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ORIGINAL ARTICLE

Activity preferences and demographic factors associated with screen time sedentary behaviour among grade 1 to 4 students: A pilot study among Canadian children.

Rebecca L. Bassett-Gunter, PhD¹ and Scott T. Leatherdale, PhD²

Abstract

Background: Sedentary behaviour is a modifiable risk factor contributing to childhood overweight and obesity. **Purpose:** The current study seeks to explore if a) significant between-school random variation and b) activity preferences and demographic characteristics are associated with spending >2 hr-day⁻¹ in screen-based sedentary behaviour (SSB) among young children. **Method:** Data were collected from 2,331 grade 1 to 4 elementary students from Ontario, Canada as part of the PLAY-On study. Parents reported students' physical activity and SSB, as well as their perceptions of their child's activity preferences. Demographic data (sex, age, BMI) were collected by a registered nurse. Students also reported their activity preferences. **Results:** There was no significant between-school random variation in the odds of a student engaging in high SSB (i.e., >2 hr-day⁻¹). High SSB was more likely among male (vs. female), older (vs. younger), overweight (vs. normal), and high active (vs. low active) students. Males were also more likely than females to engage in high levels of physical activity. Students were less likely to engage in high SSB if their parents perceived that they liked playing sports. Student activity preferences were not related to SSB. **Conclusion:** The school environment may not be important in determining SSB risk factors among grade 1-4 students. Rather, individual characteristics and parents' perceptions of activity preferences may contribute to SSB. Boys and older children may be at particular risk for high SSB. Parents' role in monitoring and limiting SSB may be imperative in ensuring young children do not exceed SSB guidelines. Campaigns and initiatives to increase parents' awareness of the risk of high SSB would be of value. **Health & Fitness Journal of Canada 2014;7(1):3-13.**

Keywords: Screen-based sedentary behaviour; Youth; Physical activity; Parents

From ¹York University, School of Kinesiology and Health Science, and ²University of Waterloo, School of Public Health and Health Systems. Email: rgunter@yorku.ca

Introduction

Overweight and obesity are rising among Canadian children (Shields, 2005; Tremblay et al., 2010). Screen-time sedentary behaviour (SSB; e.g., TV/movies, video/computer games) is a modifiable factor contributing to childhood obesity (Dennison et al., 2002; Eisenmann et al., 2002, Hills et al., 2007; Lowry et al., 2002; Marshall et al., 2004). Independent of promoting physical activity (PA), limiting SSB is important for preventing childhood overweight and obesity (Dietz, 2001; Epstein et al., 2000). Current guidelines recommend no more than 2 hr per day of sedentary behaviour for children (Tremblay et al., 2012). Canadian children and youth get an average of over seven hours of SSB per day (Leatherdale and Ahmed, 2011). The recently released *Active Healthy Kids Canada* report card graded Canadian children "F" for sedentary behaviour with over 30% of children aged 5-11 exceeding the recommended daily screen time (Active Healthy Kids Canada, 2014).

Characteristics of the school environment may be related to SSB. For example, school-based/afterschool SSB-reduction and PA programs were associated with reduced SSB among grade 5-8 students (He et al., 2009; Leatherdale et al., 2010). We are unaware of any

research investigating the role of the school environment on SSB among grade 1-4 students. Outside the school environment, parents are the gatekeepers of young children's behaviour (Anderson et al., 2009). Parent factors such as PA encouragement (Bauer et al., 2008) and perceived PA barriers (Smith et al., 2010) are related to children's SSB. Parents' perceptions of their children's activity preferences may also influence the PA opportunities they provide (Bassett-Gunter and Leatherdale, under review; Gustafson and Rhodes, 2006). For example, if a parent believes his child dislikes active games and PA, he may permit greater SSB in order to meet the child's preferences. However, it is unknown if parents' perceptions of children's activity preferences are associated with children's SSB. Among older youth, SSB has been associated with characteristics such as sex (Leatherdale and Ahmed, 2011; He et al., 2009), age (Sisson et al., 2009), PA level (He et al., 2009), and body mass index (BMI) (Epstein et al., 2000; Utter et al., 2003). Specifically, high SSB is more likely among boys, older children, less physically active children, and children with higher BMI. Children's activity preferences may also impact their SSB. For example, a child who dislikes PA may choose SSB as children are unlikely to engage in activities they dislike (Weiss, 2000). Additional research is needed to understand the association between SSB and such factors. The current study seeks to explore if activity preferences and demographic characteristics are associated with spending ≥ 2 hr·day⁻¹ in SSB among grade 1-4 students. We hypothesize the following: a) boys and older children will be more likely to spend ≥ 2 hr·day⁻¹ in SSB compared to

