



Reported barriers to physical activity and the role of built environment among overweight and obese youth attending a Canadian pediatric weight management clinic

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ABSTRACT

Objective: To assess activity levels and role of the built environment among overweight and obese youth referred to a pediatric weight management clinic.

Design: A cross-sectional study using a caregiver-administered survey was completed from October 2017 to February 2018.

Results: The study analyzed 210 surveys. Participants were 52 % male and average age was 11.6 years (3–18 years). Of those surveyed, 73 % of respondents reported ≥ 2 h of average daily screen time in the past 3 months, and 74 % of children partook in < 60 min of daily physical activity of any intensity. The most common location for physical activity was a recreational facility. The least common was nearby green spaces. Moreover, 77 % of caregivers felt that their child did not engage in enough physical activity, and the most common cited barrier was motivation. The built environment, however, was not cited as a barrier to active living as 90 % of caregivers reported their community was safe, and greater than 80 % of caregivers agreed their community was aesthetically beautiful, well connected with good infrastructure. The majority of commonly used spaces were located within 2 km of their home, however, it was uncommon for children to walk or bike to them.

Conclusion: Overweight and obese children referred to our clinic are not meeting national recommendations for physical activity and screen time. The built environment does not appear to be a large contributing factor to decreased physical activity in this population and the most common reason cited for lack of physical activity was motivation.

1. Introduction

Obesity continues to pose a threat to the health of Canadian children and adolescents. Among Canadian youth ages 5 to 17 years in 2017, 18.3 % were considered overweight and 10.6 % obese based on measured body mass index (BMI) (Avail 0000). The Canadian 24-Hour Movement Guidelines for Children and Youth ages 5–17 years recommends at least 60 min of moderate to vigorous intensity physical activity per day and no more than 2 h per day of recreational screen time (Avail 0000). In 2016–2017, nearly 40 % of Canadian youth 5–17 years old met the target for physical activity and 53 % met the screen time recommendation (Avail 0000).

The health of Canadian youth is influenced by the conditions in

which they live, grow and play, known broadly as the social determinants of health. In recognition that urban environments have a significant impact on health and health equity, the World Health Organization's 2008 Commission on Social Determinants of Health set out a strong call to "ensure urban planning promotes healthy and safe behaviors equitably, through investment in active transport, retail planning to manage access to unhealthy foods, and through good environmental design and regulatory controls..." (Avail 0000).

Researchers have also focused closely on the influence of the built environment on obesity and physical activity. Broadly, the built environment includes "urban design factors, land use, and available public transportation for a region, as well as the available activity options for people within that space." (Booth et al., 2005). Features of the built

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environment promote either active or sedentary behavior by creating opportunities or barriers to active commuting and active leisure. Children are particularly vulnerable to these factors, as they have limited ability to choose or change their environment (Audrey and Batista-Ferrer, 2015).

The aim of this current study was to describe activity levels and barriers to active living, including the built environment, among overweight and obese children and adolescents referred to our multi-disciplinary pediatric weight management clinic.

2. Methods

2.1. Study design

This study was a cross-sectional analysis of a caregiver-administered survey targeting children and adolescents referred for dietitian counseling or to the Pediatric Centre for Wellness and Health (PCWH), a multi-disciplinary lifestyle clinic, at the Alberta Children's Hospital in Calgary, Alberta, Canada.

The PCWH is a multi-disciplinary lifestyle clinic comprised of pediatricians, a pediatric endocrinologist, a registered nurse, a registered dietitian, an exercise specialist, a psychologist and a social worker. Children can be referred to the program if they are 2–17 years of age and have a body mass index (BMI) greater than or equal to the 85th percentile. Referral criteria for dietitian counselling is the same.

Prior to starting in the PCWH, families attend an orientation called the Family Information Session. After the family information session, families decide if they would like to participate in the program and can request to be booked for an assessment. The study survey was provided to caregivers either during the family information session, PCWH initial assessment or follow-up appointments, or the initial or follow-up dietitian visit. Surveys were distributed between mid-October 2017 to mid-February 2018, and a total of 233 survey responses were obtained. An accurate response or refusal rate could not be calculated. There were 142 new referrals to the PCWH for multidisciplinary care during the above study period, however not all families referred necessarily follow through to attend the Family Information Session, and surveys were also offered to families already involved in the program during follow up dietitian or subspecialty appointments. The program does not track monthly dietitian or multidisciplinary follow visits, and the number of distributed surveys was not otherwise tracked.

