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Effects of cycle skills training on cycling-related knowledge, confidence and behaviour in adolescent girls

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ABSTRACT

Background: Cycle skills training (CST) improves children's cycling knowledge and skills. This study examined and compared the effects of short-term CST (1–10 weeks) with or without on-road training on cycling-related knowledge, confidence and behaviours in adolescent girls.
Methods: Girls (n = 117; age: 13.9 ± 0.7 years) participated in either playground-based CST only (Traffic-Free CST; n = 43) or combined playground-based and on-road CST (Traffic-Free + OnRoad CST; n = 74). Participants completed pre-training and post-training surveys about cycling-related knowledge, confidence and behaviour, and practical cycling skills assessment (fundamental and advanced skills). Data were analysed using paired t-test and McNemar tests.
Results: At baseline, few adolescents cycled > 1/week (11.1%) or to school (2.6%). Both types of CST improved adolescents' knowledge (Traffic-Free: 82.9 ± 13.0% to 88.9 ± 9.5%, p = 0.001; Traffic-Free + OnRoad: 85.9 ± 8.8% to 93.6 ± 6.4%, p < 0.001). Traffic-free CST improved adolescents' confidence to cycle in the parks/playgrounds (very confident: 41.9% to 60.5%; p = 0.034). Traffic-Free + OnRoad CST increased adolescents' confidence to cycle on the road (very confident: 41.9% to 54.1%; p = 0.013), but not to school (very confident: 25.4% to 31.5%; p = 0.146). Cycling habits and preferences did not change significantly after CST (all p > 0.05). Traffic-Free + OnRoad CST participants were competent in most fundamental (97.8 ± 7.6%) and advanced practical cycling skills (97.6 ± 5.7%), whereas Traffic-Free CST participants had lower scores in fundamental skills (81.4 ± 29.2%; p < 0.001).
Conclusion: CST with or without on-road training improved cycling-related knowledge but did not change cycling habits in adolescent girls. CST with on-road training improved adolescent girls' confidence to cycle on the road, but not to school. Future CST programs should be tailored to the adolescents' needs and preferences.

1. Introduction

In many developed countries, prevalence of cycling to school is lower than prevalence of walking (McDonald, 2007; Larsen et al., 2009; Chillón et al., 2009; Nelson et al., 2008; Leslie et al., 2010; Mandic et al., 2015; Frater et al., 2017) and has been declining over

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the last two decades (McDonald, 2007; Ministry of Transport, 2015a). In addition, in some (McDonald, 2007; Sun et al., 2015) but not all countries (Ostergaard et al., 2013; Cooper et al., 2006; Trang et al., 2012), prevalence of cycling to school is lower in adolescents compared to children. Although gender differences in active transport to school have been reported in some (Chillón et al., 2009; Larsen et al., 2009; Nelson et al., 2008) but not all (Mandic et al., 2017b; Cooper et al., 2006) studies, several studies suggested that cycling to school may be less prevalent among adolescent girls compared to adolescent boys (Reimers et al., 2013; Timperio et al., 2006; Nelson et al., 2008; Emond and Handy, 2012; Handy, 2014; Ramirez-Velez et al., 2016). Given the decline in physical activity from childhood to adolescence (Corder et al., 2015) and lower sport participation (Mandic et al., 2012) among adolescent girls versus boys, encouraging cycling to school could be one intervention to promote physical activity in this gender and age group.

Traffic safety is a key concern regarding cycling for transportation, especially in children and adolescents (Krizek et al., 2009; Sallis et al., 2013; Department for Transport, 2015). Both adolescents (Mandic et al., 2017b) and their parents (Hopkins and Mandic, 2017) perceive cycling to school as a less safe mode of transport compared to walking. High rates of bicycle-related injuries in adolescents have been reported in Europe (Candappa et al., 2012), the United States (National Highway Traffic Safety Administration, 2015), Australia (Boufous et al., 2011) and New Zealand (Ministry of Transport, 2015b). In addition, Australian (Boufous et al., 2011) and New Zealand (Ministry of Transport, 2015b) adolescents have the highest rates of bicycle-related accidents compared to other age groups.

