source: Year 6 (2017–18) COMPASS Student Questionnaire

Abbreviations: aOR, adjusted odds ratio; BMI, body mass index; CESD-R-10, Centre for Epidemiological Studies Depression Scale (Revised)-10; CI, confidence interval; GAD-7, Generalized Anxiety Disorder 7-item Scale; *ref.*, reference category.

Notes: Model I estimates the log odds of missing data in depression symptom (CESD-R-10) scores (*ref.* = not missing); Model II estimates the log odds of missing data in anxiety symptom (GAD-7) scores (*ref.* = not missing); Model III estimates the log odds of missing data in self-concept sum scores (*ref.* = not missing); Model IV estimates the log odds of missing data in weight control intentions (*ref.* = not missing). All estimates are adjusted for MVPA, screen time, sleep and breakfast skipping.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

this study reported that they were trying to gain or lose weight. Our findings demonstrate an association between weight control intentions and mental health, while controlling for BMI and other covariates.

In our study, intention to lose weight was associated with higher symptoms of depression and anxiety and poorer self-concept in boys and girls. These associations may be explained, in part, by psychological distress triggered by unsuccessful weight loss attempts.[54] In adults, attempts to lose weight are common but largely ineffective.[55-57] As body weight is seen as a controllable and individual responsibility, difficulty losing weight may be misattributed to personal faults rather than the ineffectiveness of diets and behavioural weight-loss interventions. Evidence supports strong links between weight preoccupation and body dissatisfaction, disordered eating and weight-based discrimination, which are associated with poor psychosocial well-being.[58-60]

Obesity prevention efforts have traditionally included weight-focussed messages that can negatively affect adolescents.[61-64] It is imperative to move beyond weight-focussed indicators (e.g. weight status) and messaging, and emphasize the importance of engaging in healthy behaviours (e.g. eating behaviours, physical activity) in health promotion efforts.[59,61-64]

Stratified analyses revealed gender differences in the observed outcomes. Intentions to gain weight were associated with more symptoms of depression and anxiety and lower self-concept in girls. Symptoms of depression and anxiety were also increased in boys who intended to gain weight, but to a lesser extent. While some research demonstrates that body dissatisfaction and negative body image are more common in girls than in boys[65-67], Pope et al. suggest that rates of body dissatisfaction in boys may be comparable to these rates in girls.[68] In adolescent boys, body dissatisfaction tends to manifest as a greater emphasis on weight gain via increased muscle mass, rather than as weight loss.[69] Manipulation behaviours used to enhance muscularity have been associated with adverse psychological consequences in adolescence.[70-72] Our findings of symptoms of higher anxiety in boys with weight-gain intentions corroborate this evidence. However, it remains unclear why boys' weight-gain intentions were not also associated with depressive symptoms or poor self-concept. This may be related to developmental differences, with pubertal timing in boys tending to lag behind that of girls, and pubertal changes bringing boys closer to sociocultural ideals of muscularity.[73] Girls, on the other hand, tend to report higher body dissatisfaction and poor self-image and depression after the onset of puberty.[73,74] Findings may therefore differ across developmental age and in early versus late developers, factors we were unable to assess in this study.

Our findings for weight maintenance intentions were mixed. In our sample, girls and boys who intended to maintain their weight reported lower symptoms of depression but greater symptoms of anxiety. This suggests that intending to maintain weight is not ubiquitously related to mental disorder symptoms, as appears to be the case for intending to lose or gain weight. Our measures do not reflect actual engagement in weight-control behaviours. The effect of active weight-maintenance behaviours on mental health warrants additional research, especially in contrast to adolescents without particular intentions. Intending to maintain weight was associated with greater self-concept in boys, indicating that those who intend to maintain their weight may be satisfied with their physical and social beliefs about themselves. This was not evident among girls in our sample, echoing the literature that shows that adolescent girls are disproportionately affected by sociocultural norms to do with body weight and shape.[67] Future research is needed on the gendered experience of weight maintenance and control intentions and mental health.

