

Can bicycle training for children increase active travel?

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Evidence in support of cycle training is limited, and its potential to improve safety and make a tangible difference to cycling levels is unclear. Nevertheless, Bikeability, the UK government's cycle training programme introduced in 2006, is widespread in schools and is actively supported by many parents/carers. This paper draws together a number of evidence sources in an attempt to understand the role of cycle training as one among several measures for increasing active travel. It reviews existing research regarding the role of and outcomes from cycle training for children before offering an overview of the current distribution of cycle training in English schools. Next it draws on two new data sources – the 2014 CensusAtSchool and the 2014 Bikeability School Travel Survey – to explore outcomes, experiences and perceptions of cycling and cycle training from a child's perspective. From this it draws conclusions regarding the role of cycle training in schools and elaborates on what this means for policy makers and practitioners.

1. Introduction

The advantages of active travel for children and adults are well documented, with measureable health and wellbeing benefits for individuals (Gordon-Larsen *et al.*, 2009; Hamer and Chida, 2008; Humphreys *et al.*, 2013; Martin *et al.*, 2014; Oja *et al.*, 2011; Suminski *et al.*, 2014), wider society (De Hartog *et al.*, 2010; Rabl and De Nazelle, 2012; Woodcock *et al.*, 2009) and the public sector (De Nazelle *et al.*, 2011; Jarrett *et al.*, 2012). As such, measures to promote active travel have been widely encouraged. However, evidence about the effectiveness of public policy interventions to promote active travel is variable, partly because these interventions often form part of wider packages of measures (Pucher *et al.*, 2010).

Since Tudor-Locke *et al.* (2001) highlighted active travel to and from school as a potentially overlooked source of physical activity, there has been a significant amount of research devoted to exploring this field. Indeed, in 2003 the UK government recognised the opportunity that the school run offered for pupils to engage in physical activity within their policy guidance documentation (Department for Education and Skills, 2003a, 2003b). Despite this, the number of children cycling to school in England has remained generally unchanged since the 1990s (DfT, 2014). In general, it is agreed that children who travel actively to school are more physically active overall than those who do not (Cooper *et al.*, 2005; Lubans *et al.*, 2011; Roth *et al.*, 2012; Van Sluijs *et al.*, 2009). However, these findings are not universal and vary by area type,

gender and other factors. Furthermore, while cycling is included in many studies, the number of cyclists in the sample is often very low (Cooper *et al.*, 2005; Yang *et al.*, 2010) meaning that less is known about the role of cycling than walking in terms of active travel.

Some studies have addressed cycling specifically, and find that children who cycle to school are less likely to be obese (Bere *et al.*, 2011) and more likely to have a higher level of cardiovascular fitness (Cooper *et al.*, 2008) than those who do not. Notwithstanding the general paucity of evidence about the role of cycling in children's active travel, Yang *et al.* (2010) posit that school-based interventions to promote cycling should be further explored and evaluated because they (especially those with parental and community involvement) have proved to be particularly effective at increasing physical activity (Van Sluijs *et al.*, 2007).

The reasons why children do not cycle more are wide-ranging, and include individual, environmental and social factors (Salmon *et al.*, 2007). This is reinforced by Panter *et al.* (2010) who suggest that attitudinal and social support factors are associated with active travel behaviour on the journey to school. A recent systematic review (Lorenc *et al.*, 2008) identified five themes: a culture of car use, fear and dislike of local environments, children as responsible transport users, parental responsibility and behaviour and contextual factors. One issue that spans several of these themes is

child safety. In fact, in the UK, parents of children aged 7–10 years are now more worried about ‘traffic danger’ than ‘stranger danger’ on the journey to school (Sustrans, 2014). However, while safety may be one of the key concerns, evidence shows that the benefits of cycling outweigh the risks of injury (De Hartog *et al.*, 2010). This suggests that interventions focusing on safe active travel may have a positive impact on travel behaviour through minimising concerns about risks (real or perceived) associated with safety.

