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

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This article has been peer reviewed.

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

Introduction

Adolescence (i.e. ages approximately 12 to 18 years) 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. This can contribute to the rise of negative body image—a person’s confidence in their appearance—and weight dissatisfaction. An unhealthy body image, characterized by skewed and negative perceptions, may play a role in the development of adverse behaviours and psychological harm. This is especially true during adolescence, a critical time for the onset of depression, anxiety and eating disturbances.

Body image is influenced by exposure to messages about body ideals, through interacting with family and friends and observing portrayals in the media. Some may feel pressured to conform to socially prescribed body ideals that often represent unrealistic and unattainable body weights and shapes. 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 concerns19,20, including mental disorder and subclinical symptoms of social anxiety21,22 and depression23-26 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 conflict31, 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 weight44 and report feeling pressured to lose weight15, 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 print40 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 dependent (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.31,42

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 α = 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 (α = 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 (α = 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).³⁶ 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 Measures used to assess MVPA⁴⁸, screen time⁴⁸ and BMI⁵² 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).³⁹ 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 overweight. 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 (β = −0.21, p < 0.01) and greater symptoms of anxiety (β = 0.22, p < 0.01) than adolescent girls without weight control intentions. Girls who intended to lose weight reported greater symptoms of depression (β = 0.52, p < 0.001) and anxiety (β = 0.41, p < 0.001) and poorer self-concept (β = 2.06, p < 0.001), while girls who intended to gain weight also reported greater symptoms of depression (β = 0.54, p < 0.001) and anxiety (β = 0.50, p < 0.001) and poorer self-concept (β = 1.25, p < 0.001). Adolescent boys who intended to maintain weight reported fewer symptoms of depression (β = −0.15, p < 0.05), slightly greater anxiety (β = 0.17, p < 0.05) and higher self-concept (β = −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 (β = 0.26, p < 0.001) and anxiety (β = 0.33, p < 0.001) and poor self-concept (β = 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 (β = 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
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.\textsuperscript{54} In adults, attempts to lose weight are common but largely ineffective.\textsuperscript{54-57} 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.\textsuperscript{38-60}

Obesity prevention efforts have traditionally included weight-focussed messages that can negatively affect adolescents.\textsuperscript{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.\textsuperscript{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\textsuperscript{65-67}, Pope et al. suggest that rates of body dissatisfaction in boys may be comparable to these rates in girls.\textsuperscript{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.\textsuperscript{69} Manipulation behaviours used to enhance masculinity have been associated with adverse psychological consequences in adolescence.\textsuperscript{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 masculinity.\textsuperscript{73} Girls, on the other hand, tend to report higher body dissatisfaction and poor self-image and depression after the onset of puberty.\textsuperscript{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.\textsuperscript{68} Future research is needed on the gendered experience of weight maintenance and control intentions in this 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 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

<table>
<thead>
<tr>
<th>Measure</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys (ref.)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Girls</td>
<td>0.85 (0.81–0.89)**</td>
<td>0.85 (0.79–0.91)</td>
<td>0.58 (0.52–0.63)**</td>
<td>0.64 (0.54–0.76)**</td>
</tr>
<tr>
<td>Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 (ref.)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>10</td>
<td>0.86 (0.81–0.92)**</td>
<td>0.95 (0.87–1.03)</td>
<td>0.82 (0.73–0.92)**</td>
<td>0.87 (0.70–1.07)</td>
</tr>
<tr>
<td>11</td>
<td>0.77 (0.72–0.82)**</td>
<td>0.88 (0.80–0.96)**</td>
<td>0.79 (0.70–0.89)**</td>
<td>0.77 (0.62–0.97)**</td>
</tr>
<tr>
<td>12</td>
<td>0.77 (0.72–0.83)**</td>
<td>0.91 (0.82–1.00)</td>
<td>0.85 (0.74–0.97)**</td>
<td>0.67 (0.52–0.88)**</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-racialized (ref.)</td>
<td>1.37 (1.30–1.44)**</td>
<td>1.46 (1.36–1.57)**</td>
<td>1.57 (1.43–1.72)**</td>
<td>1.05 (0.88–1.25)**</td>
</tr>
<tr>
<td>Racialized</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>1.21 (1.01–1.45)*</td>
<td>1.31 (1.03–1.66)*</td>
<td>1.52 (1.10–2.07)**</td>
<td>1.41 (0.77–2.60)</td>
</tr>
<tr>
<td>Normal (ref.)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.06 (0.98–1.15)</td>
<td>0.91 (0.82–1.02)</td>
<td>1.07 (0.92–1.24)</td>
<td>0.95 (0.71–1.28)</td>
</tr>
<tr>
<td>Obesity</td>
<td>1.00 (0.90–1.15)</td>
<td>1.06 (0.91–1.22)</td>
<td>1.22 (1.00–1.40)*</td>
<td>1.23 (0.86–1.76)</td>
</tr>
<tr>
<td>Not reported</td>
<td>1.43 (1.35–1.52)**</td>
<td>1.60 (1.48–1.72)**</td>
<td>1.89 (1.71–2.10)**</td>
<td>2.13 (1.77–2.56)**</td>
</tr>
</tbody>
</table>

