



Determinants of uptake and maintenance of active commuting to school



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ABSTRACT

The objective was to identify determinants of uptake and maintenance of active school travel (AST) over 4 years in children aged 9 at baseline. Data from wave 1 (n=8502) and 2 (n=7479) of the Growing Up in Ireland study were analysed. At 9- and 13-years 25% and 20% engaged in AST. Children were more likely to maintain or take-up AST if they lived in an urban area. Change in distance to school influenced both maintenance and adoption of AST, with a negative impact seen for increased distance between 9 and 13 years and a positive impact seen for decreased distance. Some factors which predict uptake and maintenance of AST are modifiable and can inform intervention development.

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1. Introduction

In the past 3–4 decades motorised transport has become a predominant mode of transport for children and adolescents travelling to and home from school in many developed countries (Gordon-Larsen et al., 2005) including Ireland (Nelson et al., 2008; Murtagh and Murphy, 2011). The association between active travel to school and health has been established with children who actively commute having higher levels of physical activity (Murtagh and Murphy, 2011; Denstel et al., 2015), a healthier body composition (Lubans et al., 2011) and increased cardiovascular fitness compared with children who use motorised transport methods (Davison et al., 2008; Larouche et al., 2014). At a time where the low level of physical activity among children has become a public health concern – increased attention has been given to the role of active travel as a means of helping children reach recommended levels of physical activity. Indeed active transport has been promoted as one of the '7 best investments that work for physical activity' (Global Advocacy for Physical Activity (GAPA), the Advocacy Council of the International Society for Physical Activity and Health (ISPAH), 2012). A number of countries have tried to reverse the trend towards motorised transport through interventions designed to encourage

children to walk or cycle some or all of the school journey (Chillón et al., 2011). Understanding the determinants of active commuting to school is important to the design of such interventions. Stewart (2011) identified common factors associated with active transportation to school indicating that distance from home to school, urban form and social disadvantage play a role. To date there have been few investigations of the predictors of active commuting to school in Irish schoolchildren and a paucity of studies internationally which have used a longitudinal design to identify determinants of active commuting over time.

Decisions on active or passive transport to school are likely to be influenced by myriad of factors at the policy, neighbourhood, and parent/family levels (Sirard and Slater, 2008; Stewart, 2011). Although several plausible models have attempted to provide conceptual frameworks for understanding active commuting behaviour in children and young adults (Sirard and Slater, 2008; McMillan, 2005; Panter et al., 2008) these have been developed largely from evidence from cross-sectional studies, therefore whether each variable causes or is a consequence of children's active commuting is unclear. Longitudinal studies of multiple levels of influence on changes in young people's active commuting are required to examine the causal pathways of influence to inform programmes and policies seeking to promote active transport (Hume et al., 2009; McMillan, 2005).

The transition from primary to post-primary school is associated with a decrease in physical activity levels (Dumith et al., 2011) although little is known about how active transport to

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school contributes to the changes in physical activity noted during this transition. D'Haese et al., (2015) noted changes in the sources of physical activity across this transition with girls increasing and boys decreasing their active transportation to school despite an overall decline in physical activity in both sexes. During primary school, children are deeply embedded in their family contexts, and so behaviours, such as active commuting are strongly influenced by their parents' attitudes, values and beliefs (Pont et al., 2009). With the transition to second level education increased autonomy could increase the potential for young adults to choose active transport to and from school. However the choice of mode of travel may be influenced by changes in other factors such as journey time/distances (Nelson et al., 2008; D'Haese et al., 2011), uniform/shoes (Daniels et al., 2014) or the requirement to transport books or sports kit (Kweon et al., 2006; Ziviani et al., 2004) to and from school. To date few longitudinal studies have examined the change in commuting behaviour in the transition between primary and second level education. Therefore the present study examines variables associated with active commuting within each layer of the bio-ecological model to determine the predictors of maintenance and uptake of active commuting over 4 years in a sample of children at age 9 and 13 years.