There are particular opportunities for encouraging more cycling in urban areas where routine trips are likely to be shorter, and it is possible for individuals to switch to active modes (Pooley *et al.*, 2011). For children, the average distance travelled to school by 11–16-year-olds living in urban conurbations and urban city and town areas is 2.9–3.1 miles (4.7–5.0 km). Travel-to-school distances in the same areas for 5–10-year-olds are even lower (1.5–1.6 miles (2.4–2.6 km)). Nevertheless, while walking is the predominant mode of transport for 11–16-year-olds living under 2 miles (3.2 km) from school, car and bus dominate for those living between 2 and 5 miles (3.2–8.0 km) from school, with the percentage of children cycling reaching only 1% (DfT, 2013).

With rising levels of overweight and obese children and adults, and significant potential for increasing cycling to school and other places nearby in urban areas, efforts to overcome barriers that are putting people off cycling have never been more important. This paper explores the contribution of one particular intervention – cycle training – in minimising these barriers and changing attitudes and behaviours.

2. Effectiveness of cycle training in general

The majority of evaluations of cycle training consider knowledge transfer and safety outcomes. On the whole, the results suggest child cycle training is a positive intervention, as the following authors show. Simpson and Mineiro (1992) interviewed hospital patients involved in cycling collisions and concluded that in the 8–12 years age group, two-thirds of accidents were due to cyclist error. They found that children without formal cycle training were twice as likely to have caused the collision than those with training. In addition, Savill *et al.* (1996) assessed whether ‘cycle training schemes lead to improved, safer cycling skills and knowledge’ for children aged around 12 years, 2 years after they had completed one of several different training courses. Trained children (especially those whose training involved an on-road element over several weeks) performed significantly better than untrained children in the practical and knowledge tests.

Others have also raised concerns regarding the efficacy of child cycle training before the introduction of Bikeability in 2006. One study even suggested a potential negative effect for some children, possibly due to increased inadvertent risk-taking and reduced supervision (Carlin *et al.*, 1998). When investigating the links between cycle training, accidents, attitudes and behaviours, Colwell and Culverwell (2002) did not find any relationship between cycle training and reduced accident levels or safer attitudes and

behaviours (although the study was undertaken some 4 years after training and therefore any influence of the training may have been lost). This finding is supported by Macarthur *et al.* (1998), who found in a randomised controlled trial that a playground-based cycle training course was not effective in improving knowledge, behaviour or attitudes.

The Royal Society for the Prevention of Accidents (Rospa, 2001) reviewed 14 evaluations of the effectiveness of cycling training delivered between 1976 and 1998 and found mixed results in terms of effectiveness. Overall, the review posited that practical, on-road training is more effective than theoretical, off-road training. A second systematic review by Richmond *et al.* (2014) of 25 evaluations of diverse cycle training programmes over a 30-year period found a paucity of high-quality evaluations. They suggest that the content of cycle training programmes has changed little in 30 years. Furthermore, they identified that although some observational evaluations found statistically significant improvements in cycling behaviour (especially for on-road training) and knowledge, evidence in support of the role of cycle training programmes in reducing injury to cyclists remains inconclusive.

Latterly there has been a resurgence of interest in evaluating cycle training programmes for children. Lachapelle *et al.* (2013) found that cycle training programmes do lead to improvement in children’s knowledge of safe cycling, at least in the short term. This is echoed by Hooshmand *et al.* (2014), who found increased knowledge of safety after training compared to before training. An investigation into an off-road cycle training course for young children also found an increase in safe cycling skills among the target group (Ducheyne *et al.*, 2013).

While it is possible to identify a range of studies looking at the safety and knowledge elements of cycle training (albeit of mixed quality), surprisingly few studies have explored the impact of cycle training on the frequency of cycling. Little is known about the impact of cycle training on active travel, although when it has been investigated the results are generally positive. Rush (2014) looked at cycle to school trends in five Safe Routes to School areas in the USA (which included cycle training as a major component) and found increases in the level of cycling to school in four of these. Furthermore, studies of adult trainees have identified an increase in cycling frequency and in confidence after training, compared to before (Johnson and Margolis, 2013; Rissel and Watkins, 2014; Telfer *et al.*, 2006). Two of these looked at health impacts in more detail: Rissel and Watkins (2014) found a small but statistically significant reduction in weight and body mass index, while Johnson and Margolis (2013) found an increase in overall physical activity following the cycle training, compared to before.