Implications for findings

This research furthers evidence that adolescence represents an important period for the development of body image, self-concept and mental health. Considering that bodily changes occur alongside heightened

TABLE 2
Differences in weight control intentions by sample characteristics and measures of depression, anxiety and self-concept (N = 45 019)

Measure	Self-reported weight control intentions				*p* value
	None	Maintain	Lose	Gain	
Grade, n (%)					
9 (*ref.*)	3719 (30.1)	2527 (27.9)	4117 (25.1)	1647 (22.7)	< 0.0001
10	3580 (29.0)	2578 (28.5)	4437 (28.1)	2011 (27.8)	
11	3183 (25.8)	2541 (28.1)	4459 (27.2)	2111 (29.1)	
12[a]	1867 (15.1)	1399 (15.5)	3365 (20.6)	1478 (20.4)	
Gender, n (%)					
Boys (*ref.*)	5750 (46.6)	4833 (53.4)	11 055 (67.5)	1302 (18.0)	< 0.0001
Girls	6599 (53.4)	4212 (46.6)	5323 (32.5)	5945 (82.0)	
Race/ethnicity, n (%)					
Non-racialized (*ref.*)	9404 (76.2)	6872 (76.0)	11 195 (68.4)	4907 (67.7)	< 0.0001
Racialized	2945 (23.8)	2173 (24.0)	5183 (31.6)	2340 (32.3)	
BMI category, n (%)					
Underweight	262 (2.1)	125 (1.4)	76 (0.5)	294 (4.1)	< 0.0001
Normal (*ref.*)	7601 (61.5)	5980 (66.1)	6903 (42.1)	5270 (72.7)	
Overweight	1033 (8.4)	918 (10.1)	3286 (20.1)	372 (5.1)	
Obesity	369 (3.0)	342 (3.8)	1873 (11.4)	120 (1.7)	
Not reported	3084 (25.0)	1680 (18.6)	4240 (25.9)	1191 (16.4)	
Meets MVPA guidelines, n (%)[b]					
No (*ref.*)	7814 (63.3)	5271 (58.3)	9494 (58.0)	3420 (47.2)	< 0.0001
Yes	4535 (36.7)	3774 (41.7)	6884 (42.0)	3827 (52.8)	
Meets screen time guidelines, n (%)[b]					
No (*ref.*)	11 543 (93.5)	8462 (93.5)	15 680 (95.7)	6938 (95.7)	< 0.0001
Yes	806 (6.5)	583 (6.5)	698 (4.3)	309 (4.3)	
Meets sleep guidelines, n (%)[b]					
No (*ref.*)	6861 (55.6)	4912 (54.3)	10 748 (65.6)	4115 (56.8)	< 0.0001
Yes	5488 (44.4)	4133 (45.7)	5630 (34.4)	3132 (43.2)	
Skipping breakfast, n (%)					
No (*ref.*)	6096 (49.4)	4690 (51.8)	5887 (35.9)	3634 (50.1)	< 0.0001
Yes	6253 (50.6)	4355 (48.2)	10 491 (64.1)	3613 (49.9)	
Depression symptoms (CESD-R-10)					
Mean score (SD)	8.0 (5.8)	7.9 (5.5)	10.5 (6.4)	8.2 (5.7)	< 0.0001
Anxiety symptoms (GAD-7)					
Mean score (SD)	5.6 (5.4)	5.9 (5.3)	8.0 (6.0)	5.6 (5.5)	< 0.0001
Self-concept[c]					
Mean score (SD)	10.2 (4.3)	9.9 (4.0)	12.5 (4.8)	10.0 (4.4)	< 0.0001
Total (%)	12 349 (27.4)	9045 (20.1)	16 378 (36.4)	7247 (16.1)	

Source: Year 6 (2017–18) COMPASS Student Questionnaire.

