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Does parental support influence children's active school travel?

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ABSTRACT

Today's ‘backseat generation’ of children is more often driven to school. Active school travel (AST) can contribute up to 30% of recommended daily physical activity. Although governed by a complex set of factors, parents are considered ‘gatekeepers’ of children's travel mode decisions. Therefore, we investigate the relationship between parental support and children's AST.

Data were from *Active Streets, Active People-Junior* (British Columbia, Canada). Children self-reported travel mode to/from school for 1 week (10 trips). We assessed parental perceived neighborhood traffic and crime safety (Neighborhood Environmental Walkability Scale-Youth) and frequency of parental support for AST (0–5×/week). We investigated the association between daily AST behaviour and parental support using logistic regression (controlling for age, sex, distance to school and perceived neighborhood safety).

In our sample ($n = 179$, 11.0 ± 1.0 years, 59% girls), 57% reported daily AST and 63% of parents provided daily support. Bivariate analyses showed AST behaviour was significantly associated with parental support frequency and parents' perceived safety. In adjusted analysis, daily parental support remained significantly associated with daily AST (OR 9.0, 95% CI 4.2, 19.7).

The relationship between parental support and AST was independent of noted correlates of AST. Thus, interventions that focus solely on changes to the built environment may not be enough to encourage AST. Therefore, interventions that aim to increase AST should involve parents and children in the planning process.

1. Background

Physical activity (PA) is a cornerstone of health at every age. Despite this, fewer than 10% of Canadians aged 6–19 years currently meet PA guidelines of 60 min or more per day of moderate-to-vigorous PA. Conversely, the same boys and girls spend up to 8 times as many hours in sedentary pursuits (Colley et al., 2011; Tremblay et al., 2010). As PA and sedentary time track from childhood to adulthood (Telama et al., 2005), the current generation of low active, sedentary Canadian children are poised to become the inactive adults of tomorrow. Thus, effective strategies are needed to promote PA in children.

Children spend more than half their waking hours in school (Fox et al., 2004). As opportunities for PA in school have declined over time (Hardman, 2004), there is a need to enhance PA opportunities outside the school day (Jago and Baranowski, 2004). Importantly, research suggests that to achieve a population-level impact, strategies that encourage ‘incidental’ activity through active living (such as active school travel (AST), e.g. walking or cycling) may be key (Sallis et al., 2006).

AST promotes overall health (Lubans et al., 2011) and is an invaluable source of children's incidental daily PA. We and others have shown that it contributes as much as 30% toward recommended daily levels of PA (van Sluijs et al., 2009; Voss et al., 2015). Children who use active travel modes to and from school tend to be more physically active compared with peers who do not (Faulkner et al., 2009; Lee et al., 2008). Unfortunately, children of today's ‘backseat generation’ (Karsten, 2005) are more frequently driven to school, and Canadian children use AST much less than 20 years ago (Grize et al., 2010; Buliung et al., 2009).

Many factors influence a child's decision to actively travel to school. Important among these are distance to school (McDonald, 2008), and built and social environments (Rothman et al., 2014; Dalton et al., 2011; de Vries et al., 2010). As studies more often focus on urban environments (Mitra et al., 2014), less is known about children's AST in suburban settings. Further, we recently reported that students who live in suburbs actively travel to school less often than those who live in

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urban settings (Frazer et al., 2015). Thus, investigating AST in suburban areas is merited.

The social influence of parents may also be an important part of a multi-component solution. Parents can have both positive (Leung et al., 2016) and negative (Salmon et al., 2007) impacts on children's PA. As "gatekeepers" of children's travel behaviours, they govern their children's travel mode decision (Carver et al., 2013; Pont et al., 2011; Hume et al., 2009; Panter et al., 2008), and their support for certain travel modes may play a significant role in how children travel to school. Support is influenced by environmental concerns about traffic volume, child safety, ability to navigate the route to school safely, and convenience (Faulkner et al., 2010). Therefore, our objective was to evaluate whether children's AST is associated with parental support in suburban school communities.

2. Materials and methods

2.1. Participants and protocol

We conducted a cross-sectional study as part of the larger *Active Streets*, *Active People-Junior* (*ASAP-Jr*) study, collected in October 2015 at 5 elementary schools in Surrey, British Columbia, Canada. We invited students in grades 4–7 to participate; $n = 341$ students (11.0 ± 1.0 years old) provided written parental consent and student assent. We also invited one parent of every child ($n = 341$) to participate in the study. We excluded participants who (i) had missing child or parental survey data and (ii) lived further than 3 km from school, based on previous criterion (D'Haese et al., 2011). Children completed anthropometric and fitness measurements and questionnaires during their regular physical education class. Parental consent forms and questionnaires were sent home with the child to be completed and returned. While we encouraged parents to participate and return their surveys to the school, completing parent packages was optional. Parent packages were collected for 240/341 (73%) of *ASAP-Jr* participants. The University of British Columbia Behavioural Research Ethics Board approved the study (H12–01439).