3. Effectiveness of Bikeability in particular

In England, most cycle training delivered in schools is based on the National Standard for Cycle Training, branded as ‘Bikeability’.

It has three levels: level 1 training focuses on cycling with control in traffic-free environments and preparing for cycling on the road; level 2 training takes place on single-lane roads and simple junctions; and level 3 training takes place on multilane roads and complex junctions. Bikeability-trained children learn to cycle on the road with traffic in environments where road design may help or hinder their journey. The vast majority of training combines levels 1 and 2 and is delivered to children aged 9–12 years of age (primary school years 5 and 6). Training is delivered by national standard instructors working within quality-assured Bikeability schemes managed by local authorities or school games organiser host schools (Bikeability, 2014; DfT, 2012).

Arguably, Bikeability has the potential to address attitudinal barriers directly by providing children (and adults) with skills and confidence for cycling on today's roads, thereby encouraging more people to cycle more safely, more often. The extent to which this is the case is unclear because evaluation of the effectiveness of Bikeability thus far is limited. Much of the grey literature, which has often drawn on both adult and child participants (by surveying parents or guardians), suggests that some people cycle more often after training than before (CTUK, 2013; Mott MacDonald, 2010; Steer Davies Gleave, 2008). However, such studies tend to have weak designs, lacking comparison groups and relying on post-training data collection rather than pre-/post-training data collection and analysis.

Nevertheless, a comparison of Bikeability and school travel administrative data showed an increase in cycling to secondary schools in one local authority area where all feeder primary schools delivered Bikeability, against an overall decline in cycling to other secondary schools with less exposure to Bikeability. The study also found larger increases in cycling to school in local authorities with more funded training places and a longer history of Bikeability delivery (Steer Davies Gleave, 2012). In addition, children who had received level 2 Bikeability training were found to score significantly higher in a computer-based hazard perception and appropriate response quiz than those who had not (Hodgson and Worth, 2015). Finally, 95% of parents think that formal cycle training for children is important, and both parents and children who had undertaken Bikeability training viewed it positively. Parents and children both reported children cycling more after Bikeability training than before, and the children also felt more confident riding their bikes (Ipsos MORI, 2011).

4. Data sources

The previous section shows how little is known about the effectiveness of Bikeability training at encouraging more cycling among children. In order to explore this issue further, the remainder of this paper discusses new data sources relating to the delivery of Bikeability in England, including Bikeability administrative data and two recent surveys comparing cycling outcomes for trained and untrained children.

4.1 Bikeability administrative data

Data relating to the availability and delivery of Bikeability in England (excluding London, which is not included in the mapping as funding is provided to London schools by a different mechanism) were taken from administrative data for the academic year 2013/2014 provided by the Bikeability support team at Steer Davies Gleave who administer the allocation of Department for Transport (DfT) Bikeability funding each year, and the DfT (2015a, 2015b). The data set was mapped (Elliot *et al.*, 2000) to show the distribution of cycle training as a relative rate across England using a boundary data map (UK Data Service, 2014) and best-fit output area lookup files (Office for National Statistics, 2011).

4.2 CensusAtSchool

CensusAtSchool (which is distinct from the school census undertaken annually by the Department for Education) is an international children's census set up with the aim of 'collecting and disseminating real data for use by teachers and pupils in data-handling, ICT and across the curriculum for teaching and learning' (CensusAtSchool, 2014). It was established in 2000 in conjunction with the Office for National Statistics and linked to the 2001 Census. It has subsequently developed into an ongoing project run by the International Centre for Statistical Education at Plymouth University.

