



Exploring differences in school travel mode choice behaviour between children and youth



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ABSTRACT

A child's school travel behaviour may change with the transition toward adolescence. However, the topic remains understudied in current literature. This paper examines school travel mode choice behaviour of 11-year-old children and 14–15 year old youth in Toronto, Canada. Morning period school trip data was analysed using multinomial logit models. Distance to school was the most important barrier to walking for both age groups; neighbourhood built environment characteristics (i.e., major street intersections, retail density and block density) had a stronger association with a child's odds of walking; and access to transit was correlated with only a youth's travel mode outcome. In addition, a male youth was more likely to walk than a female youth; gender of a child was not associated with school travel mode. As school travel related programmes are beginning to be adapted to the high-school context, our results indicate that a current North American model that is largely designed around capital improvement of transport infrastructure may not be very successful. Rather, programmes and initiatives should emphasize education, and perhaps attempt to understand and reshape the culture of youth mobility, in order to encourage healthy and sustainable travel practices.

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1. Introduction

Researchers, policy makers and community-based organizations have for some time now recognized the potential importance of active school transportation (AST: travel to/from school by human powered modes such as walking and cycling) to the healthy physical and mental development of children. For example, those who regularly walk to and from school are more active overall than those who are driven (Active Healthy Kids Canada, 2014; Faulkner et al., 2009; Mackett, 2013), have greater and/or different knowledge about their neighbourhood environment, and potentially a stronger sense of community (Active Healthy Kids Canada, 2014; Fusco et al., 2012). In addition, recent research in the US estimated that 10–14% of all private automobiles on the road during morning peak hours are related to school trips (McDonald et al., 2011). Notably, most of these school trips are relatively short, and can potentially be substituted by other more sustainable options such as walking, cycling and transit; modes that if used could reduce vehicular emissions, free up road space during peak hours, and reduce the risk of pedestrian–motor vehicle collisions

(Badland and Schofield, 2005; McDonald et al., 2013).

Despite potential benefits, current school transportation research has reported a steady decline in AST and transit use across the Western nations over the last five decades (Buliung et al., 2009; Fyhri et al., 2011; McDonald, 2007; van der Ploeg et al., 2008). Most of these walking, cycling and transit trips were replaced by trips in private automobiles. Not surprisingly, then, an emerging literature has explored school travel behaviour, in order to understand and potentially reverse the current trend. With regard to AST correlates, the literature has largely focused on four major aspects: (a) distance (e.g., McDonald, 2008a; Schlossberg et al., 2006; Yang et al., 2012), (b) neighbourhood built and the social environment related to traffic and personal safety (e.g., Larsen et al., 2013; Lee et al., 2013; Mitra and Buliung, 2014; Panter et al., 2010a), (c) neighbourhood walkability (e.g., Lee et al., 2013; Yang et al., 2012) and (d) the activity and travel patterns of parents or adult caregivers (e.g., McDonald, 2008b; Mitra and Buliung, 2014; Yarlagaadda and Srinivasan, 2008). A detailed discussion of this literature can be found elsewhere (Mitra, 2013; Stewart, 2011).

However, the results from this literature are sometimes at odds with each other, particularly with regard to the influence of the neighbourhood environment. For example, while higher residential density (McDonald, 2008a) and mixed land use (McMillan, 2007; Mitra and Buliung, 2014) were identified by some as potential enablers of walking, others have reported negative or no

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association (Larsen et al. 2012; Yang et al., 2012; Yarlagadda and Srinivasan, 2008). Similarly, higher street density associated with the likelihood of walking in some case studies (Panter et al., 2010b; Yang et al., 2012); in others, a negative association was documented (Schlossberg et al., 2006). Several external effects such as differences in school policy (Yang et al., 2012) and the cultural and policy-related contexts around mobility in general (Mitra, 2013) may explain the inconclusive and often mixed results, in addition to, of course, historically rooted differences in neighbourhood design. Part of the problem may also relate to how children's mobility is conceptualized. One such conceptual aspect that remains relatively less examined in current literature is the potentially moderating effect of a child's age on school transportation mode choice behaviour.

Recent theoretical works on children's mobility, such as the ones by Panter et al. (2008) and Mitra (2013), emphasize that various influences on a child's/youth's school travel outcome can be moderated by a child's age. The ecological theories of human behaviour (Bandura, 1989; Bronfenbrenner, 1989) posit that a child develops and matures through an active interplay with the environment (or the psychological construction of the environment). Previous research also indicates that parental perception of a child's "maturity" was associated with unsupervised walking and cycling (Johansson, 2006; Prezza et al., 2001). Drawing on this literature, Mitra (2013) conceptualized that through repeated exposure to the neighbourhood environment, a child develops physical and cognitive capabilities of navigating the neighbourhood environment and urban streets. One proxy measure of this development can be his/her age. Conceivably, a household's attitudes or evaluations toward a child's capability of travelling to/from school unsupervised on foot, cycle or by transit may change with a child's perceived maturity with age. Children may also become more independent decision makers as they transition into teenage years (i.e., > 12 years), and their mode choice process may differentiate from that of their parents.