2.2. Measures

2.2.1. Demographics

Parents reported their marital status, family car ownership, home address, and child's age and sex. We geocoded each participant's home address using a Geographic Information System (ArcGIS™, v10.1, ESRI®, Redlands,CA) and obtained school geofiles from the City of Surrey open data catalogue (data.surrey.ca). We used the Network Analyst tool to calculate participants' shortest route to school (in metres) along the street network and used distance to school as a continuous variable in statistical analyses.

2.2.2. Active school travel

To measure AST, children self-reported their trips to and from school with an item from a validated school travel questionnaire (Mendoza et al., 2010): "In an average week, how many days do you use the following ways to get to and from school?" Response options were "walk", "bike", "car", "school bus", "public transit", "combination", or "other". Children who reported "combination" or "other" were asked to specify their travel mode. In addition to walking and cycling, we considered "scooter", "longboard", and "skateboard" as active trips. We calculated the number of active trips to and from school per week such that a child could accumulate 0–10 active trips. For analysis we used the frequency of active trips per week (i.e., 0–10 active trips/week) and also classified participants as daily (≥9 active trips) or occasional/non (≤8 active trips) active travelers.

2.2.3. Parental support

We defined parental support for AST as verbally encouraging a child to walk or bike to school. To assess parental support, we asked parents: "How often per week do you encourage your child to (i) walk or (ii) cycle to school?" Possible responses were 0 times/week, 1–2 times/week, 3–4 times/week, and daily. For analysis we used the frequency of parental support (i.e., 0–5 times/week), and also categorized participants as receiving daily support (5 times/week) or occasional/no support (≤4 times/week).

2.2.4. Neighborhood safety

We assessed perceived neighborhood safety using two sections of the Neighborhood Environmental Walkability Scale for Youth (NEWS-Y) survey. These sections assess safety and walkability on a 4-point scale specifically related to (i) pedestrians and traffic (7 items), and (ii) crime (6 items). We recoded items in each section such that higher scores represent the perception of a safer and more walkable neighborhood (opposite to the scoring approach published in 2009 by Rosenberg et al.), and created an average score (continuous measure ranging from 1 to 4) for each section.

2.3. Statistical analysis

Statistical analyses were performed using STATA/MP 13.1 (StataCorp, LP, College Station, TX). We assessed sex differences in age, distance to school and perceived neighborhood safety using independent sample *t*-tests and frequency of active trips and frequency of parental support using Wilcoxon-Mann Whitney tests. We compared perceived neighborhood safety scores across schools using one-way ANOVA (Tukey post hoc tests where appropriate) and compared frequency of active trips and parental support using Kruskal Wallis tests. We used the Pearson correlation coefficient (r) to describe the bivariate association between distance to school and perceived neighborhood safety scores and Spearman's correlation coefficients (r_s) to describe the association of frequency of active trips and frequency of parental support with age, distance to school, and perceived safety scores.

Due to the distribution of our data we also dichotomized frequency of active trips and parental support into 'occasional/no' and 'daily' categories. We evaluated sex differences in these categories using Chi-square tests and differences in distance to school across categories using *t*-tests. Finally, we used multivariable logistic regression to calculate the odds ratio of a participant being a daily active traveler by parental support category (daily vs. occasional/no support). We controlled for age, sex, distance to school, and perceived neighborhood safety, as these were independently associated with AST in previous studies (McDonald, 2008). We evaluated model fit by examining model specification (Link test), goodness of fit (Hosmer-Lemeshow chi-square), multicollinearity (variance inflation factor) and influential data points (Pearson residual, deviance residual and Pregibon leverage). We considered $p < 0.05$ statistically significant.

3. Results

3.1. Descriptive characteristics

Of eligible participants ($n = 341$), $n = 4$ children did not report travel modes, $n = 114$ parents did not report parental support frequency, $n = 28$ parents were missing neighborhood safety perceptions scores, and $n = 16$ participants lived further than 3 km from their school (D'Haese et al., 2011). Excluded participants did not significantly differ by height, weight, age or sex. There was no difference in distance to school between included and excluded participants who lived within 3.0 km ($n = 127$) of school.

Thus, our final sample size included $n = 179$ participants (11.0 ± 1.0 years old, 59% girls). The majority of parents were married (87%) and nearly all (94%) parents reported having a vehicle in their

Table 1
Means and standard deviations for continuous variables, and frequencies (percentages) for categorical variables.

