



Associations of children's active school travel with perceptions of the physical environment and characteristics of the social environment: A systematic review



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ABSTRACT

This systematic review summarised and evaluated the evidence for associations between school travel modes in children aged 5–13 years and perceived physical environments as well as social and sociodemographic characteristics. A computerised electronic search was performed for English articles published between January 2000 and July 2017. Data were extracted, study quality was assessed, and findings were analysed using a vote-counting technique. Thirty-seven studies met the inclusion criteria and were reviewed. Active school travel was associated positively with safety, walkability and neighbourhood social interactions, and negatively with travel distance and car ownership. Risk of bias, poor sampling methods and lack of external validity were common study limitations. Generally insufficient findings were reported for social characteristics.

1. Background

A global epidemic of physical inactivity has contributed to increased prevalence of non-communicable diseases and a worsening of health and associated economic burden (Ding et al., 2016). Sufficient physical activity can boost physical, psychological, social and cognitive health and wellbeing in children and youth (Janssen and LeBlanc, 2010; Sallis et al., 2015; Strong et al., 2005). Physical activity can be accumulated in various ways such as sports, play, active travel (e.g., walking or cycling to destinations), and at different settings (e.g., schools, home, and the neighbourhood built environment (Sallis et al., 2015; Tremblay et al., 2016)). Active school travel can be a key form of habitual physical activity in children and youth (Frank et al., 2016; Larouche et al., 2014). Previous systematic reviews proved positive associations of active school travel with overall physical activity and cardiorespiratory fitness in children and youth (Faulkner et al., 2009; Lee et al., 2008; Lubans et al., 2011). However, despite the clear benefits of physical activity and active school travel, recent evidence across 38 countries from six continents showed that only 20–39% of children and youth were adequately physically active for health (Tremblay et al., 2016). Overall, about half of the population successfully engaged in sports, play and active travel, and lived in supportive school, community and built environments (Tremblay et al., 2016). Active school travel is also low and declining worldwide (Buliung et al., 2009; Grize et al., 2010; McDonald, 2007; Ministry of Transport, 2014; Yang et al., 2016).

Socio-ecological models have been advocated to better understand the multifaceted influences on physical activity and active school travel (Giles-Corti et al., 2005; Lu et al., 2014; Sallis et al., 2012; Spence and Lee, 2003). These models encompass attributes of the individual, and social/cultural, physical (i.e., natural and built) and policy environments (Giles-Corti et al., 2005; Sallis et al., 2012; Spence and Lee, 2003). Physical and social environments can substantially and broadly impact on children's school travel behaviour directly and indirectly (Mitra, 2013; Panter et al., 2008; Pont et al., 2009). It is evident that perceptions of the physical environment may have at least an equal association with children's school travel behaviour compared to objective measures of physical environments (D'Haese et al., 2015; Kerr et al., 2006; Lu et al., 2014; McMillan, 2007). Previous systematic reviews have investigated correlates of active school travel with perceived physical environment barriers (Lu et al., 2014), or a combination of objective and perceived physical environments (D'Haese et al., 2015; Pont et al., 2009; Rothman et al., 2014, 2018). Apart from the considerable influence of distance to school (Lu et al., 2014; Pont et al., 2009; Rothman et al., 2018), active school travel has also been positively associated with walkability, safety, traffic calming, walking and cycling infrastructure, and recreational facilities (D'Haese et al., 2015; Lu et al., 2014; Pont et al., 2009; Rothman et al., 2014). Socio-demographic correlates include parental education, household income and car ownership, and ethnicity were also demonstrated (Pont et al., 2009; Rothman et al., 2018).

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Gaps remain in this evidence base. Social interactions in the neighbourhood may enhance perceptions of safety and sense of community, thus potentially facilitating children's active travel (Waygood et al., 2017; Webb Jamme et al., 2018). However, aspects of the neighbourhood social environment (e.g., social relationships, social support) have not been thoroughly explored in previous systematic reviews (Pont et al., 2009). Furthermore, quality assessment of the existing evidence to ensure the rigor of systematic reviews is warranted (Petticrew, 2009; Roberts and Ker, 2015). Although a variety of quality assessment tools have been utilised to appraise risk of bias or the methodological strength of relevant studies (Lu et al., 2014; Lubans et al., 2011; Pont et al., 2009; Rothman et al., 2013; Smith et al., 2017), quality assessment has been insufficiently reported in many published systematic reviews.

