

# Leadership skills are associated with health behaviours among Canadian children

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## SUMMARY

Life skills development is a core area for action in the Ottawa Charter for Health Promotion. The role of life skills in influencing health behaviours among children has received little attention in research. The purpose of this cross-sectional study was to investigate the relationship between self-leadership, as a model of life skills, and diet quality, physical activity, sleep duration and body weight. A provincially representative sample of 2328 grade 5 students (aged 10–11 years) was surveyed in Alberta, Canada. Self-leadership skills were assessed based on student responses indicating frequency of performing various leadership traits. Diet quality was based on responses to the Harvard Youth/Adolescent Food Frequency Questionnaire and physical activity on responses to the Physical Activity Questionnaire for Children. Sleep duration was assessed based on parent survey responses, and body mass index

determined based on measured height and weight. Random effects regression models with children nested within schools were used to determine the associations. Higher self-leadership was associated with better diet quality ( $P < 0.01$ ) and more physical activity ( $P < 0.01$ ). Although not statistically significant, higher self-leadership was suggestive of healthier body weight status ( $OR = 0.91$ , 95%  $CI = 0.66, 1.27$ ). No association of self-leadership with sleep duration was found. The incorporation of leadership skill development may enhance the effectiveness of school-based health promotion programs. This study reinforces the importance of leadership skill promotion in the promotion of healthy eating and active living, which may help curb the obesity epidemic in the short term, and prevention of chronic diseases and mounting healthcare costs in the long term.

**Key words:** leadership skills; nutrition; physical activity; health promotion

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## INTRODUCTION

Obesity is a significant public health concern with many known associations to problematic co-morbidities (Daniels, 2009). Despite significant attention to the growing obesity epidemic, the prevalence of obesity continues to rise among adults and children (Belanger-Ducharme and Tremblay, 2005). Recent data indicated that 14.7% of Canadian children aged 5–11 years are overweight and 7.9% are obese (Roberts *et al.*, 2012), with corresponding deterioration in comparable

measures of fitness and health (Tremblay *et al.*, 2010). Excess body weight is directly caused by an imbalance between energy intake and expenditure (Sparling *et al.*, 2013). The primary behavioural determinants of energy balance have been recognized as diet and physical activity (Story *et al.*, 2009; Sparling *et al.*, 2013), and recently, duration of sleep has been increasingly implicated as an important factor determining bodyweight (Chaput *et al.*, 2011; Chahal *et al.*, 2013). While social and environmental factors are commonly recognized as important aspects influencing these health

behaviours in children (Tandon *et al.*, 2012; Trapp *et al.*, 2012; Wordell *et al.*, 2012), personal choices remain a significant determining factor influencing these behaviours that cannot be ignored. An understanding of the individual characteristics that inform these personal choices, such as having the life skills to make these choices, are essential to further inform obesity prevention efforts.

Life skills was defined by the World Health Organization (WHO) as 'abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life' (World Health Organization, 2003), and was identified as a component of a core area for action in The Ottawa Charter for Health Promotion (World Health Organization, 1986). Consequently, life skill development has been included as a core component in the comprehensive school health framework (Centers for Disease Control and Prevention, 2013; Joint Consortium for School Health, 2013), and has since been reaffirmed as a priority for school health promotion by the WHO (World Health Organization, 1997, 2003). Interventions which recognize and target life skills have shown effectiveness in improving negative health behaviours related to substance abuse (Flay, 2009; Spaeth *et al.*, 2010) and sexuality (Yankah and Aggleton, 2008), whereas efforts to address individual choices focusing primarily on education have been ineffective.

With this growing recognition of its value for obesity prevention interventions, the mediating effect of life skills on health behaviours such as diet, physical activity and sleep duration needs to be established. There is some evidence that children can be empowered to make healthy choices by a sense of responsibility instilled in them over their own actions (Cox *et al.*, 2010). Building self-leadership skills competency may thus prove to be efficacious in improving health behaviours such as diet and physical activity. Therefore, this study aims to determine whether fundamental self-leadership skills, as a model of life skills, are associated with determinants of bodyweight (diet quality, physical activity and sleep duration) and body weight status among grade 5 children in Alberta.