	Girls ($n = 105$)	Boys ($n = 74$)	Total ($n = 179$)[a]
Age (mean years ± SD)	11.1 ± 1.0	10.8 ± 1.1	11.0 ± 1.0
Distance to school (mean distance in m ± SD)	747 ± 468	800 ± 508	783 ± 502
Parents' perceived pedestrian and traffic safety score (Mean score ± SD, scale 1–4; 4 = safest)	2.68 ± 0.52	2.59 ± 0.46	2.64 ± 0.50
Parents' perceived crime safety score (Mean score ± SD, scale 1–4; 4 = safest)	2.46 ± 0.75	2.65 ± 0.73	2.54 ± 0.74
Frequency of parental support for AST			
0×/week	13 (13%)	9 (12%)	22 (12%)
1–2×/week	18 (17%)	6 (8%)	24 (14%)
3–4×/week	14 (13%)	6 (8%)	20 (11%)
5×/week	60 (57%)	53 (72%)	113 (63%)
Active trips			
0 trips	13 (13%)	12 (16%)	25 (14%)
1 trip	0	1 (1%)	1 (1%)
2 trips	5 (5%)	0	5 (3%)
3 trips	3 (3%)	1 (1%)	4 (2%)
4 trips	3 (3%)	1 (1%)	4 (2%)
5 trips	14 (13%)	3 (4%)	17 (10%)
6 trips	4 (4%)	3 (4%)	7 (4%)
7 trips	4 (4%)	1 (1%)	5 (3%)
8 trips	5 (5%)	4 (5%)	9 (%)
9 trips	5 (5%)	0	5 (3%)
10 trips	49 (47%)	48 (65%)	97 (54%)

[a] There were no significant differences between girls and boys for any continuous (age, distance, pedestrian safety, crime safety) or categorical (distance category, frequency of parental support, and active trip frequency) variables.

household (data not shown). More than half of included families (59%) lived within 800 m of school (data not shown). There were no sex-related differences in age or distance to school (Table 1).

3.2. Active school travel

More than half of children (57%) reported daily AST; 14% of children reported no active trips. There was no association between age and AST frequency, nor were there any sex or school-related differences (data not shown). Children with more active trips lived closer to school ($r_s = -0.39$, $p < 0.001$) and had higher scores for parent perceived neighborhood crime safety ($r_s = 0.19$, $p < 0.05$).

3.3. Parental support

A large proportion of parents provided daily support for AST (63%) and few never encouraged AST (12%). There was no association between frequency of parental support and age ($r_s = 0.03$, $p = 0.69$) or distance to school ($r_s = -0.15$, $p = 0.05$), nor were there any sex ($p = 0.08$) or school ($p = 0.49$) related differences. Frequency of parental support was related to parents' perceptions of neighborhood crime safety ($r_s = 0.15$, $p < 0.05$), but not pedestrian or traffic safety ($r_s = 0.04$, $p = 0.57$).

3.4. Neighborhood safety

One quarter (27%) of parents agreed or strongly agreed that their neighborhood was safe (≥3) regarding pedestrian and traffic safety. When asked about crime safety, 34% of parents agreed that their neighborhood was safe. Parental perceptions of pedestrian/traffic or crime safety did not differ by sex and was not associated with distance to school. Age was significantly associated with perceived pedestrian/traffic safety ($r = 0.23$, $p = 0.002$) but not with crime safety. Perceived crime safety differed significantly between schools ($F(4174) = 9.62$, $p < 0.001$); parents at two schools reported statistically significantly lower scores (22–27% lower; Table 2).

3.5. Relationships between daily AST & daily parental support

Overall, about half of children (59% of boys and 40% of girls, 48% overall, Table 3) received daily support (parent-reported) and self-reported daily AST. Only 4% reported no active trips and received no support. Small proportions of participants actively traveled daily without daily support (9%) or received daily support but did not actively travel daily (15%).

Compared with girls, boys were significantly more likely to receive daily parental support than were girls ($\times^2 = 3.91$, $p < 0.05$), but were no more likely than girls to engage in daily AST ($\times^2 = 3.20$, $p = 0.07$). Children who used AST daily lived closer to school (mean difference (95% CI): 374 m (235, 513); as did those receiving daily parental support (mean difference (95% CI): 203 m (52, 354).

In unadjusted logistic regression, daily support was significantly associated with daily AST (OR 10.0, 95% CI 4.9, 20.2, data not shown). Daily parental support remained a significant predictor of daily AST after adjusting for age, sex, distance to school, and perceptions of pedestrian/traffic and crime safety (Table 4). Regression diagnostics indicated two influential data points; thus, as a precaution, we re-ran our model without these observations. Excluding these participants did not change our findings; therefore, we present the model with all participants.

4. Discussion

Given the proportion of Canadian children who do not currently meet PA guidelines, novel and multi-pronged solutions to promote PA are needed. We extend the literature by assessing children in a suburban environment and highlight the important role that parents play in a child's choice to actively travel to school, as one part of a more complex solution. Children and youth spend approximately half their waking hours in school (Fox et al., 2004), but opportunities for PA at school have diminished in recent years (Hardman, 2004). Solutions embedded outside of school, as a routine part of the school day, are most likely to contribute effectively to children's PA levels.