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 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. 

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

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

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.

c Assessed using items from the SDQ II Manual: Self Description Questionnaire II. 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

<table>
<thead>
<tr>
<th>Measure</th>
<th>Girls</th>
<th>Boys</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 (ref.)</td>
<td>6136 (26.7)</td>
<td>5874 (26.6)</td>
<td>0.843</td>
</tr>
<tr>
<td>10</td>
<td>6426 (28.0)</td>
<td>6180 (28.0)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>6282 (27.4)</td>
<td>6012 (27.2)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>4096 (17.9)</td>
<td>4013 (18.2)</td>
<td></td>
</tr>
<tr>
<td>Race/ethnicity, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-racialized (ref.)</td>
<td>16806 (73.3)</td>
<td>15572 (70.5)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Racialized</td>
<td>6134 (26.7)</td>
<td>6507 (29.5)</td>
<td></td>
</tr>
<tr>
<td>BMI category, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>309 (1.4)</td>
<td>448 (2.0)</td>
<td></td>
</tr>
<tr>
<td>Normal (ref.)</td>
<td>13861 (60.4)</td>
<td>11893 (53.9)</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>2484 (10.8)</td>
<td>3125 (14.2)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Obesity</td>
<td>983 (4.3)</td>
<td>1721 (7.8)</td>
<td></td>
</tr>
<tr>
<td>Not reported</td>
<td>5303 (23.1)</td>
<td>4892 (22.2)</td>
<td></td>
</tr>
<tr>
<td>Meets MVPA guidelines, n (%)&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (ref.)</td>
<td>14800 (64.5)</td>
<td>11199 (50.7)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>8140 (35.5)</td>
<td>10880 (49.3)</td>
<td></td>
</tr>
<tr>
<td>Meets screen time guidelines, n (%)&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (ref.)</td>
<td>21571 (94.0)</td>
<td>21052 (95.4)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>1369 (6.0)</td>
<td>1027 (4.6)</td>
<td></td>
</tr>
<tr>
<td>Meets sleep guidelines, n (%)&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (ref.)</td>
<td>14122 (61.6)</td>
<td>12514 (56.7)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>8818 (38.4)</td>
<td>9565 (43.3)</td>
<td></td>
</tr>
<tr>
<td>Breakfast skipping, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (ref.)</td>
<td>9366 (40.8)</td>
<td>10941 (49.5)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>13574 (59.2)</td>
<td>11138 (50.5)</td>
<td></td>
</tr>
<tr>
<td>Weight control intentions, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None (ref.)</td>
<td>5750 (25.1)</td>
<td>6599 (29.9)</td>
<td></td>
</tr>
<tr>
<td>Maintain</td>
<td>4833 (21.1)</td>
<td>4212 (19.1)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Lose</td>
<td>11055 (48.2)</td>
<td>5323 (24.1)</td>
<td></td>
</tr>
<tr>
<td>Gain</td>
<td>1302 (5.6)</td>
<td>5945 (26.9)</td>
<td></td>
</tr>
<tr>
<td>Depression symptoms (CESD-R-10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean score (SD)</td>
<td>10.2 (6.4)</td>
<td>7.6 (5.4)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Anxiety symptoms (GAD-7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean score (SD)</td>
<td>8.2 (5.9)</td>
<td>4.8 (5.0)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Self-concept&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean score (SD)</td>
<td>11.7 (4.6)</td>
<td>9.8 (4.2)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Total</td>
<td>22940 (51.0)</td>
<td>22079 (49.0)</td>
<td></td>
</tr>
</tbody>
</table>

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.