Abbreviations: BMI, body mass index; CESD-R-10, Centre for Epidemiological Studies Depression Scale (Revised)-10; GAD-7, Generalized Anxiety Disorder 7-item Scale; MVPA, moderate-to-vigorous physical activity; *ref.*, reference category; SD, standard deviation.

[a] There is no Grade 12 in Quebec.

[b] Refers to whether students met the Canadian Society for Exercise Physiology (CSEP) 24-Hour Movement Guidelines recommendations of ≥1 hour MVPA, ≤2 hours recreational screen time and 8–10 hours of sleep per day.[46]

[c] Assessed using items from the *SDQ II* Manual: *Self Description Questionnaire II*.[45] Higher scores indicate poorer self-concept.

TABLE 3
Differences between adolescent girls and boys (N = 45 019) in sociodemographic characteristics, weight control intentions and measures of depression, anxiety and self-concept

Measure	Girls	Boys	*p* value
Grade, n (%)			
9 (*ref.*)	6136 (26.7)	5874 (26.6)	0.843
10	6426 (28.0)	6180 (28.0)	
11	6282 (27.4)	6012 (27.2)	
12[a]	4096 (17.9)	4013 (18.2)	
Race/ethnicity, n (%)			
Non-racialized (*ref.*)	16 806 (73.3)	15 572 (70.5)	< 0.0001
Racialized	6134 (26.7)	6507 (29.5)	
BMI category, n (%)			
Underweight	309 (1.4)	448 (2.0)	< 0.0001
Normal (*ref.*)	13 861 (60.4)	11 893 (53.9)	
Overweight	2484 (10.8)	3125 (14.2)	
Obesity	983 (4.3)	1721 (7.8)	
Not reported	5303 (23.1)	4892 (22.2)	
Meets MVPA guidelines, n (%)[b]			
No (*ref.*)	14 800 (64.5)	11 199 (50.7)	< 0.0001
Yes	8140 (35.5)	10 880 (49.3)	
Meets screen time guidelines, n (%)[b]			
No (*ref.*)	21 571 (94.0)	21 052 (95.4)	< 0.0001
Yes	1369 (6.0)	1027 (4.6)	
Meets sleep guidelines, n (%)[b]			
No (*ref.*)	14 122 (61.6)	12 514 (56.7)	< 0.0001
Yes	8818 (38.4)	9565 (43.3)	
Breakfast skipping, n (%)			
No *(ref.)*	9366 (40.8)	10 941 (49.5)	< 0.0001
Yes	13 574 (59.2)	11 138 (50.5)	
Weight control intentions, n (%)			
None *(ref.)*	5750 (25.1)	6599 (29.9)	< 0.0001
Maintain	4833 (21.1)	4212 (19.1)	
Lose	11 055 (48.2)	5323 (24.1)	
Gain	1302 (5.6)	5945 (26.9)	
Depression symptoms (CESD-R-10)			
Mean score (SD)	10.2 (6.4)	7.6 (5.4)	< 0.0001
Anxiety symptoms (GAD-7)			
Mean score (SD)	8.2 (5.9)	4.8 (5.0)	< 0.0001
Self-concept[c]			
Mean score (SD)	11.7 (4.6)	9.8 (4.2)	< 0.0001
Total (%)	22 940 (51.0)	22 079 (49.0)	

Source: Year 6 (2017–18) COMPASS Student Questionnaire.

Abbreviations: BMI, body mass index; CESD-R-10, Centre for Epidemiological Studies Depression Scale (Revised)-10, GAD-7, Generalized Anxiety Disorder 7-item Scale; MVPA, moderate-to-vigorous physical activity; *ref.*, reference category; SD, standard deviation.

[a] There is no Grade 12 in Quebec.