4.1. A focus on parental support

Children who actively travel to school have higher PA levels, on average (Larouche et al., 2014). Our results yield one possible mechanism to explain this as we noted a significant relationship between parental support and AST, independent of other previously-supported correlates of active travel (age, sex, distance to school (McDonald, 2008)).

Table 2
Parental scores of perceived neighborhood safety and walkability (mean score ± SD), separated by school. Safety and walkability were scored on a scale of 1 to 4, in which 4 was the most safe and walkable.

	School A ($n = 41$)	School B ($n = 32$)	School C ($n = 27$)	School D ($n = 30$)	School E ($n = 49$)
Pedestrian and traffic safety	2.7 ± 0.5	2.5 ± 0.5	2.7 ± 0.6	2.5 ± 0.5	2.7 ± 0.5
Crime safety	2.8 ± 0.7	2.1 ± 0.7*	2.8 ± 0.8	2.2 ± 0.6*	2.7 ± 0.7

* There was a statistically significant difference between schools for crime safety as determined by one-way ANOVA ($F(4,174) = 9.62$, $p < 0.001$). Scores were significantly lower for schools B and D compared with schools A, C and E. No differences were observed between schools for pedestrian and traffic safety.

Table 3
Number of participants who fall under each active travel category (daily vs. occasional/no active travel) combined with parental support category (daily vs. occasional/no support).

	Daily parental support*	Occasional or no support
Daily active school travel		
Girls	42 (40%)	12 (11%)
Boys	44 (60%)	4 (5%)
Total	86 (48%)	16 (9%)
Occasional/no active school travel		
Girls	18 (17%)	33 (32%)
Boys	9 (12%)	17 (23%)
Total	27 (15%)	50 (28%)

* Parental support category significantly differed by sex ($\times^2 = 3.91$, $p < 0.05$); boys were more likely to receive daily support than were girls.

There are a complex set of factors that influence parents' support of AST and often include confidence in a child's ability to navigate the route to school and route safety (Faulkner et al., 2010). However, the relationship we observed was independent of factors associated with the built environment such as parental perceptions of neighborhood traffic and crime safety. This suggests that interventions that focus solely on changes to the built environment may not be sufficient to enhance the proportion of children who use AST (Van Kann et al., 2015; Napier et al., 2011), especially if parents do not support AST. Thus, municipal investment in supportive infrastructure around schools or along popular routes to school alone may not be enough to change school travel behaviour, but it may be an important part of a larger solution (Rothman et al., 2014). Finally, programs that aim to increase AST may consider a focus on parental neighborhood safety perceptions and travel mode convenience, as these may mediate parental support for AST.

4.2. Potential role for schools

Schools can play a role to facilitate AST through programs that eliminate barriers to active travel (Buliung et al., 2011). However, only a small proportion of past school interventions effectively increased children's AST (Chillon et al., 2011). Failure to engage with partners across multiple stakeholder levels, essential within socio-ecological models of health promotion (Stokols, 1996), may be one important reason. Second, as many factors influence a child's decision to actively transport to school (Faulkner et al., 2013), a "one size fits all" solution will not work.

The Walking School Bus may provide one attractive option across a mixed Active Routes to School program (Chillón et al., 2011). In the program, parent and staff volunteers lead a group of children in active trips to school (Smith et al., 2015; Mendoza et al., 2011). Active trips give children a chance to explore their environment and become effective navigators of the route to school, which increases parents' confidence in the child's navigational ability. Further, the Walking School Bus increases adult supervision, leading to greater perceived route safety (Trapp et al., 2012; Staunton et al., 2003). Thus, parents should be actively invited to contribute to planning AST programs with schools to include elements such as added supervision on the route. Parental involvement has potential to increase the likelihood parents will support the program and more often encourage their child to use AST.

4.3. Don't forget the kids

It is important to acknowledge a role for children in the decision to use AST, especially given that children may hold different perceptions of environmental safety compared with their parents (Timperio et al., 2004). Since higher PA levels are associated with children's positive attitudes about PA (Sebire et al., 2013), their perceptions of safety and attitudes about AST may also affect their motivation to walk or bike to school. Effective active travel planning initiatives in schools might therefore also address children's safety concerns.

4.4. Do neighborhoods matter?

The short answer is yes, neighborhood environment matters. The propensity of literature supports that health promoting neighborhood environments in proximity to schools, homes, and routes to school may be one important part of a larger solution (Wong et al., 2011) to increase children's AST. Indeed, more walkable, pedestrian-friendly built environments support children's choice to use AST (de Vries et al., 2010), although, as noted previously, this on its own may not be enough (Van Kann et al., 2015; Napier et al., 2011).