<sup>a</sup> There is no Grade 12 in Quebec.

<sup>b</sup> 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.<sup>6</sup>

<sup>c</sup> Assessed using items from the SDQ II Manual: Self Description Questionnaire II.<sup>6</sup> 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.<sup>75,76</sup>

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 focuses on self-esteem and adolescents’ evaluation of their self-worth,<sup>77</sup> constructs that may not adequately capture adolescents’ view of themselves across the multiple domains encompassed by self-concept (e.g. academic, social, emotional, physical).<sup>78,79</sup>

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<sup>80,81</sup> 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).<sup>82</sup> Dissonance-based and media literacy programs have demonstrated positive results in reducing body dissatisfaction among adolescents.<sup>83,84</sup>

Also worth considering is situating interventions in environments that adolescents frequent (e.g. schools, recreational facilities)<sup>85,86</sup> 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.<sup>87</sup>

Lastly, a weight-neutral approach towards health promotion should be adopted instead of using weight as an indicator of better health.<sup>90</sup> 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)

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

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.

* 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.

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.† Future research should explore the relationships between weight control intentions and mental health, including healthy behaviours and mental health.

Strengths and limitations
Despite the confidentiality of the process student use to complete the COMPASS Student Questionnaire, 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. 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.

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Table 4 shows multivariable linear regression models estimating symptoms of depression, anxiety and self-concept, in adolescent girls (n = 22,940) and boys (n = 22,079). The models control for GAD-7 and CESD-R-10, and the estimates are adjusted for grade, race/ethnicity, BMI category, MVPA, screen time, sleep and skipping breakfast. The table includes the β coefficients with 95% confidence intervals for weight control intentions (Maintain, Lose, Gain) in girls and boys, with significant associations marked with asterisks (*** p < 0.001, ** p < 0.01, * p < 0.05).

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.

Acknowledgements

The COMPASS study has been supported by a bridge grant from the Canadian Institutes of Health Research (CIHR) Institute of Nutrition, Metabolism and Diabetes (INMD) through the “Obesity—Interventions to Prevent or Treat” priority funding awards (OOP-110788; awarded to STL); an operating grant from the CIHR Institute of Population and Public Health (IPPH) (MOP-114875; awarded to STL); a CIHR project grant (PJT-148562; awarded to STL); a CIHR bridge grant (PJT-149092; awarded to KP/STL); a CIHR project grant (PJT-159693; awarded to KP); and by a research funding arrangement with Health Canada (1617-HQ-000012; contract awarded to STL). The COMPASS-Quebec project also receives funding from the Ministère de la Santé et des Services sociaux of the province of Quebec, and the Direction régionale de santé publique du CIUSSS de la Capitale-Nationale.

The funding sources had no role in the study design, in the collection, analysis and interpretation of data; in the writing of the manuscript; or in the decision to submit the article for publication.

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, and 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.

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

References


Original qualitative research

Children’s perceptions of a Centrally Procured School Food Program in southwestern Ontario, Canada

Paige Colley, PhD (1); Linda Miller, PhD (1); Jamie A. Seabrook, PhD (1, 2); Sarah J. Woodruff, PhD (3); Jason Gilliland, PhD (1)

This article has been peer reviewed.

Abstract

Introduction: This qualitative study investigates children’s perceptions of the influences of a Centrally Procured School Food Program on their dietary behaviours and their recommendations on how to improve the program.

Methods: The observations of 208 students aged 9 to 14 years (Grades 5–8) at 21 elementary schools were collected through focus groups in 2017/18. The larger intervention consisted of a 10-week program offering daily snacks (i.e. fruit, vegetables, whole grains, dairy, meat alternatives) for elementary school children in southwestern Ontario, Canada.

Results: The participants’ overall impressions of the program were positive. They noted reduced hunger, increased energy and improved nutrition. Many children felt that the program changed their dietary patterns at home as well as at school, particularly in terms of eating more fruit and vegetables. The snack program also enabled children to try healthy foods.