2.2. Ethical considerations

This study met the University of Calgary's guidelines for protection of human subjects concerning safety and privacy. Ethics approval for this study was obtained through the Conjoint Health Research Ethics Board at the University of Calgary.

2.3. Survey tools and measures

The survey (Appendix A) was adapted from two established surveys in the literature, the Built Environment and Active Play (BEAP) and the Neighborhood Environment Walkability Scale for Youth (NEWS-Y) (Roberts et al., 2015; Rosenberg et al., 2009). Demographic information including age, gender, and ethnicity of the child were collected as well as a description of the family's home environment, parental education, and annual household income. Questions about the presence or absence of parental weight concerns and medical issues for the child impacting physical activity were also included. The availability of electronic devices in the bedroom, daily screen time use, time spent in daily physical activity, and participation in school or community-based sports teams was also reviewed. We asked in which locations the child engages in physical activity, parental opinion on the adequacy of physical activity, and the perceived barriers to their child engaging in physical activity. We asked about community safety, street connectivity, neighborhood

aesthetics, and an estimate of the frequency of walking or biking to various locations in the area, including schools and parks.

2.4. Statistical analysis

Descriptive statistics were used to characterize the patient population and the results from the survey. Proportional odds modeling was performed to identify risk factors for higher screen time and lower physical activity. Approximately 10 % of responses were independently reviewed to ensure information was properly entered. Data from the survey was analyzed using Microsoft Excel and SPSS Statistics 23.0 (IBM, 2015).

3. Results

A total of 233 survey responses were obtained from October 2017 to February 2018 (53.5 % from PCWH, 44 % from dietitian, 3 % not known). Of these, 23 (10 %) surveys were excluded from the final data analysis as the caregiver included information on more than one child on a single survey. If only a small number of individual questions on a survey were left blank, those data points were coded as missing, and the remainder were included.

Table 1 summarizes the study's patient population. Patients were 52 % male, and the average age of the group was 11.6 years old (range 3–18 years). The majority of caregivers identified as Caucasian (64 %) and reported living in a single detached home (82 %) with a dual parent household (75 %). More than half of the caregivers had a university bachelor diploma or higher and a combined annual household income >\$75,000. At least one parent reported weight concerns in 72 % of surveys. Most of the children (77 %) did not have a health issue impacting their ability to be physically active, not including weight concerns. Respondents indicated that 55 % of children had electronic devices in their bedroom and 28 % of caregivers reported an average daily screen time < 2 h per day with 11 % reporting ≥ 6 h per day in the past three months. Similarly, in the last three months, caregivers reported < 60 min per day of physical activity of any intensity in 74 % of children, and 74 % of children spent < 3 days per week completing 60 min of moderate to strenuous exercise per day. Additionally, 49 % of children did not participate in any school or community-based sports teams or activities. Based on the past 3 months, the most common locations where children participated in the most physical activity on a regular basis were a recreational facility (i.e. public pool, YMCA, basketball/tennis court, gym, arena, etc.) (52 %) followed by the school yard during school hours (39 %). The least common places were nearby green space, field, city park (13 %).

The majority of caregivers felt that their child did not engage in enough daily physical activity or exercise; 62 % responded "less than ideal", 15 % responded "not at all." The most common barrier to a child engaging in more daily physical activity was motivation to partake in physical activity (56 %) followed by finding time to exercise (40 %), money or financial constraints (24 %), other (16 %), and not enough space or opportunities around my home or surrounding community to exercise (13 %).

The majority of caregivers (90 %) reported their community was safe for their child to walk, bike and play in. For the minority who replied their community was very unsafe or unsafe, the most common contributing factor was traffic (unsafe intersections, poor crosswalk access, traffic volume and speed).