In our study, only a small percentage of parents (about one quarter) felt that their community was safe for pedestrians and free of crime. While this result does not appear to be gendered, boys' parents were significantly more likely to encourage their child to actively travel to school every day, which supports previous literature that reports boys tend to receive more parental support than girls regarding PA (Beets et al., 2010).

4.5. Future research

Despite a perceived lack of safety, a significant proportion of parents provided daily support for their child to actively travel to school. Future studies might use qualitative methods to better understand why parents support children's AST, safety concerns notwithstanding. A purposely designed randomized controlled trial that investigates the role of parental support in a larger sample of boys and girls is needed to further clarify the role of parents and the gendered nature of AST and to more clearly identify solutions related to AST. Finally, a more in depth look at how objective measures of walkability and neighborhood safety, such as WalkScore® or reported crime rates, influence AST is warranted.

4.6. Strengths and limitations

One strength of our study is its suburban setting, as only 8 other studies (Babey et al., 2009; Buliung et al., 2011; Dunton et al., 2014; Lopston et al., 2012; Mitra and Faulkner, 2012; Rainham et al., 2012; Stone et al., 2014; Van Dyck et al., 2009) investigated children's AST in this setting. Other strengths include our use of validated questionnaires about school travel mode frequency (Mendoza et al., 2010) and parental perceptions of neighborhood safety (Rosenberg et al., 2009). Further, we controlled for previously-supported determinants of AST that included distance, age, and sex (Frazer et al., 2015; McDonald, 2008). Finally, we assessed distance to school objectively using the ArcGIS program.

We acknowledge that our study has a number of limitations. First, while 75% of parents returned the survey, 42% were incomplete. Thus, a large portion of eligible participants were excluded which is most

Table 4
Adjusted odds ratios for daily active school travel (AST; ≥9 active trips) versus occasional or no AST (≤8 active trips) as a result of daily parental support, while controlling for other correlates of AST.

Measure	Odds ratio (95% CI)	*p*-value
Parental support (Reference: Occasional/no support)	9.0 (4.2, 19.7)	<0.001
Parental traffic and pedestrian safety perceptions (Continuous scale 1.0–4.0, higher = safer)	1. 5 (0.6, 3.3)	0.37
Parental crime safety perceptions (Continuous scale 1.0–4.0, higher = safer)	1.3 (0.7, 2.2)	0.40
Distance to school (Continuous scale)	1.0 (1.0, 1.0)	<0.001
Sex (Reference: girls)	1.6 (0.7, 3.4)	0.27
Age (Continuous scale)	1.1 (0.8, 1.6)	0.62
Constant	0.1 (0.0, 6.5)	0.27

likely due to the voluntary nature of completing the parent packages. Second, the study's cross sectional design limits our ability to interpret our results as causal. Third, most participants included in the sample were daily active travelers, significantly higher than national averages reported for the same-aged children in Canada (Gray et al., 2014). Many also received daily parental support for AST, which may limit the generalizability of our results. Fourth, frequency distributions among the categorical variables limited our statistical approach. Thus, there was considerable diversity in frequency of AST and parental support in the occasional/no categories. The high levels of parental support may be due in part to how we defined parental support (verbally encouraging a child to walk or bike to school). While it assumes that other options such as driving to school or taking public transit are accessible and available, support could also take the form of a parent being unwilling or unable to drive their child to school. This exemplifies the strength of a parent's influence on their child's travel mode and reinforces parents' position as gatekeepers to AST. In this way, one might expect a strong relationship between parental support and AST in elementary school children. Importantly, however, not all parental support for AST resulted in a child actively traveling to school.

The higher proportions of AST and parental support in this study were likely due to sampling children within 3 km of schools, whereas previous estimates were not restricted to children living within a certain distance (Rothman et al., 2014). Finally, both the number of active trips and frequency of support were self-reported by children and parents, respectively. We have previously used accelerometry and GPS data to better assess children's travel to and from school (Frazer et al., 2015) – more studies that combine these kinds of objective measures would enhance the current literature of children's AST.

5. Conclusion

Based on our findings, interventions that aim to increase AST should involve parents and children in the planning process, and address concerns about neighborhood safety. While focusing only on changes to the built environment is likely insufficient to increase AST, the wide range of factors that influence whether children choose AST requires further research. Effective approaches that encourage AST as a routine part of a child's school day are worth pursuing. These incremental amounts of PA have potential to make an important contribution to recommended levels of daily PA and ultimately, child's health.

Conflicts of interests

The authors declare that no competing interests exist.

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References

Babey, S.H., Hastert, T.A., Huang, W., Brown, E.R., 2009. Sociodemographic, family, and environmental factors associated with active commuting to school among US adolescents. J. Public Health Policy 30:S203–S220. http://dx.doi.org/10.1057/jphp.2008.61.

Beets, M.W., Cardinal, B.J., Alderman, B.L., 2010. Parental social support and the physical activity-related behaviors of youth: a review. Health Educ. Behav. 37:621–644. http://dx.doi.org/10.1177/1090198110363884.