Conclusion: Most participants considered the program to be beneficial in promoting healthy eating. Participants recommended adding educational activities, expanding the variety of foods and increasing child involvement in selecting and preparing foods.

Keywords: nutrition, child health, food program, dietary behaviour, elementary school

Introduction

Public health professionals have become increasingly concerned about the quality of children’s diets. A meagre 10% of Canadian children aged between 6 and 12 years eat five or more servings of fruit and vegetables daily. Regular—and excess—consumption of foods that lack essential nutrients is associated with adverse health consequences. Rates of obesity have reached epidemic proportions, with nearly one-third of Canadian children overweight or obese. Obesity can lead to a lifetime of health complications including type 2 diabetes, cardiovascular disease and psychosocial problems. These trends reflect an important health issue that warrants immediate attention, given that childhood dietary patterns of low-nutritional quality often persist into adulthood.

School nutrition programs have been identified as an effective way to promote healthy eating. A recent systematic review found that multicomponent food-provision interventions in Canadian elementary schools positively influenced children’s intake of nutrient-dense foods. Elementary schools may be more successful than secondary schools for school nutrition programming as there are typically no or fewer foods for sale and stiffer restrictions around eating outside of school.

While school nutrition programming may yield positive health benefits, experimental studies evaluating elementary school food programming in Canada are limited. To our knowledge, there has only been one qualitative study investigating children’s perceptions of and experiences with elementary school food programs nationally. This presents a critical and timely opportunity to solicit the views and opinions of children receiving these initiatives.

The purpose of this qualitative research study was to investigate children’s perceptions of the Ontario Student Nutrition Program’s (OSNP) novel Centrally Procured
School Food Program (CPSFP). The CPSFP was piloted in 30 elementary schools in southwestern Ontario in 2017/2018. This qualitative study is part of a larger evaluation of the program.

The Victorian Order of Nurses implemented the CPSFP in southwestern Ontario to improve the nutritional quality of food being offered through existing school food programs and to establish local food procurement strategies. After the pilot evaluation in 2017/2018, the CPSFP has become one of the largest free school food programs in Canada, supplying primarily locally sourced food.

Participating schools receive weekly deliveries of fresh fruit, vegetables, dairy products, whole grains and meat alternatives to nourish thousands of elementary school children daily. By offering a dietitian-approved menu, the CPSFP provides high-nutrient snacks that follow the nutritional guidelines proposed by the Ministry of Children and Youth Services. This school-based initiative also incorporates centralized food procurement strategies to source a higher proportion of program food (at least 20%) from local farmers.

This study contributes to existing Canadian school nutrition literature by evaluating children’s perceptions of and suggestions for the CPSFP. The research objectives were to investigate: (1) children’s perceptions of the influences of the CPSFP on their diet and eating behaviours; and (2) factors contributing to or detracting from program success, including future program development recommendations.

Methods

This study used a child-centred research design guided by an epistemological stance that research is with children, rather than on children. The research approach used qualitative methods that value children’s voices and experiences, rather than assuming that adult program administrators can speak for all children. The data collection and analysis processes were supported by the moderator’s educational training and experience in engaging with children to facilitate an open, respectful conversation. We facilitated focus groups to create a receptive and constructive dialogue among child participants to gather perceptions of and suggestions for the nutrition program.

This study incorporated focus groups at participating elementary schools involved with the CPSFP as a 10-week intervention. Ethics approval was granted by the Non-Medical Research Ethics Board of Western University (NMREB #: 108549). The two publicly funded, English-speaking school boards in the region and the principals of 30 elementary schools approved the study.

Although the CPSFP was offered to all children from kindergarten to Grade 8, this evaluation study targeted those in Grades 5 to 8 only. Research of surveys and focus groups has shown that by this age children can effectively express their perspectives on and recommendations for improving their situation in and around school. The research team facilitated classroom presentations in each school for children in Grades 5 to 8 to explain the research process and to answer any questions. Following these presentations, a letter of information and parental/guardian consent and child assent forms were sent home (the school had already informed parents/guardians about the CPSFP). Signed parental/guardian consent and child assent were required to participate in the larger study, which included parent/guardian surveys, pre- and post-program surveys of children, direct observations during snack times and focus groups with children, school staff, program coordinators and food providers.