Within the 2013/2014 version of the survey, respondents were asked a number of questions about cycle training. These included whether the children had participated in cycle training including Bikeability, how frequently they cycle in general, and how frequently they cycle to school. CensusAtSchool relied on an opportunistic sample without random sampling; nevertheless, its focus on numeracy and IT education is likely to reduce bias from overrepresentation of schools that are supportive of cycling (although of course opportunistic sampling may introduce bias in other ways, such as within sociodemographics or other interrelated factors). A total of 1745 of the responses collected by 18 June 2014 pertain to year 7 to 9 pupils. The data discussed in this paper were analysed using log-linear modelling (Dobson, 2001) to identify whether there is a relationship between cycle training and cycling frequency among this subgroup.

4.3 Bikeability School Travel Survey (2014)

The Bikeability School Travel Survey (2014) was designed to support investigations of the effects of Bikeability cycle training. It was piloted in a small number of schools in May and June 2014 with a view to launching a larger panel survey. In total, 1345 year 5 and 6 pupils from 25 primary schools in Cambridgeshire and six other English local authority areas completed the survey. More than half (718) of the respondent pupils (53% of the pupil sample) were from 15 Cambridgeshire schools. The remaining 627 pupils came from ten schools in the following local authority areas: the London borough of Ealing, the city of Peterborough, the county of Hertfordshire, the ten unitary authorities in Greater Manchester, Liverpool City Council and Warrington Unitary Authority. The

sample was evenly distributed between boys (51%) and girls (49%) and across years 5 (44%) and 6 (56%).

Two approaches were used in the analysis. First, simple frequency distribution analysis was used to help interpret the results, before proportional odds logistic regression (Venables and Ripley, 2002) was used to provide more detailed understanding of the relationship between Bikeability training and overall cycling frequency, frequency of cycling to school, confidence cycling on the road and enjoyment of cycling. The data were modelled for years 5 and 6 simultaneously using well-established multiple regression techniques (Woodward, 2014). The modelling takes into account several possible confounding factors as far as they have been reported in the survey. In some cases, having fitted models to various outcomes conditional on various explanatory variables, it was found that the effect of a respondent reporting as year 5 was different to year 6 and suitable interaction terms were therefore incorporated into the model to account for this feature of the data correctly. In these cases, for clarity and brevity, the results are presented for year 6 pupils.

5. Results

Currently, it is possible for a child to receive cycle training in every upper-tier local authority area outside London except the Isles of Scilly, although training is not currently provided in every school. There are around 15 500 infant, junior, primary and middle schools in England (outside London) (Department for Education, 2014) and around 7500 of these offer training (based on Steer Davies Gleave Bikeability monitoring data 2013/2014). Therefore, it appears that children in around half of all primary schools in England participated in cycle training in 2013/2014, but without further analysis little can be said about their socioeconomic, education or health characteristics. Nevertheless, a positive trend can be identified with the provision of an increasing number of funded cycle training places since 2006/2007, as shown in Figure 1.

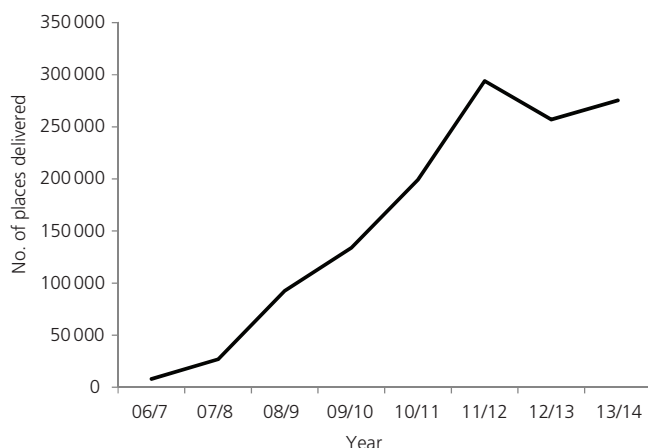


Figure 1. Cycle training places delivered each year. Source: DfT (2015a, 2015b) Bikeability delivery monitoring data 2006/2007–2013/2014

Outside London (where most Bikeability is funded by Transport for London), around 90–95% of all Bikeability training places are funded by the DfT. Therefore, the centrally provided figures of places funded each year give a good indication of the provision of Bikeability training in schools. However, as shown in Figure 2, the likelihood of a child receiving cycle training (outside London) is not equal across England, with a child living in one of the darkest-shaded areas being more than twice as likely as the overall average to have access to training.