## METHODS

### Study population

This analysis was conducted using data collected as part of the 2012 iteration of the Raising

healthy Eating and Active Living Kids in Alberta (REAL Kids Alberta) project, a cross-sectional survey administered to evaluate health and behavioural outcomes among a provincially representative population of grade 5 students in Alberta, Canada. Schools were selected using a one-stage stratified random sampling design with stratification according to residential geography (metropolitan, city or rural-town) to ensure proportional regional representation. All elementary schools with grade 5 students in Alberta (86% of all schools), with the exception of francophone, charter, private and on-reserve federal schools were included in the sampling frame. As one of the objectives of the REAL Kids Alberta project was to evaluate provincial health initiatives, these schools were excluded because their programming and health policies were not consistent with public and Catholic schools. Schools were randomly selected within each stratum. Of the 170 selected schools, 143 schools (84%) agreed to participate. A total of 4957 home surveys and parent consent forms were sent home, of which 2732 (55%) were returned and parental consent were obtained for 2483 (50%) students to participate. Trained evaluation assistants visited each school to administer student surveys and to obtain height and weight measurements. After excluding students who declined participation, a total of 2337 (47.1%) completed surveys were collected. The University of Alberta Human Research Ethics Board approved all study procedures.

### Measures of interest

#### *Leadership skills*

The 2012 Real Kids Alberta student survey included a series of nine questions that may provide a framework for measuring leadership skills in children. These questions were developed based on the seven habits of the Leader in Me process (Franklin Covey, 2013a). The Leader in Me is an implementation process of an education model based on Steven R. Covey's *The Seven Habits of Highly Effective People*, which promotes the development of personal leadership and responsibility in students (Franklin Covey, 2013a, b). The seven habits of the model, as summarized in Table 1, demonstrate substantial congruence with models of life skills, including Social and Emotional Learning (Yankah and Aggleton, 2008). Given the scarcity of reliable

**Table 1:** Description of the seven habits of the leader in me process<sup>a</sup>

Habit	Description	Corresponding survey question <sup>a</sup>
Be proactive	Ability to take initiative, make the right choices without being asked and to take responsibility for consequences	You do the right thing without being asked
Begin with the end in mind	Ability to set goals and plan ahead	You set goals and plan ahead
Put first things first	Ability to prioritize tasks based on importance	You do your homework before play
Think win–win	Ability to make mutually beneficial decisions, and to resolve conflicts by looking for alternative solutions	You try to find solutions when others don't agree with you
Seek first to understand, then to be understood	Ability to listen to other viewpoints and to empathize with others	You listen when others are talking to you
Synergize	Ability to work well as a team by utilizing everyone's strengths	You work well in groups
Sharpen the saw	Ability to make healthy lifestyle choices by eating right, exercising and getting enough sleep	You take care of your health by choosing healthy snacks You take care of your health by exercising You take care of your health by getting enough sleep

<sup>a</sup>Students were asked to read statements and to indicate the frequency of performing each behaviour from the response options 'never or rarely', 'sometimes', 'regularly', 'most of the time', 'always' or 'unsure'.

instruments for assessing life skills (Buhler *et al.*, 2008; Maruska *et al.*, 2010), these leadership traits may be an effective model for evaluating life skills. Students were asked to indicate the frequency of performing representative behaviours for each habit, on an ordinal scale of 'never or rarely', 'sometimes', 'regularly', 'most of the time' and 'always or almost always', with an additional 'unsure' response. Response scores from the six questions corresponding to habits 1–6 of the Leader in Me were aggregated by principal component analysis, and accordingly categorized into tertiles by aggregate leadership score. The three questions corresponding to habit 7 were excluded from this analysis due to co-linearity of responses to health outcome measures. Students selecting unsure or missing a response to any of the six leadership questions were separately categorized as unsure/missing. All survey instruments are available on the survey website (REAL Kids Alberta, 2013).