The majority of caregivers encouraged their child to commute by foot or by bike around the community when possible (88 %), and often see other adults and children biking and/or walking around the community (84 %) (Table 2). Most caregivers also agreed that their community has many attractive sights outdoors (86 %), their streets are well connected making it convenient to get around by bike or foot (87 %), their community has good infrastructure to make traveling by bike or by foot easy and safe (87 %), and public transit options are readily available

Table 1
Demographics of the study population (N = 210 unless otherwise specified if a caregiver chose to not answer a question).

Demographic Variable	Number	Percent (%) or Range
Sex		
Male	110	52
Female	100	48
Age (years)	11.6	(3–18)
Visit type		
Initial or follow-up PCWH	111	53
Dietitian initial or follow-up	92	44
PCWH family information session	1	0.5
Not known	6	3
Ethnicity (N = 208)		
Caucasian	133	64
Asian	36	17
African-Canadian	6	2.9
Middle-Eastern	8	3.8
Aboriginal	4	1.9
Hispanic	9	4.3
Mixed Race	12	5.8
House Type (N = 207)		
Single Detached Home	170	82
Townhouse	26	13
Apartment or Condominium	11	5
Caregiver Status (N = 209)		
Dual parent household	156	75
Single parent household	32	15
Joint shared custody	21	10
Highest Parental Level of Education (N = 209)		
Less than high school diploma	14	7
Completed high school certificate without post-secondary education	25	12
Non-university certificate or diploma, trade certificate or apprenticeship	49	23
University certificate or diploma at bachelor level	74	35
University certificate or diploma above bachelor level	47	22
Combined yearly household income (N = 204)		
≤ \$24,999	22	11
\$25,000 to \$49,999	24	12
\$50,000 to \$74,999	36	18
\$75,000 to \$99,999	31	15
≥ \$100,000	91	45
Parental Weight Concerns (N = 209)		
Both parents	70	33
One parent	81	39
Neither parent	58	28
Child Health Issue		
None	162	77
Endocrine Issues	3	1.4
MSK Issues	17	8
Mental Health Issues	2	1
Respiratory Issues	19	9
Syndrome	7	3.3
Electronic Devices in Bedroom		
Yes	115	55
No	95	45
Screen Time (N = 209)		
< 2hrs / day	58	28
2–3.99 hrs / day	83	40
4–5.99 hrs / day	46	22
≥ 6 hrs / day	22	11
Physical Activity (N = 207)		
< 30 mins / day	49	24
30 – 60 min / day	104	50
1 – 2 hrs / day	46	22
> 2 hrs / day	8	4
Frequency 60 min. daily exercise (N = 207)		
No days per week	61	30
1–2 days per week	93	45
3–4 days per week	40	19
≥ 5 days per week	13	6
School Activity (N = 208)		
No days per week	102	49

Table 1 (continued)

Demographic Variable	Number	Percent (%) or Range
1–2 days per week	69	33
3–4 days per week	30	14
≥ 5 days per week	7	3

Table 2
Caregiver perceptions of their local built environment (N = 210).

	Strongly Disagree %	Disagree %	Agree %	Strongly Agree %
I encourage my child to commute by foot or by bike around my community when possible.	3	8	57	31
My community is beautiful, with many attractive sights/interesting things to look at while outdoors.	2	11	61	25
Streets in my neighborhood are well connected, making it convenient to get around by bike or foot.	3	9	60	27
I can do most of my daily errands without use of a car.	22	53	19	6
My community has good infrastructure (sidewalks, bike lanes, streetlights, crosswalks, etc.) to make traveling by bike or by foot easy and safe.	2	12	63	24
Public transit options are readily available within walking or biking distance of my child's home.	12	8	55	25
I often see other adults and children biking and or walking around my community.	5	11	61	23

within walking or biking distance of their home (80 %). A large proportion, however, indicated they cannot do most of their daily errands without use of a car (75 %).

In terms of proximity to their home, the majority of caregivers reported that the following locations were located within 2 km of their home: public park (90 %), bike path or walking trail (86 %), open green space or open field (94 %), nearest full service grocery store (59 %), nearest convenience store or fast-food restaurant (80 %), child's nearest friend's or relative's house (55 %). The child's school and the nearest recreational or sport facility were more often reported to be located further than 2 km (60 % and 57 % respectively) from their home. Despite the proximity of these locations to the majority of families, when asked how many days per week their child walked or biked to the following locations on average in the last 3 months, the most common answer was "never" for each location (Fig. 1).