Buliung, R.N., Mitra, R., Faulkner, G., 2009. Active school transportation in the greater Toronto area, Canada: an exploration of trends in space and time (1986–2006). Prev. Med. 48:507–512. http://dx.doi.org/10.1016/j.ypmed.2009.03.001.

Buliung, R., Faulkner, G., Beesley, T., Kennedy, J., 2011. School travel planning: mobilizing school and community resources to encourage active school transportation. J. Sch. Health 81:704–712. http://dx.doi.org/10.1111/j.1746-1561.2011.00647.x.

Carver, A., Watson, B., Shaw, B., Hillman, M., 2013. A comparison study of children's independent mobility in England and Australia. Children's Geographies. 11:pp. 461–475. http://dx.doi.org/10.1080/14733285.2013.812303.

Chillon, P., Evenson, K.R., Vaughn, A., Ward, D.S., 2011. A systematic review of interventions for promoting active transportation to school. Int. J. Behav. Nutr. Phys. Act. 8. http://dx.doi.org/10.1186/1479-5868-8-10 (2011).

Colley, R.C., Garriguet, D., Janssen, I., Craig, C.L., Clarke, J., Tremblay, M.S., 2011. Physical activity of Canadian children and youth: accelerometer results from the 2007 to 2009 Canadian health measures survey. Health Rep. 22, 15–23.

Dalton, M.A., Longacre, M.R., Drake, K.M., et al., 2011. Built environment predictors of active travel to school among rural adolescents. Am. J. Prev. Med. 40:312–319. http://dx.doi.org/10.1016/j.amepre.2010.11.008.

D'Haese, S., De Meester, F., De Bourdeaudhuij, I., Deforche, B., Cardon, G., 2011. Criterion distances and environmental correlates of active commuting to school in children. Int. J. Behav. Nutr. Phys. Act. 8:88. http://dx.doi.org/10.1186/1479-5868-8-88.

Dunton, G.F., Almanza, E., Jerrett, M., Wolch, J., Pentz, M.A., 2014. Neighborhood park use by children: use of accelerometry and global positioning systems. Am. J. Prev. Med. 46:136–142. http://dx.doi.org/10.1016/j.amepre.2013.10.009.

Faulkner, G.E., Buliung, R.N., Flora, P.K., Fusco, C., 2009. Active school transport, physical activity levels and body weight of children and youth: a systematic review. Prev. Med. 48:3–8. http://dx.doi.org/10.1016/j.ypmed.2008.10.017.

Faulkner, G.E., Richichi, V., Buliung, R.N., Fusco, C., Moola, F., 2010. What's "quickest and easiest?": parental decision making about school trip mode. Int. J. Behav. Nutr. Phys. Act. 7:62. http://dx.doi.org/10.1186/1479-5868-7-62.

Faulkner, G., Stone, M., Buliung, R., Wong, B., Mitra, R., 2013. School travel and children's physical activity: a cross-sectional study examining the influence of distance. BMC Public Health 13:1166. http://dx.doi.org/10.1186/1471-2458-13-1166.

Fox, K.R., Cooper, A., McKenna, J., 2004. The school and the promotion of children's health-enhancing physical activity: perspectives from the United Kingdom. J. Teach. Phys. Educ. 23, 338–358.

Frazer, A., Voss, C., Winters, M., Naylor, P.J., Wharf-Higgins, J., McKay, H., 2015. Differences in adolescents' physical activity from school-travel between urban and suburban neighborhoods in Metro Vancouver, Canada. Prev. Med. Rep. 2:170–173. http://dx.doi.org/10.1016/j.pmedr.2015.02.008.

Gray, C.E., Barnes, J.D., Cowie Bonne, J., et al., 2014. Results from Canada's 2014 report card on physical activity for children and youth. J. Phys. Act. Health 11:S26–S32. http://dx.doi.org/10.1123/jpah.2014-0178.

Grize, L., Bringolf-Isler, B., Martin, E., Braun-Fahrlander, C., 2010. Trend in active transportation to school among Swiss school children and its associated factors: three cross-sectional surveys 1994, 2000 and 2005. Int. J. Behav. Nutr. Phys. Act. 7:28. http://dx.doi.org/10.1186/1479-5868-7-28.

Hardman, K., 2004. An Up-date on the status of physical education in schools worldwide: technical report for the World Health Organization. World Health Organization, Geneva, Switzerland Available from. https://www.icsspe.org/sites/default/files/Kenneth%20Hardman%20update%20on%20physical%20education%20in%20schools%20worldwide.pdf.

Hume, C., Timperio, A., Salmon, J., Carver, A., Giles-Corti, B., Crawford, D., 2009. Walking and cycling to school: predictors of increases among children and adolescents. Am. J. Prev. Med. 36:195–200. http://dx.doi.org/10.1016/j.amepre.2008.10.011.