#### *Determinants of body weight*

Diet quality was measured using the Diet Quality Index—International (DQI-I) (Kim *et al.*, 2003), calculated based on student responses on the Harvard Youth-Adolescent Food Frequency Questionnaire (FFQ) that was validated for children and adolescents aged 9–18 years (Rockett *et al.*, 1995, 1997). The DQI-I is a composite score (range 0–100) measuring diet variety, adequacy, moderation and overall balance (Kim *et al.*, 2003).

Total energy intake was also calculated based on FFQ responses and from information on the Canadian Nutrient Files (Health Canada, 2007). Ninety-seven (4.2%) students with calculated daily energy intake below 500 kcal or above 5000 kcal were excluded from the analysis due to unreliability of responses (Willett, 1998).

Physical activity was assessed using the Physical Activity Questionnaire for Children (PAQ-C), a validated instrument to measure frequency and duration of moderate to vigorous physical activity (Crocker *et al.*, 1997; Kowalski *et al.*, 1997). The PAQ-C is a composite score with a range of 0–5, with higher scores indicating greater physical activity.

Sleep duration was calculated based on parent responses in the home survey. Parents indicated when their child usually (i) gets into bed and (ii) wakes up, on weekdays and weekend-days, as well as how long it takes their child to fall asleep at night. Sleep duration was calculated based on the mid-point of response ranges for when the child gets into bed and wakes up, subtracting the time it takes the child to fall sleep.

#### *Body weight*

Student height without shoes was measured to the nearest 0.1 cm, and weight to the nearest 0.1 kg using calibrated digital scales, by trained assistants during the school visits to administer student surveys. Weight status was classified as 'normal', 'overweight' or 'obese' by applying the

International Obesity Task Force's cut-offs for children to the body mass index calculated from the direct height and weight measurements (Cole *et al.*, 2000).

#### Other covariates

Household income and parental education were each assessed by a single question in the home survey. Household income is categorized as ' $\leq$ \$50 000', '\$50 001–\$75 000', '\$75 001–\$100 000', '>\$100 000' or 'not reported'; parental education is categorized as 'secondary or less', 'college' or 'university/graduate'.

Geographic residency was determined based on school location, classified as 'metropolitan' for the cities of Edmonton and Calgary, 'urban' for other municipalities with a population greater than 40 000 and 'rural/town' for localities with fewer than 40 000 residents.

#### Data analysis

Association with health outcomes was assessed using random effects regression models with students clustered by school. All analyses were weighted to account for the design effect of the stratified randomization and to allow for provincially representative estimations by applying an additional variable representing the number of students within each geographic region divided by the number of students surveyed. Adjusted models included all covariates: gender, household income, parental education and geographic residency, plus energy intake for the diet quality model. Diet quality, physical activity and sleep duration were modelled as continuous outcomes using linear regressions, while overweight and obesity were separately modelled as binary outcomes relative to normal body weight status using logistic regressions. All analyses were performed using the survey package version 3.29-4 in R version 3.0.0 (R Foundation for Statistical Computing, Vienna, Austria).

#### RESULTS

Between covariates, leadership score varied significantly according to the gender and parental education, but not household income or geographic residency (Table 2). Boys showed significantly lower leadership scores than girls, and higher parental education levels were associated with higher student leadership scores.

Leadership correlated strongly with both diet quality and physical activity, but not sleep duration or body weight status, in both crude and adjusted models (Table 3). DQI-I scores were 2.07 points higher on average in the middle leadership tertile than in the low tertile, and 3.69 points higher in the top leadership tertile, after adjusting for covariates. Similarly, the mean PAQ-C score in the mid- and high leadership groups were 0.22 and 0.51 higher than in the low leadership group, respectively, after adjusting for covariates. For both diet quality and physical activity, the mean score in the unsure/missing group fell between the mean scores of the low and mid-leadership groups. Leadership showed no association with sleep duration, with mean duration varying by less than 5 min between groups. The association with the body weight status was suggestive, although not statistically significant, with the odds ratios for the mid- and high leadership groups being 0.90 (95% CI: 0.69, 1.18) and 0.91 (95% CI: 0.66, 1.27) compared with the low leadership group, respectively. Similarly, the odds ratio for being obese of students in the mid-leadership group is 0.66 (95% CI: 0.41, 1.08) compared with those in the low leadership group.

