



Effects of a cycle training course on children's cycling skills and levels of cycling to school



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ABSTRACT

Introduction: The primary aim of the present study was to evaluate the short- and longer-term effects of a cycle training on children's cycling skills. A second aim of the study was to examine the effects of a cycle training, with and without parental involvement, on levels of cycling to school and on parental attitudes towards cycling.

Methods: Three participating schools were randomly assigned to the "intervention" (25 children), the "intervention plus parent" (34 children) or "control" condition (35 children). A cycle training (four sessions of 45 min) took place only in the intervention schools. Parents in the "intervention plus parent" condition were asked to assist their child in completing weekly homework tasks. Children's cycling skills were assessed, using a practical cycling test. All participating children also received a short parental questionnaire on cycling behavior and parental attitudes towards cycling. Assessments took place at baseline, within 1 week after the last session and at 5-months follow-up. Repeated measure analyses were conducted to evaluate the effects of the cycle training.

Results: Children's total cycling skill score increased significantly more from pre to post and from pre to 5-months follow-up in the intervention group than in the control group. On walking with the bicycle ($F=1.6$), cycling in a straight line ($F=2.6$), cycling a slalom ($F=1.9$), cycling over obstacles ($F=2.1$), cycling on a sloping surface ($F=1.7$) and dismounting the bicycle ($F=2.0$), the cycle training had no effect. For all other cycling skills, significant improvements were observed on short- and longer-term. No significant intervention effects were found on children's cycling to school levels ($F=1.9$) and parental attitudes towards cycling.

Conclusion: The cycle training course was effective in improving children's cycling skills and the improvements were maintained 5 months later. However, the cycle training course was not effective in increasing children's cycling to school levels.

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Introduction

Cycling is an accessible and pleasant form of physical activity (Roberts et al., 1996). For most children, bicycles are the most important means of transportation as they make it possible to cover greater distances independently. Moreover, bicycles are also used to a great extent in play activities (Arnberg et al., 1978). Children who cycle, however, expose themselves to risks, as can be seen from a number of studies investigating bicycle-related accidents (Nixon et al., 1987; Lammar, 2005; Belgisch Instituut voor

de Verkeersveiligheid, 2011; Heesch et al., 2011). Especially, 9- to 12-year-old children were found to represent a critical age group for cycling accidents (Lammar, 2005; Tin Tin et al., 2010).

Since the ability of children to cycle safely and to perform good cycling skills is found to play an important role in bicycle-related accidents (Cushman et al., 1990; Corden et al., 2005), various cycle training courses have been introduced (e.g., 'Master on your bike' from Belgium, 'Bikeability' from the UK, 'Cycle Skills for School Kids' from New Zealand, and 'Cycle for Health' from the USA). The overarching aim of cycle training courses is to make child cyclists safer on the road by extending their knowledge, confidence and cycling skills. Within these training programs children learn to control their bicycle (i.e., mounting and dismounting, cycling in a straight line, signaling, braking).

Some studies investigated the effectiveness of cycle training on child cycling accidents (Preston, 1980; Colwell and Culverwell, 2002). However, cycling accidents occur too infrequently to be used as the criterion of evaluation (Organisation for Economic

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Co-operation and Development (OECD), 1986; Colwell and Culverwell, 2002). Alternatively, cycling skills, cycling behavior, attitudes and knowledge are used as criterions to evaluate the effects of cycle training. In Canada, a playground based cycle training course of 90 min was not effective in improving cycling skills in 9–10 years old (Macarthur, 1998). The efficacy analyses showed no significant differences between the intervention and control condition at follow-up on the prevalence of coming to a complete stop (85% vs. 82%), shoulder checking before a left turn (0% vs. 1%) and straight line cycling (89% vs. 89%). This training course consisted of two equipment stations (i.e., helmet/clothing check and bicycle check) and four bicycle handling stations. Furthermore, at each training station information on appropriate safe cycling behaviors and traffic regulations was given. A study (van Schagen and Brookhuis, 1994), conducted in the Netherlands, taught 8–9-year-old children to behave correctly in interactions with other traffic at intersections through a cycle training program based on the principles of modeling and a cycle training program build on the production rule approach. This study found a significant interaction effect between group and time. Furthermore, contrast analysis revealed a significant difference between the production rule approach and the control condition, and between the modeling condition and the control condition. No difference was found between the two experimental conditions. Thus, both training programs had an equally positive effect on children's behavior at intersections which resulted in the following improvements: children slowed down more often while approaching an intersection, looked more often for other road users and signaled more often after cycle training. It should be noted that the above mentioned studies assessed only short-term effects of a cycle training. Yet, evaluating longer-term effects of cycle training might be important to explore how long a certain training effect maintains. Furthermore, it might be interesting to know if children who did not receive cycle training catch up. However, only one study could be located in the literature assessing long-term effects of cycle training. This study, conducted by Savill et al. (1996), investigated the effects of eight different cycle training courses on cycling behavior in 1566 British children (12–13 years old) and found that children who had been trained obtained more 'safe' ratings by the assessor in the on-road practical test compared with untrained children ($\chi^2 = 83.89, p < 0.001$) and that these effects lasted for at least 2 years after training.

