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Original research

Does parental accompaniment when walking or cycling moderate the association between physical neighbourhood environment and active transport among 10–12 year olds?

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ABSTRACT

Objectives: To assess whether associations between neighbourhood environmental features and frequency of children's active trips per week are moderated by frequency of parental accompaniment when walking/cycling.
Design: Cross-sectional survey
Methods: Children aged 10–12 years ($n = 677$) were recruited from 19 schools in Melbourne, Australia. Parents reported the number of walking/cycling trips/week usually made by their child to eight local destinations. Environmental variables (i.e. number of cul-de-sacs, intersections, public open spaces (POS) defined as reserves or parks, sport and recreation POS, sport options, population density, length of busy roads and length of walking/cycling tracks) within an 800 m buffer around participants' homes were objectively assessed with a Geographic Information System. Associations between neighbourhood features and frequency of active trips were assessed using multilevel linear regressions. Moderating effects of regular parental accompaniment when walking/cycling were examined.
Results: Parental co-participation in walking and cycling was positively associated with frequency of overall walking/cycling trips. Number of intersections, sport and recreation POS, sport options and population density were positively associated with walking/cycling trips. Only one significant interaction was found; a positive association was found between intersection density and walking/cycling trips among children whose parents did not cycle with them while it was not associated among others.
Conclusions: Building supporting and safe neighbourhood environments is needed to support children's active travel behaviours to improve real and perceived safety concerns and provide relevant infrastructure and destinations, regardless of whether or not parents accompany children during walking and cycling. Although little evidence of moderation was found, future research should include co-participation in a broader range of walking behaviours.

1. Introduction

Regular participation in physical activity (PA) is important for the physical and mental health of children, and for their physical growth, biological maturation and behavioural development[1]. Habitual PA at a young age has been found to be associated with higher probability of being active in adulthood[2]. The tracking of PA into adulthood also implies that children's PA behaviour is (indirectly) associated with health in adulthood. Walking and cycling are accessible and inexpensive forms of PA, which can be easily integrated in children's daily life. Despite these benefits, rates of active transport to school among Australian children have declined in recent decades[3] and approximately 50% of parents drive their children to primary schools, often citing traffic danger as a key concern[4]. Although PA decreases during the transition into adolescence[5], active transport has the potential to increase

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during this transition due to a greater independent mobility[6]. Therefore, children in the upper years of primary school are an important target group among whom to encourage walking and cycling for transport[7]. In order to develop effective interventions to increase walking and cycling behaviour in this specific age group, an understanding of key correlates is needed[8].

The socio-ecological model posits that, next to individual factors such as attitudes and beliefs, factors in the physical (e.g. neighbourhood) and social (e.g. parents) environment should be examined as potential determinants of walking and cycling[9]. Previous research has identified several inconsistencies in how the physical environment is associated with walking and cycling for transport among children[10,11,12], suggesting that these associations are currently still not fully understood. For example, provision of walking and cycling facilities, level of urbanization, residential density and connectivity have shown inconsistent associations with levels of walking and cycling for transport among children[13,14].

It is possible that some of these aspects of the environment have equivocal relationships with active transport because moderation occurs, implying that associations may differ between subgroups[14,15]. One potential moderator of these associations is the extent to which families 'co-participate'[16] in these behaviours. Parental co-participation refers to parental accompaniment during activities, such as walking or cycling, or other forms of PA[16]. Parents' accompaniment of their child during walking or cycling may mitigate the impact of environmental attributes by increasing children's traffic and cycling skills and teaching children safe routes. Parental modelling of safe practices may also occur during co-participation, potentially increasing both children's and parent's confidence in children's ability to walk or cycle independently. Previous studies have shown that parental co-participation is an important correlate of children's PA[16,17] and may therefore be considered as a potential moderator. Additionally, parents own PA and health status has been associated with children's PA levels[18], highlighting the importance of involving parents in children's PA.

This study aimed to examine associations between objectively-assessed attributes of the neighbourhood physical environment and children's active transport to local destinations (main effects), and whether these associations are moderated by the frequency of parental accompaniment when walking or cycling.