The relationship between leadership and each of the outcomes remained consistent between crude and adjusted models. Adjustment for covariates induced minimal changes in the odds ratios for bodyweight status, and moderate reductions in the  $\beta$  coefficients for diet quality, while the adjustment slightly increased the  $\beta$  coefficients for physical activity.

#### DISCUSSION

The present study demonstrates that greater self-leadership is strongly associated with improved diet quality and physical activity in grade 5 students. These associations were observed independent of personal and family characteristics, despite the fact that children often have limited autonomy to make defining choices in this aspect of their lives (Birch and Davison, 2001; Brug *et al.*, 2008). These findings suggest an important role for self-leadership skills in helping children make healthier lifestyle choices. The relationship between leadership and body weight status, although potentially suggestive of higher leadership being associated with reduced odds of excess body weight, were not statistically significant. However,

**Table 2:** Characteristics of grade 5 students ( $n = 2337$ ) in REAL Kids Alberta 2012 survey<sup>a,b</sup>

Characteristic	Overall	Student leadership tertile			$p^c$	Unsure/missing
		Low	Mid	High		
Population ( $n$ )	2328	681	680	680	–	287
Gender					<0.01	
Boys	47.2	56.0	46.2	37.6		52.6
Girls	52.8	44.0	53.8	62.4		
Parental education					<0.01	
Secondary or less	25.3	32.6	23.5	20.0		24.8
College	37.2	38.5	37.8	37.5		31.8
University and above	37.6	29.0	38.7	42.5		43.5
Household income					0.29	
≤\$50 000	19.7	21.2	17.4	18.4		24.8
\$50 001–\$75 000	12.9	13.5	13.7	11.1		13.9
\$75 001–\$100 000	13.7	15.2	13.7	12.9		12.2
>\$100 000	28.2	24.6	28.1	32.7		26.2
Not reported	25.5	25.6	27.1	24.9		22.8
Geographic region					0.13	
Rural/town	34.7	36.6	37.3	33.3		27.7
City	16.3	17.1	15.4	16.0		17.3
Metropolitan	49.0	46.3	47.3	50.7		55.0
Weight status					0.06	
Normal weight	73.1	70.1	73.9	72.4		80.0
Overweight	19.6	20.8	19.8	19.8		15.6
Obese	7.3	9.1	6.3	7.8		4.5
DQI-I (mean)	60.8	58.3	61.2	63.6	<0.01	59.1
PAQ-C (mean)	3.33	3.13	3.32	3.58	<0.01	3.22
Weekday sleep duration (mean hours/day)	9.82	9.79	9.84	9.85	0.33	9.80
Weekend sleep duration (mean hours/day)	10.03	9.98	10.05	10.04	0.39	10.06

DQI-I, Diet Quality Index – International; PAQ-C, Physical Activity Questionnaire for Children.

<sup>a</sup>Results are weighted to represent provincial estimates of grade 5 student population in Alberta. All analyses were weighted by applying an additional variable representing the number of students within each geographic region divided by the number of students surveyed.

<sup>b</sup>Numbers presented are % unless otherwise stated.

<sup>c</sup> $p$ -value derived using the adjusted Wald test to indicate the significance of difference between low, medium and high leadership groups.

parental and early life factors are important determinants of body weight status at this age (Kuhle *et al.*, 2010), while behavioural autonomy development peaks further into early adolescence (Eccles, 1999). Thus, the association of leadership with bodyweight status may follow later in adolescence. A similar explanation may account for the lack of association with sleep duration at this age.

While there has been some research demonstrating the efficacy of life skills interventions to prevent risky health behaviours, these studies have predominantly examined adolescents and have focused on domain-specific life skills in interventions targeted at substance abuse and risk taking behaviours (Buhler *et al.*, 2008; Yankah and Aggleton, 2008; Flay, 2009; Spaeth *et al.*, 2010). Nevertheless, there is some indication from these studies that the intervention effect is mediated by general life skills. For instance, the effectiveness of

a substance abuse prevention program was significantly enhanced by the promotion of general life skills such as communication and problem solving (Buhler *et al.*, 2008). To the best of our knowledge, the present study is the first to link general life skills to specific health behaviours outside of a targeted intervention program, and is unique in assessing positive health behaviours as an outcome of life skills in pre-adolescents.