In this paper, we examine data from the focus groups with children. Parental/guardian consent and child assent included permission to audio record and transcribe verbatim all focus group material. Participants were told that anonymized direct quotations may be used for the purpose of this research.

We used a cluster randomized sampling strategy to invite the 30 schools engaged in the 10-week CPSFP research evaluation to participate in the focus groups. Out of the 30 schools, 21 agreed to participate in the follow-up focus groups. All children in Grades 5 to 8 (aged 9–14 years) were invited to participate (n = 3432) and 647 of the invited children had parental/guardian consent. From a list of students who had received parental/guardian consent, school principals selected 4 to 12 children in each school through a randomized numbered approach, yielding a sample of 208 children who assented and participated in the focus groups. We conducted 38 focus groups, each made up of four to six children, across 21 schools during the 2017/18 school years.

Sociodemographic characteristics of the focus group participants for this qualitative study were obtained from youth and parent/guardian surveys as part of the larger evaluation of the CPSFP.

A trained doctoral research candidate moderated each focus group, and each included a research assistant who took notes and audio recorded the discussions. Several members of an interdisciplinary team comprising child health researchers and educators developed a semi-structured interview guide (available from the authors on request).

The questions posed by the moderator during the focus groups facilitated the children’s discussions about their perceptions of the CPSFP, specifically any observed impacts on their diets. Each focus group lasted between 20 and 60 minutes, with most 30 minutes long. The focus groups were held in each school’s resource room, library, classroom or gym. All the focus groups were conducted in English, audio recorded, transcribed verbatim and double-checked for accuracy.

We used thematic analysis to identify patterns within the data. An inductive approach to coding was used to analyze specific participant responses and form broader conclusions. Independent coders followed Braun and Clarke’s systematic process for thematic analysis, which involved familiarizing oneself with the data, generating initial codes, searching for, mapping and defining themes, and producing a final analysis. We used NVivo qualitative software version 12 (QSR International Pty Ltd., Melbourne, Australia) to organize and review the transcripts from each school.
Several protocols were integrated to maintain rigour in the analysis. The focus group moderator created the initial codes to make sure significant content was represented accurately in conjunction with what was observed and heard within the focus groups. A secondary coder, an external research assistant who was neither involved in the development nor present in the focus groups, conducted an independent review of the secondary code of the data to mitigate any internal bias.

The two researchers, working independently, identified a high degree of similarity between the general codes. Any missing or contradictory codes were resolved by discussion with the principal investigator until consensus was reached. Critical reflexivity was integrated into the analysis by considering the ways in which personal assumptions, values and actions may have influenced interpretation of the data. An aim of the study was to align with child-centred principles and actively present the analysis using the voices and ideologies of children.

Results

A total of 208 students participated in focus groups, resulting in sufficient data to reach saturation. The mean age (SD) of the participants was 11.2 (1.2) years, with 64.4% self-identifying as female. Most participants resided in small towns or rural settings (75%). The median household income was between $80,000 and $89,999. Themes that emerged during the data analysis process were organized into two key domains: children’s perceptions of the influences of the CPSFP on their dietary behaviours, and recommendations to improve the CPSFP (see Table 1).

Perceived influences of the Centrally Procured School Food Program on children’s dietary behaviours

The overall CPSFP program was well-received by most children. Their impressions of the program and its influence on their nutrition were largely positive:

“... an opportunity for a lot of students to not be hungry.” Female, Grade 7

“It fuels the rest of our day, the snack program, because they have all the stuff that gets our energy going.” Male, Grade 6

“This [program]... keeps kids’ nutrition up.” Male, Grade 6

Many participants described how the program reduced hunger, promoted energy and encouraged proper nutrition during the school day.

Children frequently reported that they were hungry in the morning prior to receiving the CPSFP. Hunger was often attributed to not having eaten breakfast before the start of the school day.

“Some people, like, don’t have time to eat breakfast in the morning, so it’s good to get to school and then like have something there that you [...] eat.” Female, Grade 8

Nearly all of the participants wanted the snacks from the program multiple times throughout the day to curb hunger.

“... during the whole day so I wouldn’t be hungry.” Female, Grade 7

Participants noted that the snacks were quickly eaten, with few or no items remaining. The amount of the food eaten often depended on the item, preferences for select foods and general hunger levels.