Having the skills and knowledge to cycle contributes to safer cycling behaviours in children and adolescents. Much higher accident rates were observed in children with inadequate cycle skills compared to other children, even though they may cycle less frequently (Preston, 1980). In addition, parental confidence in their child's cycle skills is one of the determinants of cycling to school rates among children (Trapp et al., 2011; Ducheyne et al., 2012) and mediates the association between parental perceptions of safety and cycling in this age group (Trapp et al., 2011).

Existing findings suggest that both adolescents' and parental perceptions of adolescents' ability to cycle to school should be considered when designing interventions to promote cycling for transport in this age group. In a recent study from Dunedin, New Zealand, approximately one third of adolescents living within 4 km of their school did not perceive themselves as capable of cycling to school (Mandic et al., 2017b). Previous studies found that parental perceptions of the safety of cycling also have a strong influence on adolescents' cycling habits (Hopkins and Mandic, 2017), particularly in adolescent girls (Esteban-Cornejo et al., 2016; Carver et al., 2005). However, disparities among perceptions of cycling ability between parents and young people (Holloway, 2014, Ergler, 2015) may exist and parents may overestimate their adolescents' ability to cycle to school safely (Mandic et al., 2017a). Therefore, future interventions for promoting cycling to school among adolescents should take into account both parental and adolescents' perceptions of adolescents' cycle skills and adolescents' capability to cycle to school (Mandic et al., 2017a). Taken together, future comprehensive approaches for promoting cycling in adolescents should also offer programs such as cycle skills training (CST) to improve adolescents' cycle skills in addition to creating safer physical environments for cycling.

CST courses have been designed to help children develop the skills and confidence to cycle safely in traffic (Ducheyne et al., 2013, 2014; New Zealand Transport Agency, 2012). Existing programs vary in duration, content, and training type and often include training and practice in traffic-free areas (i.e., playgrounds) and light traffic environments (Ellis, 2014; Richmond et al., 2014). In children (8–10 years of age), CST programs conducted in a traffic-free environment or simulated traffic environment increased knowledge (McLaughlin and Glang, 2010; van Schagen and Brookhuis, 1994) and improved cycle skills (Ducheyne et al., 2013; van Schagen and Brookhuis, 1994; Ducheyne et al., 2014). Improvements in children's cycling skills after CST were observed, irrespective of child's gender, socioeconomic status and initial cycling skills and were maintained for 5 months (Ducheyne et al., 2014) and 2 years (Savill et al., 1996) after the training. However, improvements in children's knowledge and cycle skills were not observed in all studies (Macarthur et al., 1998) and the effects of CST in adolescents have not been examined.

Recent studies suggested that adolescents (Colwell and Culverwell, 2002; Mandic et al., 2016) and their parents (Mandic et al., 2017a) also have positive attitudes towards CST. In those studies, approximately four in ten adolescents (Colwell and Culverwell, 2002; Mandic et al., 2016) and three quarters of parents (Mandic et al., 2017a) perceived that CST did/would make adolescents safer cycling in traffic. For adolescents, perceptions that CST would make them safer in traffic were associated with various factors including adolescents' enjoyment of cycling for recreation, their perception that cycling to school was useful, cycling frequently with parents, encouragement from school and adolescents' desire to cycle to school (Mandic et al., 2016). For parents, perceptions that CST would make their adolescent(s) safer in traffic were associated with having fewer vehicles at home and parental perceptions that cycling to school is important and unsafe (Mandic et al., 2017a).

Therefore, as suggested previously, raising the awareness of the benefits of CST for adolescents and providing CST sessions in secondary schools could potentially help to improve cycle safety in adolescents and encourage cycling as a form of transportation (Mandic et al., 2016). However, the effects of CST in adolescents remain unknown. Therefore, more research is needed to unpack whether interventions like CST could improve adolescents' cycle skills and their capability to cycle to school. This intervention study examined and compared the effects of a short-term (1–10 weeks) CST course with and without on-road training on cycling-related behaviours, confidence and knowledge of road rules in New Zealand adolescent girls. To our best knowledge, this is the first study to examine the effects of CST conducted in traffic-free and light traffic environment in adolescent girls.

2. Material and methods

2.1. Context

The CST program evaluated in this study was implemented by Dunedin City Council as a part of the South Dunedin Cycling