



Psychosocial factors associated with children's cycling for transport: A cross-sectional moderation study



Ariane Ghekiere^{a,b,c,*}, Jelle Van Cauwenberg^{a,b,c}, Alison Carver^d, Lieze Mertens^e, Bas de Geus^f, Peter Clarys^b, Greet Cardon^e, Ilse De Bourdeaudhuij^e, Benedicte Deforche^{a,b}

^a Department of Public Health, Faculty of Medicine and Health Sciences, Ghent University, De Pintelaan 185, 4K3, B-9000 Ghent, Belgium

^b Department of Movement and Sport Sciences, Faculty of Physical Education and Physical Therapy, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussels, Belgium

^c Fund for Scientific Research Flanders (FWO), Egmontstraat 5, B-1000 Brussels, Belgium

^d School of Exercise and Nutrition Science, Deakin University, Melbourne, Australia

^e Department of Movement and Sport Sciences, Faculty of Medicine and Health Sciences, Ghent University, Watersportlaan 2, B-9000 Ghent, Belgium

^f Human Physiology Research Group, Faculty of Physical Education and Physical Therapy, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussels, Belgium

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ABSTRACT

Promoting children's cycling for transport is a useful strategy to increase their physical activity levels. No studies have examined to which extent children's psychosocial characteristics play a role in their transportation cycling. Furthermore, insights into the association between children's independent mobility (IM) and transportation cycling is lacking in Europe. This study examined (1) the association of children's psychosocial characteristics with transportation cycling and its moderating effect of child's gender, parents' educational attainment and IM, and (2) the association between children's IM and transportation cycling.

Children (n = 1232, aged 10–12 yrs) completed an online questionnaire at school assessing their psychosocial characteristics related with transportation cycling. Parents reported child's usual transportation cycling and the distance their child is allowed to cycle unsupervised (IM). Hurdle models were used to estimate associations between independent variables and odds of being a cyclist and with minutes of transportation cycling among those cycling. Data were collected during November–December 2014 across Flanders, Belgium.

Children's perceived parental modeling, parental norm, peers' co-participation, self-efficacy and IM were positively related to the odds of being a cyclist, perceived benefits were negatively associated. Parental modeling, siblings' modeling, self-efficacy and parental norm were more strongly related to the odds of being a cyclist among children with a low IM. Friends' modeling was significantly related with odds of being a cyclist among boys. IM and parental norm (only among boys) were positively related to the time spent cycling. Targeting children, their friends and parents seems therefore most appropriate when aiming to increase children's transportation cycling.

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1. Introduction

More than 60% of children worldwide fail to achieve the physical activity (PA) recommendations of 60 min/day moderate-to-vigorous-intensity PA (Brug et al., 2012; Sjöström et al., 2006). Insufficient PA during childhood has adverse health consequences later in life, i.e. an increased risk of cardiovascular diseases, type II diabetes and overweight and obesity (Craigie et al., 2011). PA promotion is therefore considered

as essential among children, because their PA levels tend to decline during adolescence and adulthood (Craigie et al., 2011). Transportation cycling is one form of PA that can easily be integrated into children's daily routine (Pabayo et al., 2012). Children can cycle to destinations such as school, sport clubs or shops that are located within a reasonable distance (less than 3 km) from their residence (D'Haese et al., 2011; Dessing et al., 2014). Children's transportation cycling has been associated with higher PA levels (Cooper et al., 2003; Southward et al., 2012), better cardiovascular health (Andersen et al., 2011; Ostergaard et al., 2012a), better physical fitness (Andersen et al., 2009; Chillón et al., 2012), lower Body Mass Index (Bere et al., 2011; Ostergaard et al., 2012b), a healthier body composition (Lubans et al., 2011) and higher PA levels in later life (Yang et al., 2014). Despite these benefits, 40% of Flemish 10- to 12-year-old children residing within 3 km from school uses motorized travel to commute to school (Ducheyne et al., 2012b).

In order to develop effective interventions aiming to increase children's transportation cycling, correlates of this behavior must be

Abbreviations: PA, physical activity; IM, independent mobility; SES, socio-economic status.

* Corresponding author.

E-mail addresses: Ariane.Ghekiere@ugent.be (A. Ghekiere), Jelle.Van Cauwenberg@ugent.be (J. Van Cauwenberg), Alison.carver@deakin.edu.au (A. Carver), Lieze.Mertens@ugent.be (L. Mertens), Bas.de.Geus@vub.ac.be (B. de Geus), Pclarys@vub.ac.be (P. Clarys), Greet.Cardon@ugent.be (G. Cardon), Ilse.Debourdeaudhuij@ugent.be (I. De Bourdeaudhuij), Benedicte.Deforche@ugent.be (B. Deforche).

understood (Baranowski et al., 1998). The Social Cognitive Theory suggests that individual factors as well as environments influence behavior (Bandura, 1998). The reciprocal determinism of the Social Cognitive Theory highlights that all relationships between individuals, environments and behavior are bi-directional (Bandura, 1998). In this study, associations between children's psychosocial characteristics and their cycling for transport were examined. Psychosocial characteristics of interest were psychological factors (such as self-efficacy, perceived barriers and benefits) and perceived characteristics (encouragement, norms, modeling and co-participation) from the social environment (parents, siblings and friends).