Jago, R., Baranowski, T., 2004. Non-curricular approaches for increasing physical activity in youth: a review. Prev. Med. 39:157–163. http://dx.doi.org/10.1016/j.ypmed.2004.01.014.

Karsten, L., 2005. It all used to be better? Different generations on continuity and change in urban children's daily use of space. Children's Geographies. 3:pp. 275–290. http://dx.doi.org/10.1080/14733280500352912.

Larouche, R., Saunders, T.J., Faulkner, G., Colley, R., Tremblay, M., 2014. Associations between active school transport and physical activity, body composition and cardiovascular fitness: a systematic review of 68 studies. J. Phys. Act. Health 11:206–227. http://dx.doi.org/10.1123/jpah.2011-0345.

Lee, M.C., Orenstein, M.R., Richardson, M.J., 2008. Systematic review of active commuting to school and childrens physical activity and weight. J. Phys. Act. Health 5, 930–949.

Leung, K.M., Chung, P.K., Kim, S., 2016. Parental support of children's physical activity in Hong Kong. Eur. Phys. Educ. Rev. 22 (Prepublished April). http://dx.doi.org/10.1177/1356336x16645235.

Lopston, K., Muhajarine, N., Ridalls, T., Smart Cities, Healthy Kids Research Team, 2012. Walkable for whom? Examining the role of the built environment on the neighborhood-based physical activity of children. Can. J. Public Health 103:S29–S34. http://dx.doi.org/10.17269/cjph.103.3232.

Lubans, D.R., Boreham, C.A., Kelly, P., Foster, C.E., 2011. The relationship between active travel to school and health-related fitness in children and adolescents: a systematic review. Int. J. Behav. Nutr. Phys. Act. 8:5. http://dx.doi.org/10.1186/1479-5868-8-5.

McDonald, N.C., 2008. Children's mode choice for the school trip: the role of distance and school location in walking to school. Transportation 35:23–35. http://dx.doi.org/10.1007/s11116-007-9135-7.

Mendoza, J.A., Watson, K., Baranowski, T., Nicklas, T.A., Uscanga, D.K., Hanfling, M.J., 2010. Validity of instruments to assess students' travel and pedestrian safety. BMC Public Health 10:1–8. http://dx.doi.org/10.1186/1471-2458-10-257.

Mendoza, J.A., Watson, K., Baranowski, T., Nicklas, T.A., Uscanga, D.K., Hanfling, M.J., 2011. The walking school bus and children's physical activity: a pilot cluster randomized controlled trial. Pediatrics 128:e537–e544. http://dx.doi.org/10.1542/peds.2010-3486.

Mitra, R., Faulkner, G., 2012. There's no such thing as bad weather, just the wrong clothing: climate, weather and active school transportation in Toronto, Canada. Can. J. Public Health 103:S35–S41. http://dx.doi.org/10.17269/cjph.103.3221.

Mitra, R., Faulkner, G.E.J., Buliung, R.N., Stone, M.R., 2014. Do parental perceptions of the neighborhood environment influence children's independent mobility? Evidence from Toronto, Canada. Urban Stud. 51:3401–3419. http://dx.doi.org/10.1177/0042098013519140.

Napier, M.A., Brown, B.B., Werner, C.M., Gallimore, J., 2011. Walking to school: community design and child and parent barriers. J. Environ. Psychol. 31:45–51. http://dx.doi.org/10.1016/j.jenvp.2010.04.005.

Panter, J.R., Jones, A.P., van Sluijs, E.M., 2008. Environmental determinants of active travel in youth: a review and framework for future research. Int. J. Behav. Nutr. Phys. Act. 5: 34. http://dx.doi.org/10.1186/1479-5868-5-34.

Pont, K., Ziviani, J., Wadley, D., Abbott, R., 2011. The model of children's active travel (M-CAT): a conceptual framework for examining factors influencing children's active travel. Aust. Occup. Ther. J. 58:138–144. http://dx.doi.org/10.1111/j.1440-1630.2010.00865.x.

Rainham, D.G., Bates, C.J., Blanchard, C.M., Dummer, T.J., Kirk, S.F., Shearer, C.L., 2012. Spatial classification of youth physical activity patterns. Am. J. Prev. Med. 42:e87–e96. http://dx.doi.org/10.1016/j.amepre.2012.02.011.

Rosenberg, D., Ding, D., Sallis, J.F., et al., 2009. Neighborhood environment walkability scale for youth (NEWS-Y): reliability and relationship with physical activity. Prev. Med. 49:213–218. http://dx.doi.org/10.1016/j.ypmed.2009.07.011.

Rothman, L., To, T., Buliung, R., Macarthur, C., Howard, A., 2014. Influence of social and built environment features on children walking to school: an observational study. Prev. Med. 60:10–15. http://dx.doi.org/10.1016/j.ypmed.2013.12.005.