girls and younger children, b) higher SSB will be negatively associated with PA, c) higher SSB will be positively associated with BMI, d) preferences related to liking sports, vigorous play and outdoor play will be negatively associated with SSB.

Methods

Data were collected from a convenience sample of 2,331 grade 1 to 4 students attending 30 elementary schools in Ontario, Canada as part of the PLAY-On study. All students at participating schools (3,926) were eligible to participate, resulting in a 59.4% response rate. Missing respondents resulted from parent refusal and absenteeism. This distribution is consistent with another active consent study among elementary students (Veugelers and Fitzgerald, 2005). Active consent from parents was required and students were able to decline participation. Student data were collected by a registered nurse and there was no compensation for participation. The University of Waterloo Office of Research Ethics and appropriate school board committees approved study procedures. Additional details available online: (www.shapes.uwaterloo.ca/projects/PLAYON).

Outcome – SSB

Given that parental proxy report is a valid and reliable measure of youth activity/inactivity (Burdette et al., 2006; Manios et al., 1998), parents reported children's PA and SSB. Parents were asked: "On an average day, how much time does your child spend watching TV/movies, playing video/computer games, surfing the internet, instant messaging or talking on the phone?" Based on current guidelines (Tremblay et

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al., 2012), SSB was coded as low SSB (≤ 2 hr·day⁻¹) and high SSB (>2 hr·day⁻¹).

Demographics

Sex and age were provided by parent reports. Grade was provided by student reports. BMI (kg·m⁻²) was calculated using objective measures of weight (kg) and height (m) and classified using the International Obesity Task Force system (Cole et al., 2000) based on age and sex

Student Activity Preferences

Students were asked the following questions: Do you prefer to play alone or with other children (*alone, other children, both*)? Do you prefer active games (e.g. tag, kickball) or quiet games (e.g. board games) (*active games, quiet games, both*)? Do you like playing sports (e.g., soccer, basketball) or do you dislike playing sports (*likes sports, dislikes sports*)? Do you like to read or do you dislike reading

Figure 1: Coding of parental measures of their child's activity preferences.

	Almost always		About equal	Almost always		
1. Prefers to play alone	1	2	3	4	5	Prefers to play with other children
2. Prefers vigorous games (e.g., tag, kickball)	1	2	3	4	5	Prefers quiet games (e.g., board games)
3. Dislikes playing sports (e.g., soccer, basketball)	1	2	3	4	5	Likes playing sports
4. Likes to read	1	2	3	4	5	Dislikes reading
5. Likes to play outside	1	2	3	4	5	Likes to play inside (home/ school)

adjusted cut-points. Students were classified: normal (BMI<25), overweight (BMI ≥ 25 and <30), or obese (BMI ≥ 30). BMI could not be calculated for 5.3% (n=123) of the sample due to missing data. Parents were asked: "On average, how many hours per day is your child physically active? Please include both moderate and vigorous PA. Please include PA during class, lunch, recess, after school, evenings and spare time". Students were coded: inactive (≤ 1 hour PA·day⁻¹), moderately active (1 to 3 hours of PA·day⁻¹), and very active (>3 hours of PA·day⁻¹).

(*likes reading, dislikes reading*)? Do you like to play outside or inside (*outside, inside, both*)?