2. Methods

Cross-sectional data were drawn from the Children Living in Active Neighbourhoods (CLAN) study[19]. Children aged 10 to 12 years and their families were recruited via 19 randomly selected primary schools, located in 9 low and 10 high socioeconomic status (SES) areas in Melbourne, Australia. Briefly, children from Grade 5 and Grade 6 ($n = 2096$) were informed about the study and invited to return consent forms signed by their parents to be eligible to participate. In total, 919 children and their families participated (44% response rate). Detailed information about sample selection has been published previously[19,20]. Ethics approval to conduct the study was received from the Deakin University Human Research Ethics Committee and the Department of Education and Training, Victoria.

Parents completed a questionnaire at home and reported their age, sex, current employment status (full-time, part-time, not currently employed) and their marital status (not married, married/de facto, previously married). Highest level of maternal education was used as a proxy for family-level SES (less than high school = 'low'; high school or technical certificate = 'medium'; tertiary education = 'high'), as it is known as a key predictor of children's health[21]. Parents also reported the age and sex of the child participating in the study.

Children's walking and cycling trips to various local destinations were assessed using parental report. Parents were asked to indicate how often in a typical week their child walked or cycled to the following eight destinations: friend's houses, parks/ovals/playgrounds, the post box, public transport, school, shops, sport venues (e.g. tennis courts/swimming pools), and bike/walking tracks. Response options (coding indicated in parentheses) were: it is not within walking/cycling distance (coded as 0); never/rarely (0); less than once per week (0.5); 1–2 times per week (1.5); 3–4 days per week (3.5); 5–6 days per week (5.5); and daily (7). These frequencies were summed to determine total walking/cycling trips per week (ranging from 0 to 56 trips per week). This measure was shown to have high test–retest reliability among parents over one week (ICC = 0.86)[22].

Population density was computed at the postcode level based on population census data, divided by the area of the postal code. Other measures of the physical environment were objectively assessed using a Geographic Information Systems (GIS; ESRI ArcView 3.3 and related extensions) and spatial data (address points, cadastral, and road network data) owned and supplied by the State Government of Victoria (VICMAP Address v2, 2003; VICMAP Property v2, 2003; VICMAP Transport v2, 2004) and the Australian Research Centre for Urban Ecology (Open Space 2002). Participants' residential addresses (if available) were geocoded ($n = 677$, 74% of participants) and an 800 m Euclidian buffer was applied to define each child's neighbourhood, consistent with previous studies and parents' perception of a 'walkable' distance for their child[23]. Total number of cul-de-sacs and intersections, as well as total length (km) of on- and off-road walking and cycling tracks, were generated as measures of connectivity and infrastructure, respectively, within the 800 m buffer around participant's houses. To obtain a proxy measure of traffic exposure, the total length (km) of 'busy' roads (defined as freeways, highways and arterial roads) within each buffer was computed. Density of public open spaces (POS) classified as 'reserves or parks' and 'sport or recreation' were determined. Locations where the nine most popular sports among Australian children (i.e. basketball, BMX riding, cricket, football, gymnastics, netball, swimming, skating, soccer and tennis)[24] could be performed were sourced from local government, community directories, telephone directories and the internet and they were used to generate the total number of sports able to be accessed within 800 m of home. The examination of infrastructure related to road safety and the provision of walking/cycling tracks was relevant to children's active transport because parental concern about road safety is a key barrier to children's walking and cycling in their neighbourhood[25]. Furthermore, road network connectivity has been demonstrated to be associated with active transport among adults[26].

Parents were asked how often their child walked the dog and walked for fitness with at least one adult family member. Response options included: don't know/doesn't apply; never/rarely; 1–2 times per month; once per week; several times per week and daily. These variables were dichotomized as not being involved ($\leq$never/rarely) and being involved ($\geq$1–2 times a month) in accompanied walking (included parental accompanied walking the dog and/or walking for fitness). A third question examined how often they go for bike rides with at least one adult family member. Response categories were similarly dichotomized as being either involved ($\geq$1–2 times a month) or not involved ($\leq$never/rarely) in parental accompanied cycling. Test–retest reliability (ICC) of these three items ranged from 0.83–0.93 when administered twice (one week apart) in a separate sample of 113 parents[22].

All statistical analyses were conducted using SPSS version 22. Analyses are based on the subset of participants whose address was able to be geocoded. Initial differences between the included and excluded participants were examined via independent samples t-tests for continuous variables and chi-square tests for