Sallis, J.F., Cervero, R.B., Ascher, W., Henderson, K.A., Kraft, M.K., Kerr, J., 2006. An ecological approach to creating active living communities. Annu. Rev. Public Health 27: 297–322. http://dx.doi.org/10.1146/annurev.publhealth.27.021405.102100.

Salmon, J., Salmon, L., Crawford, D.A., Hume, C., Timperio, A., 2007. Associations among individual, social, and environmental barriers and Children's walking or cycling to school. Am. J. Health Promot. 22, 107–113 (doi:).

Sebire, S.J., Jago, R., Fox, K.R., Edwards, M.J., Thompson, J.L., 2013. Testing a self-determination theory model of children's physical activity motivation: a cross-sectional study. Int. J. Behav. Nutr. Phys. Act. 10:1–9. http://dx.doi.org/10.1186/1479-5868-10-111.

van Sluijs, E.M.F., Fearne, V.A., Mattocks, C., Riddoch, C., Griffin, S.J., Ness, A., 2009. The contribution of active travel to children's physical activity levels: cross-sectional results from the ALSPAC study. Prev. Med. 48:519–524. http://dx.doi.org/10.1016/j.ypmed.2009.03.002.

Smith, L., Norgate, S.H., Cherrett, T., Davies, N., Winstanley, C., Harding, M., 2015. Walking school buses as a form of active transportation for children—a review of the evidence. J. Sch. Health 85:197–210. http://dx.doi.org/10.1111/josh.12239.

Staunton, C.E., Hubsrnith, D., Kallins, W., 2003. Promoting safe walking and biking to school: the Marin County success story. Am. J. Public Health 93, 1431–1434.

Stokols, D., 1996. Translating social ecological theory into guidelines for community health promotion. Am. J. Health Promot. 10:282–298. http://dx.doi.org/10.4278/0890-1171-10.4.282.

Stone, M.R., Faulker, G.E.J., Mitra, R., Buliung, R.N., 2014. The freedom to explore: examining the influence of independent mobility on weekday, weekend and after-school physical activity behaviour in children living in urban and inner-suburban neighborhoods of varying socioeconomic status. Int. J. Behav. Nutr. Phys. Act. 11:5. http://dx.doi.org/10.1186/1479-5868-11-5.

Telama, R., Yang, X., Viikari, J., Valimaki, I., Wanne, O., Raitakari, O., 2005. Physical activity from childhood to adulthood. Am. J. Prev. Med. 28:267–273. http://dx.doi.org/10.1016/j.amepre.2004.12.003.

Timperio, A., Crawford, D., Telford, A., Salmon, J., 2004. Perceptions about the local neighborhood and walking and cycling among children. Prev. Med. 38:39–47. http://dx.doi.org/10.1016/j.ypmed.2003.09.026.

Trapp, G.S., Giles-Corti, B., Christian, H.E., et al., 2012. Increasing children's physical activity: individual, social, and environmental factors associated with walking to and from school. Health Educ. Behav. 39:172–182. http://dx.doi.org/10.1177/1090198111423272.

Tremblay, M.S., Shields, M., Laviolette, M., Craig, C.L., Janssen, I., Connor Gorber, S., 2010. Fitness of Canadian children and youth: results from the 2007–2009 Canadian health measures survey. Health Rep. 21, 7–20.

Van Dyck, D., Cardon, G., Deforche, B., De Bourdeaudhuij, I., 2009. Lower neighborhood walkability and longer distance to school are related to physical activity in Belgian adolescents. Prev. Med. 48:516–518. http://dx.doi.org/10.1016/j.ypmed.2009.03.005.

Van Kann, D.H.H., Kremers, S.P.J., de Vries, S.I., de Vries, N.K., Jansen, M.W.J., 2015. Parental active transportation routines (PATRns) as a moderator of the association between neighborhood characteristics and parental influences and active school transportation. Environ. Behav. 48:1–20. http://dx.doi.org/10.1177/0013916515574548.

Voss, C., Winters, M., Frazer, A., McKay, H., 2015. School-travel by public transit: rethinking active transportation. Prev. Med. Rep. 2:65–70. http://dx.doi.org/10.1016/j.pmedr.2015.01.004.

de Vries, S.I., Hopman-Rock, M., Bakker, I., Hirasing, R.A., van Mechelen, W., 2010. Built environmental correlates of walking and cycling in Dutch urban children: results from the SPACE study. Int. J. Environ. Res. Public Health 7:2309–2324. http://dx.doi.org/10.3390/ijerph7052309.

Wong, B.Y., Faulkner, G., Buliung, R., 2011. GIS measured environmental correlates of active school transport: a systematic review of 14 studies. Int. J. Behav. Nutr. Phys. Act. 8:39. http://dx.doi.org/10.1186/1479-5868-8-39.