Variance in conceptualisation and measurement of variables across different studies adds complexity in aggregating findings for systematic reviews (Lu et al., 2014; Rothman et al., 2018). In this context, meta-analyses are not possible, and alternative robust methods for data synthesis are required (Rothman et al., 2018). Reviews are further hampered when individual studies do not allow for disentangling physical and social environments (e.g., 'neighbourhood safety' can encompass safety from traffic and stranger danger). There is also a need for systematic reviews that have comprehensively examined and summarised the strength and direction of relationships with school travel behaviour. To date, only one systematic review has undertaken this process, with findings indicating individual (e.g., child age and ethnicity, parental education), and social (e.g., household income, car ownership) factors had moderately positive associations with active school travel (Rothman et al., 2018).

Therefore, the aims of this systematic review are: (1) to summarise associations of school travel mode in children aged 5–13 years with perceived physical environment attributes and social and socio-demographic characteristics; and (2) to assess the robustness of the evidence and synthesis in relation to quality of the studies included, and the consistency of these results. This review adds to and builds on existing systematic reviews by summarising and evaluating the evidence for social factors, conducting quality appraisal, reassessing and re-assigning individual variables to well-defined categories, and identifying the strength and direction of associations.

2. Methods

The review presents the highest level of evidence possible by utilising Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocols as a reporting guideline of methodology (Moher et al., 2009), and the implementation of rigorous study quality assessment (Gebel et al., 2015). The systematic review protocol was published following the PROSPERO criteria (Ikeda and Smith, 2017).

2.1. Eligibility criteria

Studies were selected according to the eligibility criteria of study designs, participants, and outcome measures. Inclusion criteria were:

- Descriptive and observational studies (i.e., cohort and prospective studies, case-control studies, case series, cross-sectional studies, longitudinal studies).
- Children aged 5–13 years at the commencement of the study and/or their parents/caregivers. Studies with mixed child age groups were included if over 50% of the participants were so defined and findings for the age group included in the review were reported separately.
- Objectively or subjectively measured modes of travel to/from school reported as a dependent variable.
- Subjectively measured (i.e., survey, scale) physical environment attributes AND objectively or subjectively measured social

environment variables reported as independent variables.

- Associations of school travel mode with perceived physical environments AND social environments reported.

Exclusion criteria were:

- Experimental studies (e.g., natural and quasi experiments) and interventions (due to a variety of environmental and/or behavioural changes involved (Benton et al., 2016; Humphreys et al., 2017; Ogilvie et al., 2005), and the complexity of determining the true effect of each intervention); qualitative studies (due to the different quality assessment criteria required (Baxter and Eyles, 1997; Hawker et al., 2002; Petticrew, 2009)); and other study designs (i.e., systematic reviews, expert opinions and conference proceedings).
- Other age groups that could not be separated; and children with medical conditions or physical or intellectual disabilities that could restrict active school travel.
- No objectively or subjectively measured modes of travel to/from school reported.
- Subjectively measured physical environment attributes OR/NOR objectively or subjectively measured social environment variables reported.
- Only objectively measured (e.g., geographic information systems (GIS)) physical environment attributes reported.
- No associations of school travel mode with perceived physical environments AND/OR social environments reported.

All composite and individual outcomes as reported in the included studies were considered. Outcomes measured at the individual (e.g., child, parent, household) and group (i.e., school, neighbourhood) levels were included. In this review, the physical environment was defined as natural (non-man-made physical features) and built (man-made physical attributes) environments in which children live and spend their time (e.g., neighbourhood, school, home) (Davison and Lawson, 2006; Pont et al., 2011, 2009). Built environment referred to urban design, transportation systems, and recreation settings (Ding et al., 2011; Handy et al., 2002; Thornton et al., 2011). The term 'social environment' was used to encompass social (e.g., social cohesion, social interaction, social support) and sociodemographic (e.g., socioeconomic status, ethnicity) characteristics. Test statistics and significance for associations between dependent and independent variables were included.

This systematic review was limited to peer-reviewed articles, available in full-text, written in English, and published from January 2000 to July 2017. This time period was chosen, as most of the relevant literature was published during the last decade. Moreover, it is essential to study only the most recent literature as environments are constantly changing.

2.2. Information sources and search terms

Between October 2016 and July 2017, the lead author (EI) conducted literature searches in Scopus, Web of Science, MEDLINE (EBSCO, Ovid and PubMed Interfaces), CINAHL (EBSCO Interface), SportDiscus (EBSCO Interface), PsycINFO (Ovid Interface), ERIC (Education Resources Information Center, Ovid and ProQuest Interfaces), TRID (Transportation Research International Documentation), and Cochrane Library. The information sources and search strategy were elaborated in consultation with a subject-specific research librarian.

Search terms were identified from previous related reviews (Baker et al., 2015; D'Haese et al., 2015; Martin et al., 2016) and the knowledge and expertise of the authors using four categories (Appendix A): (1) population, (2) travel mode, (3) physical environment, and (4) social environment. An example of a full electronic search strategy is available in figshare (Ikeda and Smith, 2017).

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