[b] Refers to whether students met the Canadian Society for Exercise Physiology (CSEP) 24-Hour Movement Guidelines recommendations of ≥1 hour MVPA, ≤2 hours recreational screen time and 8–10 hours of sleep per day.[46]

[c] Assessed using items from the *SDQ II Manual: Self Description Questionnaire II*.[45] Higher scores indicate poorer self-concept.

social pressures and greater exposure to sociocultural ideals in secondary school, our findings suggest it may be beneficial to target school-based adolescent populations in promoting healthy weight control and positive body image. Further research is needed to examine the temporal and potential bidirectional relationships between weight control intentions and mental health in adolescent girls and boys, as depression and anxiety may play a role in body weight and health behaviours.[75,76]

Also needed is additional research examining the gendered associations between weight control intentions and mental health in adolescents. For instance, discerning why intentions to gain weight were associated with poor mental health in girls, more so than boys, would help design interventions that have an impact. Much of the existing research on weight control intentions focusses on self-esteem and adolescents' evaluation of their self-worth,[77] constructs that may not adequately capture adolescents' view of themselves across the multiple domains encompassed by self-concept (e.g. academic, social, emotional, physical).[78,79]

Given the high number of students who reported attempting to control their weight through weight loss, despite our controlling for BMI, it is important to mitigate adolescents' exposure to factors contributing to unnecessary weight-related intentions. Public health interventions in multiple environments[80,81] can address these factors equitably, for example, by including educational components directed toward adolescent groups or the adults they regularly interact with (e.g. parents, teachers and coaches).[82] Dissonance-based and media literacy programs have demonstrated positive results in reducing body dissatisfaction among adolescents.[83,84]

Also worth considering is situating interventions in environments that adolescents frequent (e.g. schools, recreational facilities)[85,86] as well as broader-level policies and regulations. Policy interventions that restrict adolescents' exposure to weight-focussed advertisements on popular social media and photo sharing platforms may be beneficial.[87]

Lastly, a weight-neutral approach towards health promotion should be adopted instead of using weight as an indicator of better health.[61] Obesity prevention efforts

TABLE 4
Multivariable linear regression models estimating symptoms of depression, anxiety and self-concept, in adolescent girls (n = 22 940) and boys (n = 22 079)

Weight control intentions	β (95% CL)					
	Model I		Model II		Model III	
	Unadjusted	Adjusted[a]	Unadjusted	Adjusted[a]	Unadjusted	Adjusted[a]
Girls						
None (*ref.*)	0.00	0.00	0.00	0.00	0.00	0.00
Maintain	−0.30 (−0.46, −0.14)***	−0.21 (−0.37, −0.06)**	0.25 (0.11, 0.40)***	0.22 (0.08, 0.37)**	−0.25 (−0.43,−0.08)**	−0.12 (−0.29, 0.05)
Lose	0.75 (0.62, 0.88)***	0.52 (0.39, 0.66)***	0.42 (0.30, 0.54)***	0.41 (0.28, 0.54)***	2.46 (2.31, 2.61)***	2.06 (1.92, 2.21)***
Gain	0.66 (0.40, 0.91)***	0.54 (0.29, 0.79)***	0.45 (0.22, 0.68)***	0.50 (0.27, 0.73)***	1.36 (1.08, 1.63)***	1.25 (0.98, 1.51)***
Boys						
None (*ref.*)	0.00	0.00	0.00	0.00	0.00	0.00
Maintain	−0.20 (−0.34, −0.05)**	−0.15 (−0.29, −0.01)*	0.17 (0.03, 0.30)*	0.17 (0.04, 0.31)*	−0.48 (−0.65, −0.32)***	−0.33 (−0.49, −0.17)***
Lose	0.41 (0.28, 0.55)***	0.26 (0.12, 0.40)***	0.31 (0.19, 0.44)***	0.33 (0.20, 0.47)***	1.39 (1.24, 1.54)***	1.10 (0.94, 1.26)***
Gain	0.08 (−0.05, 0.21)	0.08 (−0.05, 0.21)	0.15 (0.24, 0.27)*	0.17 (0.01, 0.26)*	−0.29 (−0.44, −0.14)***	−0.11 (−0.26, 0.12)

Abbreviations: BMI, body mass index; CESD-R-10, Centre for Epidemiological Studies Depression Scale (Revised)-10; CL, confidence limit; GAD-7, Generalized Anxiety Disorder 7-item Scale; MVPA, moderate-to-vigorous physical activity; *ref.*, reference category.