“There’s barely any [food] left.” Male, Grade 8

“Sometimes they put, like, all the favourite foods, and then it’s all gone really quick.” Male, Grade 5

Most participants indicated that they wanted more snacks, in particular the foods they liked.

Many children felt that the program had positively influenced their eating patterns at school and at home. Participants described eating more fruit and vegetables, and reducing their intake of unhealthy snacks, since participating in the program.

“I started packing my lunch a lot differently. A lot of the times I have no junk food in my lunch and more fruit and vegetables.” Male, Grade 5

A few participants, however, indicated that the program did not change their eating patterns, as they thought they already had a healthy diet.

Many children described how the program encouraged them to try various foods that they had not eaten before.

“There’s a lot of different food that I’ve never had before in the snack program, so that kind of encouraged me to eat different foods.” Female, Grade 6

“If I try something at school and then I really like it, then I’ll go home and want it, so then my parents buy it for me and I’ll eat that.” Female, Grade 8

The children noticed that access and exposure to healthy food items may have influenced their willingness to try and consume diverse foods. They also noticed how they influenced their parents/guardians’ purchasing patterns since participating in the program.

<table>
<thead>
<tr>
<th>Perceived influences of the CPSFP on children’s dietary behaviours</th>
<th>Recommendations to improve the CPSFP</th>
</tr>
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<tbody>
<tr>
<td>• Encourages proper nutrition</td>
<td>• Adding utensils and tools</td>
</tr>
<tr>
<td>• Provides energy</td>
<td>• Portioning food</td>
</tr>
<tr>
<td>• Reduces hunger</td>
<td>• Improving food safety and hygiene</td>
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<tr>
<td>• Some positive impacts on eating patterns at school and home</td>
<td>• Adding educational initiatives</td>
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<td>• Greater consumption of fruit and vegetables</td>
<td>• Gathering student feedback on food preferences</td>
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<td>• Reduced intake of unhealthy snacks</td>
<td>• Greater child involvement in food preparation</td>
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<tr>
<td>• Willingness to try different foods</td>
<td>• Adding a greater variety of foods</td>
</tr>
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</table>

Abbreviation: CPSFP, Centrally Procured School Food Program.
Recommendations to improve the Centrally Procured School Food Program

A central theme emerged surrounding program implementation practices. Children recommended adding utensils to help eat foods provided, coolers or ice packs to keep items cold and containers to portion food. For example,

“They should [...] put the same, equal amount of grams in every cup.” Male, Grade 5

Portioning food into recommended serving sizes was frequently suggested.

Some participants expressed concerns about food safety and hygiene practices, or possible contamination by other children touching food products.

“They sometimes people don’t eat because, like, other people put their dirty hand[s] into it.” Female, Grade 6

A few participants suggested supplying hand sanitizer, gloves or food tongs or encouraging hand-washing practices among children.

Participants recommended more educational initiatives, such as healthy eating messaging and announcements, cooking classes, field trips, school gardening and games, to enhance their knowledge and motivation to maintain a healthy diet. For example,

“If school is to prepare you for life, then they should probably have a cooking class. Because you can’t just go to fast food restaurants or dining all your life.” Male, Grade 8

“We should take a trip to learn about agriculture.” Female, Grade 8

“I think we should do, like, […] a 7-day challenge to see which class will eat the most vegetables.” Male, Grade 8

“We should have, like, a ‘Watermelon Wednesday.’” Male, Grade 8

Most participants enjoyed the foods offered in the CPSFP; however, some children said they wanted to be involved with selecting food items. For example, children recommended conducting a survey in each school to gather children’s food preferences.

“I was thinking maybe we could do, like, a survey to see what kind of food people like.” Female, Grade 5

The children encouraged getting feedback on the food items provided and offering greater quantities of preferred foods, particularly to reduce any food waste. In addition, participants proposed adding novel food items (i.e. meat products, a salad bar, tropical or exotic fruit, dips to enhance flavour).

Weekly deliveries of food items were often prepared by school staff members, parent volunteers and, in some cases, children. Some participants wanted to be more involved with the preparation and delivery of snacks.