Promotion of leadership skills was identified as a core area for action in The Ottawa Charter for Health Promotion (World Health Organization, 1986), and a priority for school health promotion by the WHO (World Health Organization, 1997, 2003). The present study reinforces the importance of leadership skill promotion as an avenue to promote healthy eating and active living, which may benefit the curbing of the obesity epidemic in the short term, and prevention of chronic diseases

**Table 3:** Association of leadership skill scores with health behaviours and body weight status among grade 5 children in Alberta, Canada ( $n = 2337$ )<sup>a</sup>

	Student leadership tertile				$p^b$	$p^c$
	Mid		High			
	$\beta$	95% CI	$\beta$	95% CI		
DQI-I						
Crude	2.82	1.61, 4.03	5.23	3.85, 6.61	<0.01	<0.01
Adjusted <sup>d</sup>	2.07	0.98, 3.17	3.69	2.58, 4.79	<0.01	<0.01
PAQ-C						
Crude	0.19	0.10, 0.28	0.44	0.36, 0.53	<0.01	<0.01
Adjusted <sup>d</sup>	0.22	0.13, 0.30	0.51	0.43, 0.59	<0.01	<0.01
Weekday sleep (hours/day)						
Crude	0.05	-0.03, 0.14	0.07	-0.01, 0.14	0.33	0.15
Adjusted <sup>d</sup>	0.05	-0.03, 0.14	0.06	-0.02, 0.14	0.45	0.17
Weekend sleep (hours/day)						
Crude	0.07	-0.02, 0.16	0.06	-0.02, 0.14	0.39	0.50
Adjusted <sup>d</sup>	0.05	-0.04, 0.14	-0.02	-0.09, 0.06	0.23	0.46
Overweight (OR)						
Crude	0.94	0.72, 1.23	0.94	0.68, 1.30	0.37	0.81
Adjusted <sup>d</sup>	0.90	0.69, 1.18	0.91	0.66, 1.27	0.33	0.48
Obese (OR)						
Crude	0.68	0.45, 1.03	0.85	0.57, 1.26	0.13	0.10
Adjusted <sup>d</sup>	0.66	0.41, 1.08	0.99	0.67, 1.47	0.20	0.21

DQI-I, Diet Quality Index—International; PAQ-C, Physical Activity Questionnaire for Children; OR, odds ratio.

<sup>a</sup>Multilevel regression models with children nested within schools were used to test for associations. All regression coefficients and odds ratios are presented with the low leadership group as reference. Results presented are coefficients ( $\beta$ ) unless stated otherwise.

<sup>b</sup>Test for overall significance of differences between leadership tertile groups.

<sup>c</sup>Test for overall trend in the leadership tertile groups.

<sup>d</sup>Analyses adjusted for gender, household income, parental education and geographic region. Analyses related to DQI-I were additionally adjusted for energy intake by including energy intake as a covariate in the model.

and mounting healthcare costs in the long term (Tran *et al.*, 2013). Further research is needed to assess the degree to which these interventions will improve specific health behaviours and to assess the benefits of incorporating leadership skills development in school health promotion initiatives. The cross-sectional design of the present study limits the ability to infer temporal causality from study results. As such, an intervention study design to evaluate a school-based leadership skill development program is indicated to further investigate this association.

This study was conducted among a large provincially representative population. However, this study was limited by the use of self-reported information on diet, physical activity and sleep. A validated FFQ shown to be comparable to 24-h recalls in measuring typical food intake over the past year (Rockett *et al.*, 1995, 1997) and a validated measure of physical activity (Crocker *et al.*, 1997; Kowalski *et al.*, 1997) were used in order to minimize potential bias.

## FUNDING

The Real Kids Alberta survey is funded by Alberta Health. The present study was further funded through a Canada Research Chair in Population Health. An Alberta Research Chair in Nutrition and Disease Prevention, and an Alberta Innovates Health Solutions Scholarship to Dr. P.J.V. All interpretations and opinions in the present study are those of the authors.

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