Under current funding arrangements, the distribution of funded training places is based on the number of places local authorities and school games organiser host schools bid to deliver each year. This does not necessarily reflect demand for training from pupils, parents or schools. Further research is needed in order to discover the socioeconomic, education and health characteristics of children who participate in Bikeability training, and those who do not.

5.1 Frequency of cycling

Bikeability training is intended to encourage more children to cycle more safely, more often, by giving them the skills and confidence to cycle on today's roads. It is therefore important to establish whether trained children do cycle more often than untrained children. Both surveys compared the frequency of cycling among trained and untrained children.

The 2014 Bikeability School Travel Survey used an aggregate three-point scale to measure cycling frequency: 'frequent' (at least

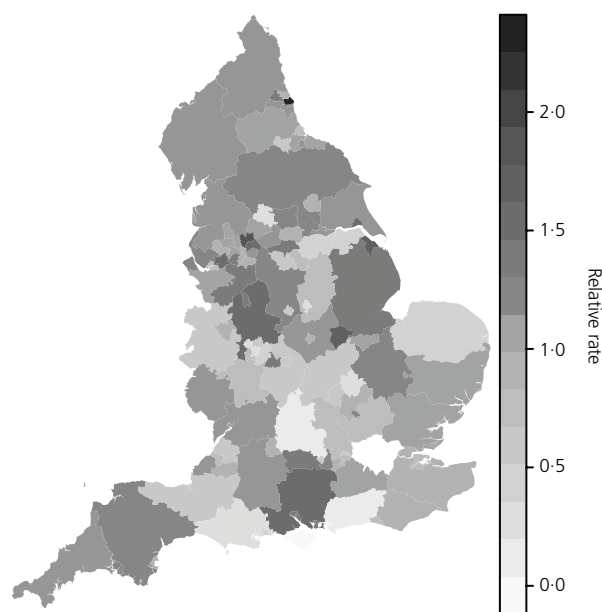


Figure 2. Relative Bikeability delivery 2013/2014. Source: Department for Education (2014), SDG Bikeability monitoring data (2013/2014). Notes: Excluding London, Northern Ireland, Scotland and Wales. © Crown Copyright 2015 Ordnance Survey. Media 076/15

once a week); 'infrequent' (less than once a week, more than once a month); and 'rare or never' (less than once a month). The results indicate that more than half (58%) of all children reported cycling at least once a week. However, 9% fewer trained than untrained pupils rarely or never cycled, 5% more trained pupils than untrained pupils cycled frequently, and 4% more trained than untrained pupils cycled infrequently.

A model was fitted to these data in order to determine the association between Bikeability training and overall levels of cycling, taking into account confounding factors such as gender and usual location of cycling (e.g. on the road, on the footway, in the park). This showed that the adjusted odds ratio (OR) for year 6 pupils for the association between Bikeability and an increased self-reported level of cycling was 1.01 (95% confidence interval (CI) 0.75–1.38). In other words, the relationship is not regarded as statistically significant, and while the results are interesting, either the sample size is not large enough to detect an effect or the association between training and overall cycling levels is small.

CensusAtSchool collected data on the number of year 7, 8 and 9 pupils who had cycled for at least 30 min during the previous week. When a log-linear model was fitted to these data it showed a statistically significant association between reporting cycle training and reporting cycling for at least 30 min during the previous week (OR 1.27, 95% CI 1.07–1.51). This shows that children who have participated in cycle training were more likely to have cycled for at least 30 min during the previous week than those who had not participated in training.

While only one study has achieved statistical significance, both give consistent evidence of an association. The Bikeability School Travel Survey, which focuses entirely on primary school pupils, provides an indication that a relationship exists, but a larger sample size is needed to confirm this. The CensusAtSchool survey, based predominantly on secondary school pupils, provides statistically significant evidence of an association between cycle training and increased cycling frequency. However, the directionality of this association remains unclear: are children and young people who cycle frequently more likely to participate in training, or are trained children and young people more likely to cycle frequently? Further research is required to answer this question.

5.2 Destinations

Both surveys included questions about cycling to school frequency for trained and untrained children. CensusAtSchool data for children reporting that they had cycled to school at least once during the previous week were compared to those who had not reported cycling to school. In this case the statistically significant result provided by the log-linear modelling indicates that children who have participated in cycle training are more likely to cycle to school than those who had not (OR 1.599, 95% CI 1.17–2.21).

The Bikeability School Travel Survey asked a similar question with more detail. Children were asked to specify how often they cycled to school. This also showed that children who have completed Bikeability are more likely to cycle to school than those who have not (see Figure 3). This finding is confirmed by the use of a proportional odds logistic regression model that was fitted to the data to examine the strength of this finding taking into account a range of confounding factors. These data suggest that children who have completed Bikeability training report a higher level of frequency of cycling to school (OR 2.25, 95% CI 1.83–3.52) than those who have not, a statistically significant result.

The Bikeability School Travel Survey also attempted to ascertain how children usually travel with family and friends, and how they usually travel to a range of other destinations nearby. Of the 1345 children, 39% stated that cycling was their usual way of travel for at least one of the categories offered to them. This comprised 35% of the children who had not completed Bikeability compared with 43% of those who had. While the majority of both trained and untrained children only stated cycling as the usual mode for one category (most commonly travel to the park), trained children were slightly more likely to state cycling was their usual mode of transport for three or more categories. As Figure 4 shows, children were more likely to use cycling as their usual mode of travel for independent trips (such as to the park and when out with friends) than for trips accompanied by an adult (such as going shopping and when out with family). In this case, trained children were also more likely to state cycling was their usual travel mode than untrained children, although whether this is because children who cycle more do Bikeability or children who do Bikeability cycle more remains unclear.

The Bikeability School Travel Survey also asked where children usually cycle. The results show that trained children are more likely

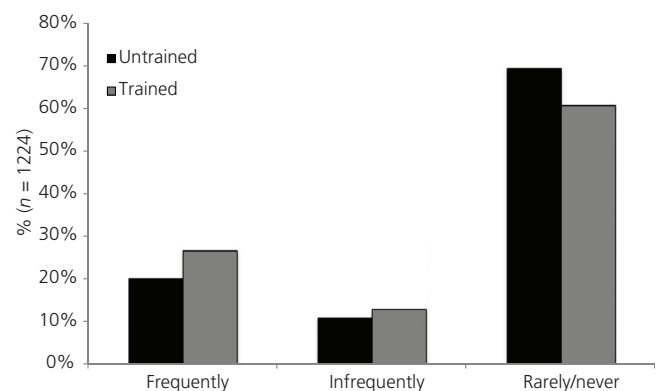


Figure 3. Frequency of cycling to school ($n = 1224$). Frequently: at least once a week; Infrequently: less than once a week but more than once a month; Rarely/never: less than once a month. The sample size is lower in this case as respondents from one school did not complete this question. Reproduced by permission of the Association of Bikeability Schemes

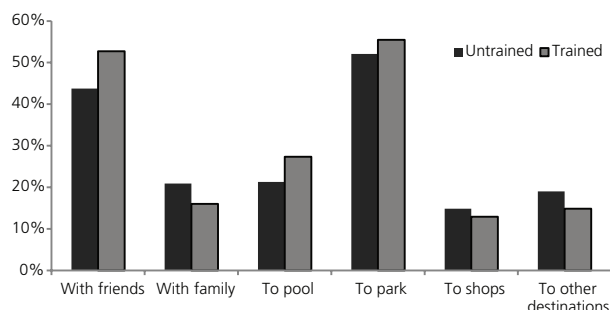


Figure 4. People children cycle with, and where they cycle to ($n = 1345$). Source: 2014 Bikeability School Travel Survey

than untrained children to cycle on the road, and much less likely to cycle on the footway (see Figure 5).

5.3 Confidence and enjoyment

The Bikeability School Travel Survey asked how confident children feel cycling on the road. As Figure 6 shows, trained children are more likely to feel very confident cycling on the road than untrained children. A proportional odds logistic regression model was fitted to these data and the statistically significant results suggest that girls are less confident than boys (OR 0.57, 95% CI 0.45–0.72). Furthermore, careful interpretation of appropriate main effects and interactions suggests that year 6 pupils who have completed Bikeability reported higher confidence levels than year 6 pupils who had not been trained in Bikeability (OR 1.81, 95% CI 1.26–2.59). While this is a technical measure of effect size it is usually regarded in public health circles as being a large effect. Nevertheless, although this statistically significant result is interesting, the issue remains that the direction of the association cannot be determined. There is evidence that children who have completed Bikeability say they are confident cycling on the road, but it is not known whether children who are more confident do Bikeability or children who do Bikeability are more confident.

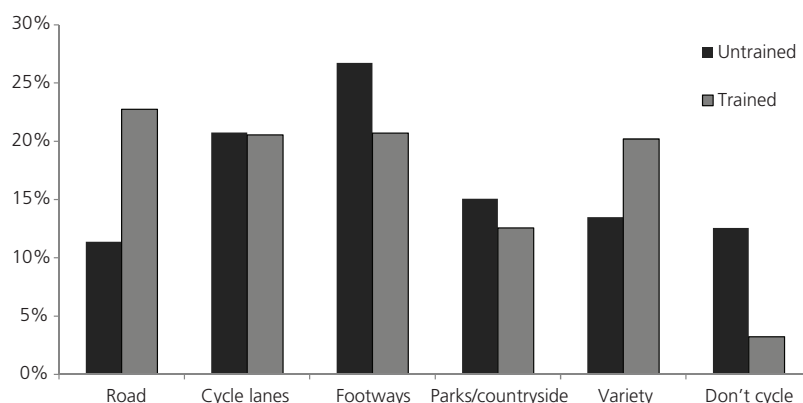


Figure 5. Where do children ride their bikes ($n = 1345$). Reproduced by permission of the Association of Bikeability Schemes

Finally, the Bikeability School Travel Survey asked whether children enjoy cycling. Overall, 81% ($n = 1224$) enjoyed cycling always, or most of the time, and Bikeability-trained children were more likely to enjoy cycling than untrained children. Based on the proportional odds logistic regression models fitted to the data, there is evidence of a very strong association between confidence and enjoyment, with a huge OR of 14.7 (95% CI 8.54–25.5) indicating that those who said they were confident cyclists were much more likely to report greater enjoyment. The frequency of cycling to school also appears to be associated with enjoyment, because children who cycle to school report enjoying cycling more than those who do not (OR 3.81, 95% CI 2.14–7.24). The pattern of these associations provides reassurance that the survey forms have been filled in carefully, as for example children who reported that they enjoy cycling more are likely to be both more confident and cycle more.

6. Discussion

Despite the documented health benefits of cycling for an increasingly sedentary population (De Hartog *et al.*, 2010) and the growth in publicly funded Bikeability training since 2006/2007 (as shown in Figure 1), there is a surprising paucity of evidence demonstrating the contribution cycle training makes to encouraging more people to cycle more safely, more often.

In 2013/2014, more than 50% of primary schools in England offered Bikeability training to their pupils. However, Bikeability delivery is unevenly distributed across English local authorities, resulting in many children not being offered any training at all (as shown in Figure 2). More needs to be known about the children who participate in training, and those who do not, and there needs to be a better understanding of how Bikeability may address public health challenges presented by childhood physical inactivity and obesity in the context of socioeconomic and health inequalities. Is Bikeability being delivered to the children who stand to benefit most from increased active travel?

In terms of overall cycling frequency, the results indicate a relationship between frequency of cycling and Bikeability training.

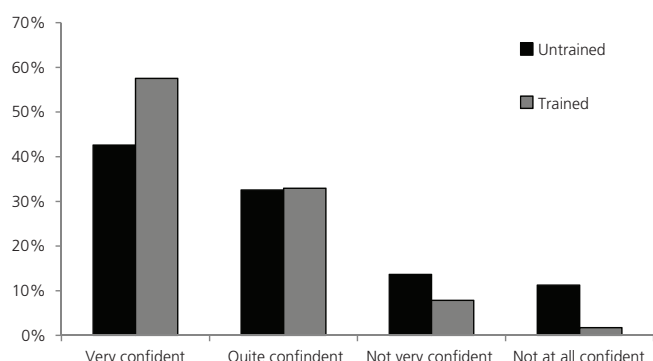


Figure 6. Confidence cycling on the road ($n = 1345$). Reproduced by permission of the Association of Bikeability Schemes

The CensusAtSchool results clearly show that trained children cycle more than untrained children, while the Bikeability School Travel Survey results also suggest that trained children cycle more than untrained children. They are also much more likely to cycle to school. This accords with the findings of Rush (2014), who showed more cycling in areas where cycle training had taken place. Further research is needed into whether, how, where and why training might lead to more cycling among children, and what more can be done to encourage it (for example through pilot initiatives such as Bikeability Plus (Bikeability, 2015), which offers additional activities to deal with specific barriers to cycling).

Results from the Bikeability School Travel Survey also indicate that trained children are more confident cycling on the road. This is important because giving children the skills and confidence to cycle on the road, and nurturing their innate enthusiasm for cycling, may help tackle some of the attitudinal barriers that discourage adults from taking up or returning to cycling (Lorenc *et al.*, 2008; Panter *et al.*, 2010; Salmon *et al.*, 2007). Confidence and enjoyment are essential if children, young people and adults are to see cycling as a viable and preferred mode of travel for life.

While many of the results from this paper are positive in terms of supporting the role of Bikeability in encouraging active travel, further work is needed to interpret these initial results. One major difficulty with the cross-sectional design adopted by both surveys discussed in this paper is that causality cannot be established. Clearly, there appear to be differences in behaviour and confidence between children who participate in cycle training and those who do not. What is less clear is whether those children who participate in training are different to those who do not participate in training prior to the training, or whether the training causes them to behave and feel differently. Future research (perhaps in the form of a longitudinal cohort study, and additional qualitative research to provide an in-depth understanding of context) should take this into account, and investigate issues of causality to engender a better understanding of the interrelationships between cycle training and cycling frequency, location, destinations, confidence and enjoyment.

Overall, the findings discussed in this paper suggest that cycle training does encourage more active travel. Taken together, the data indicate that providing Bikeability training to children could lead to individual and societal benefits. However, these results do not offer anything more than an initial view of the likely effectiveness of cycle training in increasing cycling levels among children. Further research is needed in order to understand the longer-term and wider impacts and return on investment that Bikeability promises.

7. Conclusions

This paper has used new data sources to investigate the impact of Bikeability on children's cycling. While these results came from relatively small data sets, they indicate that cycle training is associated with children who cycle more, are more confident and, importantly, enjoy cycling. More comprehensive evaluations are needed in order to attribute these observed differences in cycling behaviours and attitudes to training rather than to confounding factors. Evaluations establishing causal relationships should also consider the effectiveness of different delivery models (such as on-road, off-road, online) in addressing the needs of children who may benefit most from becoming more physically active. Notwithstanding this, the paper has shown that cycle training for children has the potential to play an important role in encouraging active travel among the children and young people of today, and potentially the adults of tomorrow.

7.1 Practical relevance and potential applications

This paper has highlighted the role of Bikeability cycle training in increasing the level of cycling among children. It is important for engineers to be aware of measures such as cycle training because they can play a valuable role alongside infrastructure measures such as cycle lanes, cycle parking, junction design and road design in maximising the potential for behaviour change and active travel. Furthermore, it is necessary to recognise that children and adults who participate in Bikeability cycle training are trained to the national standard for cycle training governed by the DfT that teaches them how to cycle safely on the road with traffic. Therefore, it is important that the highway network supports the behaviours that they are taught and enables them to cycle safely.

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