Note: Model I estimates depression symptom (CESD-R-10) scores; Model II estimates anxiety symptom (GAD-7) scores; Model III estimates self-concept (higher scores indicate poorer self-concept). Model I controls for GAD-7 and Model II controls for CESD-R-10.

[a] Estimates are adjusted for grade, race/ethnicity, BMI category, MVPA, screen time, sleep and skipping breakfast.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

should be examined and modified to emphasize the importance of indicators of health beyond weight status[61-63], including healthy behaviours and mental health.

Strengths and limitations

Despite the confidentiality of the process students use to complete the COMPASS Student Questionnaire,[40] students may have been reluctant to disclose weight-related information or any symptoms of depression and anxiety. However, active-information, passive-consent data collection protocols and anonymity in the COMPASS study promote robust self-report.[88] It should be noted that measures of depression and anxiety are not diagnostic; rather, they are indicative of the presence of self-reported symptoms of depression and anxiety in large adolescent populations.[34,89,90]

Some measures employed in the analyses may limit the interpretation of the findings. Our binary gender measure, combined with instructions given to students to not respond to items if they chose, may have resulted in the exclusion of students who self-identified as gender non-conforming or non-binary and who are disproportionately at risk for disordered eating.[91] Future research should explore the relationships between weight control intentions and mental health using more comprehensive measures of gender identity. Given the measures used and the primarily non-racialized sample, we were also unable to explore effects by ethnic identity; future studies employing intersectional analyses in this domain are warranted.

Our measure of weight control intentions did not differentiate between attempts to control lean versus fat mass; as such, findings can only be interpreted to represent an intention to either maintain or manipulate one's weight in the direction of loss or gain. Moreover, it should be noted that for some, intentions to gain weight may not necessarily be problematic as adolescents are still growing.

Due to the COMPASS study's convenience sampling procedure, our data are not nationally representative and the findings might not be generalizable to the entire adolescent population in Canada. However, convenience sampling helps achieve a desirable sample size that permits adequate power to detect the presence of a significant association, if present.[88] To help mitigate the risk of bias as a function of our complete case analysis, we included students with unreported BMI as a separate category given the evidence that weight-related data are often not missing at random.[48,92] Finally, these data were cross-sectional. While causality cannot be inferred, our findings fill a critical gap in the existing literature and can be used to guide future research clarifying temporality of the relationships between weight control intentions and mental health and their mechanisms. This can be achieved using prospective COMPASS study data.

Conclusion

Intentions to change weight were associated with mental health in a large sample of adolescent boys and girls in Canada. For both boys and girls, weight-loss intentions were associated with higher symptoms of depression and anxiety and lower self-concept, while weight-gain intentions were associated with poorer mental health in girls than in boys. Girls and boys who intended to maintain their weight represent a distinct group, warranting further investigation into how weight maintenance behaviours are associated with mental health. Future research is needed to better understand the gendered experience of weight control intentions and improve our understanding of strategies

that can mitigate their negative influence on the mental health of adolescents.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Authors' contributions and statement

ND, IR, AB and REL designed the study and drafted the manuscript. IR analyzed and interpreted the data. KAP conceptualized the COMPASS Mental Health Module, drafted components of the manuscript and revised the manuscript for critical content. STL conceptualized the COMPASS host study, led the acquisition of data and revised the manuscript for critical content. Everyone who contributed significantly to the work described in this manuscript has been listed above.

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