Statistical analysis is summarized in Table 3. We found that females had less screen time than males (OR 0.55; 95 % CI 0.31–0.97), and older children had more screen time (OR 1.32; 95 % CI 1.20 – 1.45), less physical activity per day (OR 0.85; CI 0.78–0.93), fewer days attaining at least 60 min of daily exercise (OR 0.87; 95 % CI 0.80 – 0.94) and fewer days of physical activity on a school or community sports team (OR 0.85; 95 % CI 0.78 – 0.93). When examined for gross household income, physical activity among those with a household income above \$100,000

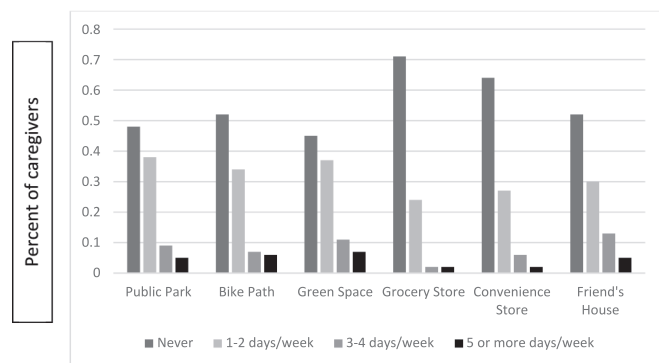


Fig. 1. Caregiver responses on the frequency of walking or biking to locations located within 2 km over the past 3 months.

was significantly more than that compared to lower household incomes (OR 2.9; 95 % CI 0.89 – 9.45). Attaining at least 60 min of daily exercise was less likely among families whose self-reported income was \$25,000 to \$49,999 (OR 0.46; 95 % CI 0.13–1.68). There were no statistically significant differences for estimates of screen time and physical activity across different dwelling types, number of parents in the household, highest parental education, or whether there was an obese or overweight parent.

4. Discussion

In this study, we found that screen time exceeded, and physical activity was lower than national recommendations for the majority of children. Only 28 % of caregivers reported < 2 h of screen time per day and 26 % reported > 1 h of physical activity per day, with only 6 % having 60 min of daily activity \geq 5 days per week. This is considerably lower than results from the Canadian Community Health Survey (2016–2017) that found that 40 % of youth 5 to 17 years old met the activity target and 53 % had no more than 2 h of screen time per day (Avail 0000). Some of this discrepancy may be due to the fact that our sample population was children referred for pediatric weight management rather than the general public.

The majority of activity took place in a recreational facility, which may be influenced by the time of year (i.e. fall and winter months) that caregivers were surveyed. Caregivers were aware that their children did not engage in enough daily physical activity and the major barriers were motivation and time. Financial constraints was not a common barrier, which may be a reflection of the reported socioeconomic status of our population.

The built environment did not appear to be a barrier to activity for our patients. The vast majority of caregivers felt their community was safe, aesthetically beautiful, and well connected with good infrastructure and public transit options. The majority of common locations for physical activity and activities of daily living were reported to be located within 2 km of the child's home, however, the majority of children did not walk or bike to these locations. This may reflect the seasons in which the survey was taken, however, this finding highlights a modifiable behavior that can be a potential focus for our clinic.

Despite the positive description of the built environment, caregivers described low levels of activity among their children. The risk factors we found: male gender for increased screen time, older age and low socioeconomic status for lower physical activity, have been previously reported (Avail 0000; Inchley et al., 2005). Motivation was the most commonly reported barrier to physical activity, followed by finding time and then financial constraints. Surprisingly, green space, fields and city parks were the least used among families. This information can help focus counseling provided to families in lifestyle clinics on physical activity. For example, prioritizing discussions on screen time and physical activity for older children and brainstorming on low-cost

activities that make use of the nearby green space, especially if there are known financial constraints. In addition, the use of motivational interviewing (MI) has been shown to improve physical activity in overweight and obese adults (Hardcastle et al., 2008) and improve adherence to pediatric obesity interventions (Bean et al., 2015). The aim of MI is to create an environment in which the patient becomes the main advocate for change and the primary person carrying out the change (Gourlan et al., 2013). Gourlan M et al. (2013) found that six MI sessions over a six month period delivered to obese adolescents significantly increased physical activity length by an average of 33 min/day whereas the group receiving standard care reported no change in physical activity (Gourlan et al., 2013). These findings together with our results suggest that use of MI in pediatric lifestyle clinics could be a powerful tool for counseling on lifestyle changes and increasing physical activity.