Previous studies indicate that parents play a key role in deciding whether the child cycles for transport. For example, parents determine the distance children are allowed to roam without adult supervision (i.e. territorial range, as a proxy for independent mobility (IM) (Carver et al., 2014b)). Studies from Australia and Canada previously demonstrated a positive association between children's IM and active transport (Mitra, 2013; Schoeppe et al., 2013). However, insight is lacking on how IM is related to cycling for transport within a more European context.

When children age, they become more involved in transport-related decisions (Panter et al., 2008). Currently, it is unclear to what extent the child's preferences and psychosocial variables contribute to those decisions. Only few studies have investigated the association between children's psychosocial factors and active transport. In all these studies, parents reported child's psychosocial characteristics. For example, a Flemish study examined whether children's psychosocial factors were related to cycling to school and showed that children being more encouraged by their parents and their friends (parent-reported) were more likely to cycle to school (Ducheyne et al., 2012b). Similarly, Salmon and colleagues concluded that Australian children's preference (parent-reported) for being driven to school was negatively associated with walking to school (Salmon et al., 2007). The only study that used children's reports of their attitudes and preference showed that children perceiving higher levels of peer and parent support were more likely to walk or cycle to school in the UK (Panter et al., 2010). This indicates that more insight is needed into whether children's psychosocial characteristics are associated with their transportation cycling.

Additionally, it might be that some children, very motivated to cycle for transport, do not do so due to low IM (Hillman et al., 1990; Mitra, 2013). This interaction between children's characteristics and parent-defined IM needs further investigation. Furthermore, gender and educational attainment are proposed as other potential moderators, because girls, overall, and children from lower SES (those with the lowest PA levels) may need a specific approach in order to increase their cycling for transport (Brodersen et al., 2007). Insight on how to target these specific subgroups will add to the current knowledge.

The current study examined how parent-defined IM and child-reported psychosocial factors relate to their transportation cycling, to explore whether future interventions aiming to increase children's cycling need to focus on improving children's psychosocial characteristics towards cycling. Secondly, we examined the moderating effect of IM, gender and educational attainment on the relation between child-reported psychosocial factors and their transportation cycling to obtain more insight on how to develop targeted interventions.

2. Materials and methods

2.1. Participants and procedure

We recruited children via randomly selected primary schools across Flanders, Belgium. Researchers telephoned 109 primary schools across Flanders of which 45 agreed to participate in the study (participation rate = 41%). The participation rate was higher for schools located in rural (<300 inh/km², 80% participation) compared to semi-urban (300–600 inh/km², 41% participation) or urban areas (>600 inh/km², 21% participation) (Lenders et al., 2005).

Researchers visited each school twice. During the first visit, children from the 5th and 6th grade (primary school, 10–12 yrs old) received a letter including information about the study, a link to the study website and a personalized login which enabled parents to participate in the study by completing an online questionnaire at home. Parents had to give active written consent for their child to participate at school. One week later, researchers returned to the schools to collect the informed consent forms and the children completed an online questionnaire at school. School visits were conducted in November and December 2014, while the parental questionnaire was closed at the end of January 2015. The Ethics Committee of the Ghent University Hospital approved the study protocol.

2.2. Study protocol and measures

2.2.1. Children's questionnaire

Children self-reported their gender, age and the school they attended. Additionally, they completed 31 questionnaire items assessing psychosocial factors specific for transportation cycling. These items were based on validated questionnaires of psychosocial correlates of PA among youth (Reynolds et al., 1990; Saunders et al., 1997; Verplanken and Orbell, 2003) and complemented with cycling-specific items based on previously used cycling-specific questionnaires (de Geus et al., 2008; Ducheyne et al., 2012a).

The 31 items represented eight psychosocial constructs: perceived benefits, perceived barriers, self-efficacy, encouragement, co-participation in cycling, social norms and modeling. Average scores for psychosocial constructs were computed. As the internal consistency of the items for the constructs co-participation in cycling (3 items; from parents, peers, siblings), social norms (2 items; from peers and parents) and modeling (3 items; from parents, peers, siblings) were moderate (Cronbach's $\alpha = 0.54, 0.63$ and 0.59 , respectively), the following 12 items were examined as independent variables: perceived benefits, perceived barriers, parental modeling, sibling's modeling, peers' modeling, parental norm, peers' norm, parental co-participation, siblings' co-participation, peers' co-participation, self-efficacy and encouragement). A test-retest with a one week interval was conducted prior to the start of the data collection among a separate sample of 39 children from one primary school not participating in the study (40% girls, 51% 5th grade students, 10.4 yrs old), and indicated moderate to very good reliability of the items and constructs (see additional file 1).

2.2.2. Parental questionnaire

Parents reported highest education of father and mother of the child. Parents' educational attainment was defined as low if neither parents had a college or university degree, and high if at least one parent had a college or university degree (D'Haese et al., 2015; De Meester et al., 2014; Verloigne et al., 2012). Educational attainment was considered as a proxy of children's socio-economic status. Parents indicated their urbanization level (urban: living in the city center, border of city and the town center, rural: living outside the center of a town). Parents completed questions about their child's usual transportation cycling within their neighborhood based on the International Physical Activity Questionnaire (IPAQ; usual week (Craig et al., 2003)). Additionally, parents reported their own cycling behavior in the same way. Finally, as a measure of the child's independent mobility (IM), parents were asked how far their child was allowed to cycle alone to a destination (response options: not, 500 m, 1 km, 3 km, 5 km, 10 km and 15 km).

2.3. Analyses

For the current analyses, children were only included when their parents also completed the questionnaire. Differences between characteristics of the study sample and children whose parents did not complete the questionnaire were determined via independent sample

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