Many studies have recognized this potential "age effect" on school travel decision processes, and in response, have explored travel behaviour of specific age groups (e.g., Larsen et al., 2013; Mitra and Buliung, 2014; Panter et al., 2010a; Schlossberg et al., 2006). However, a very limited literature has examined and compared the potential influences on school travel outcomes across multiple age groups, providing deeper insights into how school travel behaviour might change with a child's age and perhaps with improved maturity. For example, Timperio et al. (2006) explored the correlates of walking between children aged 5–6 years and 11–12 years in Melbourne, Australia. Their results indicate that for both age groups, parental perception of the absence of other children in the neighbourhood, the absence of street lights or crossings, and the presence of major barriers on the way to school may reduce the likelihood of walking. However, some differences across the two age groups were also reported. Younger children (5–6 years) were less likely to walk or cycle if their travel routes to school had steep slopes. In comparison, older children (10–12 years) with direct travel routes to school (representing well-connected streets, and perhaps with busy traffic, in comparison to poorly connected streets) were less likely to travel actively.

In a study of US school children/youth aged 5–14 years and 15–18 years, McDonald (2008b) also reported some important age-related differences in school travel behaviour. For the < 15 years age cohort, a child's age was positively associated with the likelihood of walking to school, while for the 15–18 years group, age was not associated with the travel mode outcome. Similarly, < 15 year old children were less likely to walk when their mothers travelled to work in the morning; an older youth's travel outcome was not associated with his/her parents' travel patterns. Urban residential density was associated with walking across both age

groups.

This paper takes a similar approach to McDonald (2008b) and Timperio et al. (2006) in exploring the differences (or similarities) in school travel mode choice behaviour between elementary school students aged 11 years (5th/6th grade) and high school students aged 14–15 years (9th/10th grade) in Toronto, Canada. The paper advances our current understanding of school travel behaviour by contributing to a very limited literature that has investigated potential changes in the correlates of AST as children age. An emphasis on the differences in neighbourhood environment-related correlates across the two age groups is particularly novel in the North American context.

In addition, the findings from this study has direct implications for transportation policy that is centred on children's mobility and well being, particularly in the context of recent community and professional interests in Canada around promoting and facilitating AST among older youth. The School Travel Planning (STP) programmes in Canada, similar to the Federally legislated Safe Routes to School (SRTS) programmes in the US, are designed for elementary and middle schools (Green Communities Canada, 2014; National Center for Safe Routes to School, 2011). At the time when school boards across Canada are showing increased commitment to active, safe and sustainable transportation of their students (e.g., Toronto District School Board, 2014; Waterloo Region District School Board, 2011), the STP model is beginning to be adapted to the high school context (Stuckless, 2012). Findings from this study can inform such adaptations and implementations, and the development of new programmes and interventions in Canada, the US and elsewhere focused broadly on the health of children and the youth.

2. Study design

2.1. Study area

The City of Toronto is the largest city as well as the business/financial capital of Canada with a population of 2.6 million (Statistics Canada, 2012). Steady population growth over the last century, and political amalgamation of Toronto's older neighbourhoods with the inner ring suburbs in the late 1990s, have produced a city with neighbourhoods that are diverse with regard to built form, politics, and preferences for housing and transport. The downtown and inner-city neighbourhoods have high walkability, while automobile oriented "planned suburban" design dominates the inner-suburban neighbourhoods that became part of the City during a political amalgamation in 1998.

Most children in Toronto attend publicly funded schools; a recent study reported that 88% of all 5th/6th grade students were travelling to public schools (Mitra and Buliung, 2014). The two publicly funded school boards (Toronto District School Board: TDSB, and faith based Toronto Catholic District School Board: TCDSB) maintain small travel distance thresholds (through school districting/catchments), and children/youth are generally expected to attend the school that is closest to their residential location.

2.2. Data

School travel data from the 2006 Transportation Tomorrow Survey (TTS) was analysed. TTS is a large cross-sectional survey of travel behaviour that is conducted every five years since 1986 (Data Management Group, 2009). The 2006 version includes a 5.2% random sample of all households in Southern Ontario, including the City of Toronto (approximately 150,000 households in total; 51,500 households in Toronto). The survey includes retrospective travel data for all household trips by ≥ 11 year olds (e.g., origin/

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