2. Methods

This paper involved analysis of data collected as part of the Child Cohort of *Growing Up in Ireland, The National Longitudinal Study of Children*. Technical reports on the design, instrumentation and procedures of *Growing Up in Ireland* have been published previously (Murray et al., 2010). In brief, the Child Cohort of the *Growing Up in Ireland* study is a nationally representative sample of 8500 children and their families. Children born between 1 November 1997 and 31 October 1998 were the sample for interview at nine years of age, with data collection taking place between August 2007 and May 2008 (Murray et al., 2010). The sample design was based on a two-stage selection process: a representative sample of 910 schools participated in the study – from the national total of 3200 primary schools. The sample of children and their families was then randomly generated from within those schools. The sample frame consisted of all 9-year olds registered in primary schools in the Republic of Ireland ($n=55,105$). Data for 8568 children were available for analysis. A 2nd wave of data collection took place when the children were 13 years of age, with interviews conducted between August 2011 and February 2012 for 7400 participants (Department Of Children And Youth Affairs, 2012). Ethical approval was obtained from a dedicated Research Ethics Committee established by the Department of Health and written informed consent was required from parents.

The Conceptual Framework for the *Growing up in Ireland* study is guided by Bronfenbrenner's 1979 bio-ecological model of child development, implying that development outcomes are seen as the result of an interplay between a large number of factors including the biology of the child, their immediate environment such as home, family and school, and wider influences such as the community and society (Greene et al., 2010). The study focuses on a broad range of child outcomes across three domains (1) physical health and development, (2) social/emotional/behavioural well-being, and (3) educational achievement and intellectual capacity (Greene et al., 2010). These outcomes were assessed in a home interview of both primary and secondary caregivers using computer-assisted personal interviewing (CAPI) and a self-completion questionnaire. Where applicable, questionnaires were also sent to non-resident parents and center/home-based carers for self-completion.

For wave 1 a response rate of 82% was achieved at the school level and at the level of the household (i. e. eligible child selected within the school) a total of 57% of children and their families consented to participate in the study (Williams et al., 2009). The data were reweighted by adjusting the distribution of the sample to known population figures on the number and characteristics of children and their families from the 2006 Census of Population (Office of The Minister For Children And Youth Affairs, 2010).

2.1. Measures

At both wave 1 and wave 2 parents were asked in a home interview to report how their child usually travels to school. There were six response categories: (1) walks, (2) by public transport, (3) school bus/coach, (4) by car, (5) rides a bicycle, (6) other. Walking or cycling was classified as active commuting. Using public transport, travelling by the school bus/coach or car were classified as passive commuting. The 'other' category was excluded from analyses as it could not be classified as passive or active.

Potential predictor variables were included if they were previously shown to be associated with active commuting to school in either cross-sectional or longitudinal studies (see Appendix 1). As the *Growing Up in Ireland* study is guided by Bronfenbrenner's 1979 bio-ecological model, variables associated with active commuting within each layer of influence were selected. In total 20 variables were included in the analysis. These included four individual-level variables (gender, BMI, hard exercise, light exercise), five family-level variables (older sibling, household class, household income, single parent, parent education), two school-level (enrolment size, distance to school) and nine neighborhood-level variables (urban: rural status and 8 variables related to parental perceptions of neighborhood safety). Data on gender of the study child was collected from the Primary Caregiver. Information on perceptions of child physical activity level, neighborhood safety, distance to school, parent education, occupation of parents, and single parent status were gathered from the Primary Caregiver Main Questionnaire. Presence of older siblings was identified in the Child Sensitive Questionnaire at wave 1. The interviewer took anthropometric measurements of the child and adult respondents. Height was recorded to the nearest millimetre using a Leicester portable height measure and weight was recorded to the nearest kilogram using a SECA 761 flat mechanical scales (Murray et al., 2010). BMI classification of the study child was derived from this measured data using the IOTF cut-off points (Cole et al., 2000). Detailed description of the instruments used, including reliability and validity of measures, have been reported separately (Murray et al., 2010). The wording of each question is available online from the *Growing Up in Ireland* website (www.growingup.ie).

2.2. Data analysis

Participants were classified into the following four groups: (1) maintained active commuting, (2) took up active commuting, (3) dropped out from active commuting, (4) maintained passive commuting. The associations between changes over time in mode of commuting (active and passive) and the hypothesised predictor variables were examined using chi-square and Cramer's V. The outcome variable was a single variable representing all four groups of changes in commuting. The predictor variables represented change over time. Cramer's V converts the chi-square statistic into an effect size measure, thus providing an indication of the size of the association. It ranges from 0 to 1, with values closer to 1 indicating a stronger association. Where Cramer's V values were 0.1 or greater, the associations between these variables and change in commuting practice (maintaining AST, taking up AST and dropping out from AST) were examined further by generating

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