While cycle training was introduced to make child cyclists safer, it is often used as a strategy to promote cycling. In Flanders, Belgium, the organization of a cycle training course is a common practice schools use as a way to promote cycling to school (Stichting Vlaamse Schoolsport et al., 2005; Belgisch Instituut voor de verkeersveiligheid, 2009). Also in the UK, cycle training is a component of the Sustrans' school cycling project, called Bike It (Sustrans, 2013). Furthermore, in Ireland, a toolkit was developed by the National Transport Authority and Green Schools Travel to help schools promote cycling to school. Within this toolkit cycle training was once more cited as an important 'top tip' to promote cycling (National Transport Authority and Green Schools Travel, 2011). However only a few studies evaluated the effect of cycle training on cycling to school levels. A study, conducted in the UK, investigated the effect of the National Cycling Proficiency Scheme (NCPS) and found that children who had been trained tended to cycle more to school than those in the control group (1976). Similar results were found in a study carried out in London Borough of Bexley, which showed that children who attended a cycling awareness course were more likely to cycle to school (1992). A more recent study (Hollowood and Rotheram, 2012) found also some encouraging indications that a cycle training was positively associated with higher levels of cycling to school among 5–15 years old. This cycle training course comprised three levels: in level 1 children learn to control their bicycle in an off-road environment,

in level 2 children learn the basics of on-road cycling, and in level 3 advanced on-road cycling skills are taught. However, due to the absence of a comparison group this could not be presented in a statistically meaningful way. Consequently, more research is needed to investigate the impact of school-based cycle training on the prevalence of cycling to school.

Parental attitudes and perceptions towards cycling were found to play a crucial role in deciding their children's mode choice to school (Seraj et al., 2012). For example, Ducheyne et al. (Ducheyne et al., 2012a) investigated the relationship between parental attitudes and children's cycling to school and found that children whose parents had a positive attitude towards cycling to school had a decreased likelihood of never cycling to school (OR 0.89, CI 0.81–0.97). In fact, McMillan (McMillan, 2007) found that parental attitudes regarding child and traffic safety were more important in influencing travel mode choice to school than built environment attributes. Furthermore, a study conducted by Trapp et al. (Trapp et al., 2011) found that parental confidence in their child's ability to cycle to school played a mediating role in the association between perceived safety and cycling. Consequently, shifting parental attitudes to be more favorable towards their child's walking and cycling to school seems important when promoting walking or cycling to school. To accomplish this, some initiatives promoting active travel to school involve parents in the interventions (Fesperman et al., 2008; Wen et al., 2008). Consequently, it is of interest to know if a cycle training with parental buy-in is more effective on levels of cycling to school than without parental involvement.

Therefore, the primary aim of the present study was to evaluate the effects of a cycle training course on cycling skills in Belgian children from the 4th grade of elementary school within 1 week after the intervention and at 5 months follow-up. Effects on traffic skills were not investigated, since most of the school-based cycle training programs do not include traffic skills but mainly focus on improving children's basic cycling skills through practical cycling exercises that take place within a traffic-free environment. Training and evaluating children's traffic skills is a next stage and requires the school researchers to work together with other organizations (i.e., the traffic police). A second aim of the study was to examine the effects of a cycle training course, with and without parental involvement, on levels of cycling to school and on parental attitudes towards cycling. In this perspective, it is important to keep in mind that improving cycling skills is one strategy among several to increase levels of cycling to school in children.

Methods

Study protocol

A random sample of five primary schools in Flanders, Belgium, was selected to participate in the study. The school principals were sent a recruitment letter and afterwards contacted by phone. Three schools agreed to participate and all children ($n = 135$) of the 4th grade in these schools were invited to participate in the intervention study. The other two schools indicated that they could not participate due to lack of time. Children from the 4th grade were chosen as most cycle training programs focus on children from 9 to 10 years old (Stichting Vlaamse Schoolsport et al., 2005; Belgisch Instituut voor de verkeersveiligheid, 2009). Furthermore, at this age, children's motor and cognitive abilities are already sufficiently developed to ride a bicycle (Briem et al., 2004) and these children represent a critical age group for cycling accidents whereby the ability of children to perform cycling skills was found to play an important role (Lammar, 2005; Corden et al., 2005). The three participating schools were randomly assigned to one of the three conditions. In the first condition only children were involved (I). In

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