A limitation of this study was that we surveyed caregivers in the fall and winter months which may have influenced responses and thus made them less generalizable. Caregivers were asked to average physical activity estimates over the last three months, so there may have been some recall bias. However, we had aimed to include some months with better weather to have a more accurate picture of physical activity outdoors as well as within recreational facilities. An accurate response rate could not be calculated for the present study, as the specific number of families approached to complete the survey was not collected (i.e. those that attended follow-up specialty clinic or dietician counselling appointments). There may have been a bias in the families that chose to complete the survey, since it was offered to all families in the waiting room, but no data was able to be collected from those that chose to not complete the survey. Another limitation is that the results may not be generalizable given that the population in this study was majority Caucasian, had a high family income of greater than \$100 000, and had a caregiver with a university education (Table 1). This likely contributed to the high satisfaction with the built environment and neighborhoods of these families. Lastly, this analysis did not address physical activity that occurred at school during school hours. For the purpose of the study, it was assumed that most children would have equal access to their school gymnasium or the outdoor space immediately adjacent to the school during school hours, hence this variable would not differentiate between respondents or add to our analysis of how the broader built environment can affect rates of physical activity in our population.

5. Conclusion

In conclusion, youth referred to dietitian counselling or the pediatric weight management clinic at our site were not meeting national recommendations for physical activity and screen time. The built environment did not appear to be a barrier to active living in our population as most caregivers felt that their community was safe, aesthetically beautiful, well connected, and had good infrastructure. In addition to this, the majority of commonly used locations were located within 2 km of the home. Despite these positive built environment factors, most caregivers felt that their child did not engage in enough daily physical activity and it was uncommon for children to walk or bike to close locations. Families felt that the most common reason for lack of physical activity was lack of motivation. This is a modifiable factor and supports that this should be a target for counselling and goal setting within our clinic. Focusing on motivational interviewing around physical activity may produce positive gains, given that the majority of families reported that their current built environment was conducive to activity.

Authors contributions

RS, PL, MJ, JH designed the research; RS, PL, MJ, JH collected the data; RS, PL, MJ, JH discussed investigation methodology and contributed to result interpretation; RS and PL performed data analysis; PL and JH supervised the study conduction; RS and PL wrote the original draft; all authors revised the paper and agreed with the final version of the manuscript.

Author Disclosure

Table 3
Association between demographic variables and activity scores*.