“They should, like, take five or six students down to help them prepare, like, what they should have for the next day.” Female, Grade 6

Many recognized the time and labour needed to maintain the snack program and participants wanted to help.

Discussion

This study used focus groups to explore children’s perceptions of the effect of the CPSFP on their dietary behaviours. Current research exploring elementary school nutrition programs in Canada is limited.5,9 One qualitative study recognized how potentially significant the Northern Fruit and Vegetable Program is in promoting fruit and vegetable consumption among economically disadvantaged children.10 The CPSFP evaluation had similar findings; however, participants from all schools described positive impacts on nutrition, independent of household socioeconomic status. The CPSFP was offered to all children in participating schools, to try to improve child nutrition across the region.

Findings from this qualitative analysis indicated that many children believed that the CPSFP positively influenced their eating patterns and reduced hunger. Several participants reported that they did not eat breakfast before school. A recent study found that, on average, 1 in 10 Canadian children do not eat breakfast every day.17 Eating a nutritious morning meal is critical to replenishing essential nutrients needed to maintain energy levels throughout the day.17 Participants believed that the morning snacks improved nutrition, reduced hunger and increased their energy levels. Previous research has indicated the benefits of school food programs as an effective way to address hunger.18

An important finding from the focus groups was that children believed the CPSFP changed their eating patterns at school and at home. The CPSFP helped children sample and eat more fruit and vegetables, and as a result, some children believed that they were eating fewer unhealthy snacks. Previous experimental studies involving school food programs also demonstrated increases in children’s intake of fruit and vegetables.19,20 These improved dietary patterns sometimes transcended into the home, with some children persuading their parents to purchase the healthy foods that they ate through the school food program. Recent experimental evaluations of school nutrition programs in Canada had similar findings.9 The school food programs increased children’s preference for high-nutrient foods such as fruit and vegetables,21,22 as well as their attitudes and willingness to try a variety of foods.8,23,24

This qualitative study offers contextually rich data to further our understanding of the positive dietary impacts associated with school nutrition programs. Given the nutritional benefits evidenced by this evaluation, coupled with what is known about school nutrition programs,9,21 the CPSFP could be an exemplary model for a universal school food program in Canada.

The focus group findings highlighted several factors contributing to or detracting from program success, including future program development recommendations. Participants often presented challenges delivering the snack program. Some of these issues may be attributed to a lack of resources and support systems (e.g. financial, human) to effectively deliver the program. Process evaluation research on school nutrition programming has identified similar challenges13-27 and recommends establishing guidelines to effectively facilitate nutrition programming in schools.27-28 School nutrition policies may be one avenue to provide a comprehensive framework by which schools can plan and implement
Findings from this study provide valuable data that may be relevant, applicable and useful for various nutrition programs in Canada.

Conclusion

The CPSFP is a promising approach to improving nutrition in elementary schools. The program offers healthy, primarily locally-sourced snacks that were well-received by most participants. It increased participants’ consumption of fruit and vegetables and willingness to try new foods, and improved eating habits and general feelings of health and well-being. The child participants provided useful insights into improving the program, such as incorporating educational initiatives and increasing the frequency with which snacks were provided and the variety of foods.

This qualitative evaluation offers rich, data-driven research to support the development and sustainability of nutrition programming regionally and beyond. Additional research on centralized food procurement practices in alternative contexts and regions of Canada will help to determine its success in reducing child hunger, increasing energy and improving nutrition. This research also helps in supporting the development of comprehensive nutrition policies that increase accessibility to centrally procured food-provision practices in elementary schools in Canada.

Strengths and limitations

Information shared among the focus group participants may have been influenced by peers. The focus groups were conducted by university student researchers in an elementary school setting, naturally creating a power imbalance between the children and moderator. This relational dynamic could have affected what participants chose to share; however, the moderator minimized any potential social desirability bias by avoiding leading questions.

Although selection of students for focus groups was randomized by school principals, it may still be that the group of students who assented to participate over-represented children who were more interested in the CPSFP. In addition, this study might be context-specific to geographical location and influenced by participants’ sociodemographic characteristics. It may be beneficial to investigate these factors in relation to school nutrition programming in future research.

The target population for this study was elementary school children. Their ability to articulate pragmatic recommendations to improve the program might be limited. Nevertheless, children are the primary recipients of the program and key informants in providing feedback related to program impacts and opportunities for improvement.