Parent Reported Activity Preferences

Parents were asked the following questions regarding their child's activity preferences: Prefers to play alone vs. with other children; Prefers vigorous games vs. quiet games ; Likes playing sports vs. Dislikes playing sports; Likes to read vs. Dislikes reading; and, Likes to play outside vs. inside. Refer to Figure 1 for anchors and coding procedures (based on response distributions).

Analyses

Demographic characteristics, student activity preferences, and parents' perceptions of activity preferences were examined by SSB. Since students (level-1) are nested within schools (level-2), and consistent with other multi-level studies (Leatherdale and Papadakis, 2011), we initially examined if differences in SSB were random or fixed across schools. This test identified that there was no significant between-school random variation in the odds of being high SSB [$\sigma^2_{\mu_0}=0.061(0.044)$]; school-level differences only accounted for 1.8% of the variability in the odds of a student being high SSB versus low SSB. As such, logistic regression models were calculated to examine student-level characteristics associated with SSB while controlling for demographic characteristics. We examined how student activity preferences (Model 1) and parents' perceptions of activity preferences (Model 2) were associated with the odds of high SSB. The multi-level statistical analysis was conducted on MLwiN Version 2.02 and the descriptive statistics and predictive models were conducted on SAS 9.2.

Results

Student demographics are presented in Table 1. Males were more likely than females to be high SSB ($\chi^2=5.99$, $df=1$, $p < 0.05$). Grade 3 and 4 students were more likely to be high SSB compared to grade 1 and 2 students ($\chi^2=10.40$, $df=3$, $p < 0.05$). Weight status did not vary by sex ($\chi^2=0.09$, $df=3$, $p = 0.99$). Overweight or obese students were more likely than normal weight students to be high SSB ($\chi^2=14.68$, $df=3$, $p < .01$). Males were more likely to be very active compared to females ($\chi^2=11.41$, $df=2$, $p < 0.001$), and

very active students were more likely than low or moderately active students to be high SSB ($\chi^2=16.48$, $df=2$, $p < 0.001$).

Student Activity Preferences

As shown in Table 1, none of the student activity preferences varied significantly between low and high SSB students.

Parent Reported Activity Preferences

Students were less likely to be high SSB if their parent reported they liked sports compared to disliking sports or being about equal with respect to liking/disliking sports ($\chi^2=9.05$, $df=2$, $p < 0.05$). Students were less likely to be high SSB if their parents reported they preferred to play indoors compared to being about equal with respect enjoying to play inside or outside ($\chi^2=13.53$, $df=2$, $p < 0.01$).

Student Reported Activity Preferences Associated with SSB

The adjusted odds ratios for Model 1 are presented in Table 2. None of the student reported activity preferences examined were significantly associated with the likelihood of a student being high SSB. Demographic characteristics were important. Male students were more likely than female students to be high SSB (OR 1.30, 95%CI 1.07 to 1.57). Grade 4 students were more likely than grade 1 students to be high SSB (OR 1.49, 95%CI 1.13 to 1.97). Very active (OR 1.60, 95%CI 1.14 to 2.25) or moderately active (OR 1.47, 95%CI 1.20 to 1.80) students were more likely to be high SSB compared to low active students. Overweight students (OR 1.50, 95%CI 1.15 to 1.95) or those missing BMI data (OR 1.84, 95%CI 1.19 to 2.83) were more likely to be high SSB compared to normal weight students.

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Table 1: Descriptive statistics for youth in grades 1 to 4 by sex in Play-On (Ontario, Canada, 2007-2008).

<i>Demographic characteristics</i>		Low Sedentary (n=1,644)	High Sedentary (n=612)	Chi-square
		% (n) ^a	% (n) ^a	
Sex	Male	70.6 (810)	29.4 (337)	$\chi^2=5.99, df=1, p < 0.05$
	Female	75.2 (834)	24.8 (275)	
Grade	1	76.5 (391)	23.5 (120)	$\chi^2=10.40, df=3, p < 0.05$
	2	75.4 (364)	24.6 (119)	
	3	71.9 (441)	28.1 (172)	
	4	68.9 (445)	31.1 (201)	
Weight status ^b	Normal weight	74.9 (1,272)	25.1 (427)	$\chi^2=14.68, df=3, p < 0.01$
	Overweight	67.1 (210)	32.9 (103)	
	Obese	69.0 (98)	31.0 (44)	
	Missing	62.9 (61)	37.1 (36)	
Physical activity level	Low active	78.4 (214)	21.6 (59)	$\chi^2=16.48, df=2, p < 0.001$
	Moderately active	74.2 (1,055)	25.8 (366)	
	Very active	66.7 (374)	33.3 (187)	
<i>Student Reported - Activity Preferences</i>				
Prefers to play alone or with other children	Alone	71.8 (28)	28.2 (11)	$\chi^2=2.32, df=2, p = 0.31$
	Both	74.6 (707)	25.4 (241)	
	Other children	71.7 (893)	28.3 (353)	
Prefers to play active or quiet games	Active	77.8 (105)	22.2 (30)	$\chi^2=2.68, df=2, p = 0.26$
	Both	73.4 (915)	26.6 (332)	
	Quiet	71.4 (608)	28.6 (243)	
Preference for playing sports	Likes sports	72.8 (1,535)	27.2 (574)	$\chi^2=0.19, df=1, p = 0.66$
	Dislikes sports	74.6 (91)	25.4 (31)	
Preference for reading	Likes reading	75.4 (264)	24.6 (86)	$\chi^2=1.34, df=1, p = 0.24$
	Dislikes reading	72.6 (1,364)	27.4 (514)	
Prefers to play outside or inside	Outside	72.0 (67)	28.0 (26)	$\chi^2=2.50, df=2, p = 0.29$
	Both	73.7 (1,261)	26.3 (450)	
	Inside	69.9 (300)	30.1 (129)	
<i>Parent Reported - Activity Preferences</i>				
Prefers to play alone or with other children	Alone	75.3 (55)	24.7 (18)	$\chi^2=2.30, df=2, p = 0.32$
	About equal	70.7 (468)	29.3 (194)	
	Other children	73.7 (1,111)	26.3 (397)	
Prefers to play vigorous or quiet games	Active	73.4 (348)	26.6 (126)	$\chi^2=0.83, df=2, p = 0.66$
	About equal	73.6 (639)	26.4 (229)	
	Quiet	71.8 (647)	28.2 (254)	
Preference for playing sports	Likes sports	74.5 (1,249)	25.6 (430)	$\chi^2=9.05, df=2, p < 0.05$
	About equal	69.6 (257)	30.4 (112)	
	Dislikes sports	65.6 (128)	34.4 (67)	
Preference for reading	Likes reading	74.1 (823)	25.9 (288)	$\chi^2=1.79, df=2, p = 0.41$
	About equal	72.0 (501)	28.0 (195)	
	Dislikes reading	71.1 (310)	28.9 (126)	
Prefers to play outside or inside	Outside	74.1 (295)	25.9 (103)	$\chi^2=13.53, df=2, p < 0.01$
	About equal	68.2 (529)	31.8 (247)	
	Inside	75.8 (810)	24.2 (259)	

^a Numbers may not add to total because of missing values. ^b Body mass index (BMI) values used to determine weight status have been adjusted for age and sex. Play-On represents the name of the study where self-reported data were collected in 2007-2008 from a convenience sample of students in grades 1 to 4 attending 30 elementary schools in Ontario, Canada.

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Table 2: Multi-level logistic regression analyses of student reports of activity preferences associated with screen time sedentary behaviour among children in grades 1 to 4 in Play-On (Ontario, Canada, 2007-2008).

		Adjusted Odds Ratio[§] (95% CI) Final Model High Sedentary vs. Low Sedentary
<i>Demographic Characteristics</i>		
Sex	Female	1.00
	Male	1.30 (1.07, 1.57)*
Grade	1	1.00
	2	1.08 (0.80, 1.46)
	3	1.28 (0.97, 1.70)
	4	1.49 (1.13, 1.97)*
Physical activity level	Low active	1.00
	Moderately active	1.47 (1.20, 1.80)**
	Very active	1.60 (1.14, 2.25)*
Weight status ^b	Normal weight	1.00
	Overweight	1.50 (1.15, 1.95)*
	Obese	1.45 (0.99, 2.12)
	Missing	1.84 (1.19, 2.83)*
<i>Student Reported - Activity Preferences</i>		
Prefers to play alone or with other children	Alone	1.02 (0.49, 2.12)
	Both	1.00
	Other children	0.91 (0.74, 1.11)
Prefers to play active games or quiet games	Quiet	0.86 (0.55, 1.36)
	Both	1.00
	Active	0.99 (0.81, 1.22)
Preference for playing sports	Dislikes sports	1.00
	Likes sports	0.95 (0.62, 1.48)
Preference for reading	Dislikes reading	1.00
	Likes reading	1.24 (0.95, 1.63)
Prefers to play outside or inside	Inside	1.08 (0.64, 1.81)
	Both	1.00
	Outside	0.89 (0.70, 1.13)

Note: § Odds ratios adjusted for all other variables in the table.

^a BMI values used to determine weight status have been adjusted for age and sex

Final Model: 1 = High sedentary (n=603), 0 = Low sedentary (n=1,622)

* p < 0.01 **p < 0.001

Play-On represents the name of the study where self-reported data were collected in 2007-2008 from a convenience sample of students in grades 1 to 4 attending 30 elementary schools in Ontario, Canada.

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Table 3: Multi-level logistic regression analyses of parent reports of student activity preferences associated with screen time sedentary behaviour among children in grades 1 to 4 in Play-On (Ontario, Canada, 2007-2008).

		Adjusted Odds Ratio [§] (95% CI)
		Final Model High Sedentary vs. Low Sedentary
Demographic Characteristics		
Sex	Female	1.00
	Male	1.31 (1.08, 1.60)**
Grade	1	1.00
	2	1.07 (0.80, 1.44)
	3	1.32 (1.00, 1.74)*
	4	1.51 (1.15, 1.97)**
Physical activity level	Low active	1.00
	Moderately active	1.51 (1.23, 1.86)***
	Very active	1.75 (1.24, 2.47)**
Weight status ^b	Normal weight	1.00
	Overweight	1.45 (1.11, 1.89)**
	Obese	1.38 (0.95, 2.03)
	Missing	1.70 (1.10, 2.62)*
Parent Reported - Activity Preferences		
Prefers to play alone or with other children	Alone	0.79 (0.44, 1.40)
	About equal	1.00
	Other children	0.98 (0.79, 1.21)
Prefers to play vigorous or quiet games	Active	0.98 (0.75, 1.28)
	About equal	1.00
	Quiet	1.17 (0.93, 1.48)
Preference for playing sports	Likes sports	0.71 (0.54, 0.92)**
	About equal	1.00
	Dislikes sports	1.23 (0.84, 1.80)
Preference for reading	Likes reading	1.01 (0.81, 1.26)
	About equal	1.00
	Dislikes reading	1.11 (0.84, 1.45)
Prefers to play outside or inside	Outside	0.75 (0.56, 0.99)*
	About equal	1.00
	Inside	0.66 (0.53, 0.83)**

Note: § Odds ratios adjusted for all other variables in the table.

^a BMI values used to determine weight status have been adjusted for age and sex

Final Model: 1 = High sedentary (n=610), 0 = Low sedentary (n=1,640)

* p < 0.05 **p < 0.01 ***p < 0.001

Play-On represents the name of the study where self-reported data were collected in 2007-2008 from a convenience sample of students in grades 1 to 4 attending 30 elementary schools in Ontario, Canada.

Parent Reported Activity Preferences Associated with SSB

The adjusted odds ratios for Model 2 are presented in Table 3. Students who were reported to like playing sports were less likely to be high SSB compared to students who were reported to have equal preference for liking or disliking sports (OR 0.71, 95%CI 0.54 to 0.92). Compared to students where their reported preference for playing outside or inside was about equal, students were less likely to be high SSB if they preferred to play outside (OR 0.75, 95%CI 0.56 to 0.99) or inside (OR 0.66, 95%CI 0.53 to 0.83). Males were more likely than females to be high SSB (OR 1.31, 95%CI 1.08 to 1.60). Grade 3 (OR 1.32, 95%CI 1.00 to 1.74) or grade 4 (OR 1.51, 95%CI 1.15 to 1.97) students were more likely than grade 1 students to be high SSB. Very (OR 1.75, 95%CI 1.24 to 2.47) or moderately active (OR 1.51, 95%CI 1.23 to 1.86) students were more likely to be high SSB compared to low active students. Overweight students (OR 1.45, 95%CI 1.11 to 1.89) or those with missing BMI data (OR 1.70, 95%CI 1.10 to 2.47) were more likely to be high SSB compared to normal weight students.

Discussion

The current study identified that among grade 1 to 4 students, the school environment was not associated with the likelihood of exceeding sedentary behaviour guidelines. This is unique as significant between school variability in SSB was found among grade 5 to 8 students in the PLAY-On study (Leatherdale et al., 2010). The home environment may determine SSB for younger children and the time before and after school hours may be critical for reducing SSB (Atkin et al., 2008; Bauer et

al., 2008; Smith et al., 2010). The school environment may become important in determining SSB among older children and school-based prevention initiatives should target these individuals.

Parents' perceptions of children's activity preferences may impact SSB. For example, parents who believe that their children like playing sports may offer their children sport opportunities, which may offset SSB. Indeed, belonging to a sports team is negatively associated with SSB among children (He et al., 2009). The majority of children in grades 1-4 enjoy sports (Bassett-Gunter and Leatherdale, 2014) and sport participation should be encouraged instead of SSB. Parents who perceive that their children dislike sports should encourage alternative PA (e.g., walking or biking) to displace SSB.

Similarly, parents who perceive that their children prefer playing outdoors may encourage outdoor play which could result in less SSB. Alternatively, parents who believe that their children prefer indoor play may have concerns about SSB given that SSB are common indoor activities for children (Fairclough et al., 2009). Accordingly, these parents may be vigilant and reduce their children's risk of high SSB through monitoring and restricting SSB. Given that the majority of children in grades 1-4 prefer indoor play (Bassett-Gunter and Leatherdale, under review) it is important that parents monitor and restrict SSB during indoor play.

There are also individual characteristics that are important in determining risk for high SSB among children. Parents may play an important role in identifying these factors and modifying SSB accordingly. For example, as found previously (Leatherdale and Ahmed, 2011; Leatherdale et al., 2010;

Sisson et al., 2009) boys and older children were at higher risk for high SSB compared to girls and younger children. Many SSB (e.g., video games) may be especially appealing to boys and older children and efforts to reduce SSB may be particularly important among these children. Boys also engaged in higher levels of PA than girls, and those who were moderately or highly active were more likely to engage in high SSB than those who were low active. Perhaps some parents (especially boys' parents) permit higher SSB because they are under the impression that their children are engaging in adequate PA. Regardless of children's PA levels, parents must monitor SSB such that the guidelines are not exceeded as SSB is a risk factor for overweight and obesity independent of PA (Dennison et al., 2002; Eisenmann et al., 2002; Hills et al., 2007; Lowry et al., 2002; Marshall et al., 2004). Indeed, in the current study overweight children were at greater risk for high SSB compared to normal weight children.

The cross-sectional data collection limits the establishment of causation. Further, self-report may have resulted in under-reported SSB due to social desirability (Jago et al., 2007). Research using longitudinal design and objective measures of SSB should be conducted to further our understanding of risk factors for high SSB among children.

Conclusion

The school environment may not be important in determining SSB risk factors among young children. Rather, individual characteristics and parents' perceptions of activity preferences may contribute to young children developing high-risk patterns of SSB. Parents' role in monitoring and limiting SSB may be

imperative in ensuring children do not exceed SSB guidelines. Campaigns and initiatives to increase parents' awareness of the risk of high SSB would be of value.

Authors' Qualifications

The authors' qualifications are as follows: Rebecca L. Bassett-Gunter PhD, and Scott T. Leatherdale PhD.

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