Characteristic	Screen Time		Physical Activity		60 min of Exercise		School Activity	
	OR (95 % CI)	p-value	OR (95 % CI)	p-value	OR (95 % CI)	p-value	OR (95 % CI)	p-value
Age	1.32 (1.20—1.45)	<0.0001	0.85 (0.78—0.93)	0.0003	0.87 (0.80—0.94)	0.0011	0.85 (0.78—0.93)	0.0003
Female	0.55 (0.31—0.97)	0.0398	0.87 (0.49—1.54)	0.6204	1.02 (0.58—1.79)	0.9579	0.79 (0.45—1.42)	0.4375
Male (Reference)								
Aboriginal	0.53 (0.07—3.96)	0.3863	2.66 (0.33—21.68)	0.3416	1.25 (0.16—9.97)	0.4983	1.05 (0.12—9.07)	0.9460
African-Canadian	3.78 (0.63—22.71)	0.1215	0.71 (0.11—4.59)	0.5859	0.13 (0.02—1.07)	0.0751	1.22 (0.19—7.65)	0.9115
Asian	1.15 (0.50—2.64)	0.9830	0.53 (0.23—1.26)	0.0734	0.45 (0.19—1.04)	0.3163	0.67 (0.29—1.59)	0.2196
Hispanic	0.32 (0.07—1.43)	0.0549	1.14 (0.27—4.82)	0.9613	0.63 (0.15—2.67)	0.9229	1.54 (0.37—6.31)	0.6068
Middle-Eastern	5.63 (1.19—26.57)	0.0178	1.70 (0.35—8.28)	0.5309	1.46 (0.31—6.88)	0.2538	1.19 (0.25—5.63)	0.9285
Mixed	0.60 (0.17—2.09)	0.2756	1.03 (0.32—3.35)	0.9004	0.88 (0.28—2.80)	0.6209	1.38 (0.43—4.41)	0.7017
Caucasian (Reference)								
Apartment or Condominium	0.44 (0.09—2.13)	0.3366	0.57 (0.11—2.91)	0.9211	0.27 (0.05—1.43)	0.2644	1.66 (0.32—8.71)	0.4744
Single detached home	0.75 (0.29—1.95)	0.7715	0.38 (0.15—1.01)	0.1382	0.40 (0.15—1.04)	0.5683	0.94 (0.36—2.46)	0.4976
Townhouse (Reference)								
Dual parent household	0.58 (0.23—1.46)	0.1168	3.02 (1.16—7.92)	0.1090	1.83 (0.71—4.69)	0.2437	1.37 (0.51—3.66)	0.9861
Joint shared custody	1.08 (0.33—3.57)	0.4864	2.72 (0.78—9.48)	0.3870	1.40 (0.40—4.93)	0.9512	1.85 (0.53—6.48)	0.3708
Single parent household (Reference)								
Completed high school certificate, or equivalent, but no post-secondary education.	1.63 (0.38—7.01)	0.9817	0.34 (0.08—1.48)	0.3955	1.45 (0.33—6.30)	0.7457	1.46 (0.32—6.63)	0.5106
Non-university certificate or diploma, trade certificate or apprenticeship	2.48 (0.69—8.88)	0.1581	0.44 (0.12—1.62)	0.7720	0.94 (0.25—3.53)	0.2956	0.70 (0.18—2.74)	0.1322
University certificate or diploma at the bachelor level	2.26 (0.66—7.73)	0.2239	0.46 (0.13—1.63)	0.8896	1.64 (0.45—5.94)	0.3534	1.32 (0.36—4.82)	0.5413
University certificate or diploma or degree above bachelor's level (i.e. Master's, PhD, MD)	1.32 (0.37—4.68)	0.4436	0.37 (0.10—1.35)	0.3563	1.54 (0.41—5.76)	0.5289	1.32 (0.35—5.00)	0.5806
Less than a high school diploma (Reference)								
\$25,000 to \$49,999	0.71 (0.20—2.55)	0.7607	0.98 (0.27—3.55)	0.1913	0.46 (0.13—1.68)	0.0334	0.73 (0.19—2.74)	0.4785
\$50,000 to \$74,999	0.48 (0.15—1.52)	0.0960	1.72 (0.54—5.52)	0.9096	1.79 (0.56—5.72)	0.1264	1.10 (0.33—3.72)	0.6916
\$75,000 to \$99,999	1.27 (0.36—4.48)	0.1830	2.61 (0.72—9.37)	0.2011	1.43 (0.41—5.05)	0.4436	0.93 (0.25—3.50)	0.9173
More than \$100,000	0.77 (0.24—2.47)	0.8831	2.90 (0.89—9.45)	0.0520	1.37 (0.43—4.39)	0.4427	1.15 (0.34—3.86)	0.5565
Less than \$24,999 (Reference)								
No, neither parent has weight concerns	1.59 (0.78—3.22)	0.1663	1.12 (0.54—2.30)	0.9347	1.78 (0.86—3.65)	0.5370	0.70 (0.34—1.46)	0.4659
Yes, both parents	1.03 (0.53—2.03)	0.5198	1.18 (0.60—2.36)	0.7162	2.11 (1.07—4.18)	0.1349	0.81 (0.40—1.61)	0.8993
Yes, only one parent (Reference)								

*Proportional odds modelling of ordinal activity scores. OR = odds ratio. CI = confidence interval.

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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