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Conflicts of interest

None.

Authors’ contributions and statement

PC contributed to methodology and was responsible for investigation (focus groups), data curation, formal analysis and writing (original draft; revising and editing). JAS contributed to methodology, funding acquisition, supervision, and writing (review and editing). SW contributed to methodology, funding acquisition and writing (review and editing). LM contributed to writing (review and editing). JG was responsible for study conceptualization, methodology, funding acquisition, supervision, project administration, and writing (review and editing).

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

References


Release notice

Cancer in Young People in Canada Data Tool: latest incidence rates and case counts

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The Public Health Agency of Canada (PHAC) is pleased to announce the release of the latest incidence rates and case counts in the Cancer in Young People in Canada (CYP-C) Data Tool. The interactive CYP-C Data Tool, located on the Public Health Infobase website, includes data for children up to 14 years of age diagnosed with cancer.

The CYP-C Data Tool includes an “Incident Cases” tab, which provides the latest numbers of cases, age-standardized incidence rates and crude incidence rates for different cancer types in children, data up to 2019 from the CYP-C database and up to 2017 from the Canadian Cancer Registry. These statistics can be stratified by cancer type, period of diagnosis, sex, age, geography and data source.

The data tool also includes a “Survival & Relapse Risk” tab, which presents overall survival, event-free survival and relapse risk statistics for different cancer types in children, data up to 2016. Users can stratify these statistics by cancer type, period of diagnosis, sex, age and disease severity.

The CYP-C program’s surveillance and research database is available to researchers seeking to improve cancer diagnosis, treatment and outcomes. The “Publications and Data Access” tab of the data tool contains information on how to apply for access.

CYP-C is a collaboration of the PHAC, all 17 pediatric oncology centres in Canada, the C17 Council and the Canadian Partnership Against Cancer.
Call for papers – 2021 special issue
Tobacco and vaping prevention and control in Canada

Submission deadline extended!

Editors: Jennifer O’Loughlin (University of Montreal), Thierry Gagné (University College London) and Robert Geneau (Editor-in-Chief, Health Promotion and Chronic Disease Prevention in Canada Journal, Public Health Agency of Canada)

It is estimated that more than 45 000 Canadians die from a tobacco-related disease each year, making tobacco use the leading preventable cause of premature death in Canada. In recent years, the growing use of vaping products, especially among youth, has also raised significant public health concerns. There is emerging evidence that vaping products are not without risks for individual users, with more research needed to determine the long-term risks. The electronic cigarette market, if left to expand without an appropriate mix of regulations in place, could also threaten the “Tobacco Endgame.” Tobacco and vaping control policies are now largely intertwined.

Canada continues to implement comprehensive tobacco control policies and programs as part of its commitment to reach a national target of less than 5% tobacco use by 2035. Regulations on vaping products have also been introduced in recent years at the federal level and across several provinces and territories, with one of the clear aims being to curb the use of vaping products among youth.

The objective of this special issue is to disseminate current and emerging scientific evidence on tobacco and vaping-related epidemiology, prevention and control, with a focus on youth. To this effect, Health Promotion and Chronic Disease Prevention in Canada: Research, Policy and Practice seeks relevant topical research articles that present new findings or synthesize existing evidence on:

• Policies, interventions and regulations related to tobacco and/or vaping initiation, use and consumption, and cessation, including tobacco and vaping-related policy gaps and implementation challenges;
• Health inequalities in tobacco/vaping use and related harms; and
• Associations between the use of vaping products, smoking cessation and harm reduction behaviours in both smokers and non-smokers.

International submissions will be considered if they include Canadian data, results (e.g. as part of global comparisons) and/or evidence-based discussion of implications for public health in Canada.

Consult the journal’s website for information on invited article types and detailed submission guidelines for authors. Kindly refer to this call for papers in your cover letter. All manuscript submissions, pre-submission inquiries and questions about suitability or scope should be directed to PHAC.HPCDP.Journal-Revue.PSPMC.ASPC@canada.ca.


References
Other PHAC publications

Researchers from the Public Health Agency of Canada also contribute to work published in other journals. Look for the following articles published in 2020 and 2021:


